



The effect of open green space on the stress level of Bogor Botanical Garden visitors

Yuriko Asahiro^a, Arzyana Sunkar^b, Jarwadi B Hernowo^b

^aTropical Biodiversity Conservation Study Program, Graduate School, IPB University, IPB Darmaga Campus, Bogor, 16680, Indonesia

^bDepartment of Forest Resources Conservation and Ecotourism, IPB University, IPB Darmaga Campus, Bogor, 16680, Indonesia
[+62 251-8621947]

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Corresponding Author:

Yuriko Asahiro

Tropical Biodiversity
Conservation Study Program,
Graduate School, IPB
University;

Phone: +6285802736775

Email:

yurikoasahiro@live.com

Abstract. *Stress is a global phenomenon that has become a part of everyday life. The presence of stressors can trigger stress. In Indonesia, the prevalence of psychological stress keeps increasing. This study aims to analyze the perceived restoration effect of open green parks on the stress levels of Bogor Botanical Gardens visitors. A survey of 100 visitors of Bogor Botanical Garden was conducted based on Perceived Stress Scale with a random and accidental sampling method. Data on respondent characteristics and stress levels were analyzed using descriptive analysis, the visitor's characteristics that affected their stress levels were analyzed using stepwise linear regression and analysis of variance, and the effect of having a garden and the proximity to open green space on the visitor's stress levels were identified using analysis of variance. The respondents who felt low, medium, and high-stress levels were 22%, 73%, and 5%, respectively. The majority of the respondents perceived Bogor Botanical Garden as restorative. Factors that significantly affect the stress level of respondents are age and purpose of visit. The older the respondent, the lower their stress level tends to be. Visitors who visit for exercise/health activities have significantly lower stress levels than for other visits. In this study, no significant relationship was found between garden ownership and proximity to green parks on the stress level of the respondents.*

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INTRODUCTION

Stress is a global phenomenon that has become a part of everyday life (Iwata et al. 2013). According to Colman (2015), stress can be defined as psychological and physical tension caused by physical, emotional, social, economic, and occupational, events or experiences that are difficult to manage or endure. Stress can be triggered by the presence of stressors/causes of stress (Anakwenze and Zuberi 2013), such as job loss, life demands, fear, and anxiety (Klinik Community Health Center 2010). According to The Indonesian Ministry of Health (Badan Penelitian dan Pengembangan Kesehatan 2013; 2019), there is an increase in Indonesia's national prevalence of psychological distress from 6% in 2013 to 9.9% in 2018. Moreover, according to Kaligis et al. (2020), the stress level of Indonesian people keeps increasing in advance of COVID-19. This was caused by the increasing fear of contagion, misinformation, and uncertainty felt by the people (Kaligis et al. 2020). The implementation of the Lockdown policy made the condition worse (Khasanah et al. 2021; Fauk et al. 2022) and became the major stressor during the pandemic due to social disconnection and loneliness (Matos

et al. 2021). To overcome this, a means is needed to reduce the stress level of the community, one of which is by making contact with or visiting the natural environment.

Ulrich (1983) explains that contact with the natural environment can restore the capacity to focus and reduce stress levels, which have a positive impact on mental health and well-being. Several studies have shown that spending time or direct contact with the natural environment can reduce a person's stress (Maller et al. 2006; Beil and Hanes 2013; Pazhouhanfar and Kamal 2014), one of which is a park (Tyrväinen et al. 2014; Wood et al. 2017, 2018; Mennis et al. 2018). Wood et al. (2017) explained that the potential to reduce stress from parks or green open spaces would increase with an increase in the area of the park, larger parks can provide more services and more options for utilizing the park. For example, larger parks allow for a wider variety of facilities and uses and allow visitors to walk through park areas and passively observe the surrounding activity. Apart from that, the large park also has more areas for visitors to “discover” and explore.

Bogor Botanical Gardens (KRB/*Kebun Raya Bogor*) is the largest park or green open space in Bogor City, which has high natural therapeutic potential to reduce visitor stress levels. The high potential in KRB was related to the high level of diversity of habitats, plants, and animals (Hedblom et al. 2017; Felappi et al. 2020; Young et al. 2020; Nghiem et al. 2021), as well as the large area of the KRB (87 ha) which has an important role in reducing and restoring visitor stress (Wood et al. 2017). Another potential of KRB was its location which is in the center of Bogor City, making it easier for visitors both from Bogor and outside of Bogor (especially Jakarta) to visit. Ease of access could affect the restorative potential of parks (Orstad et al. 2020; Yigitcanlar et al. 2020) because it could increase the park frequency of visits (Wolf and Wohlfart 2014).

The purpose of this study was to analyze the perceived restoration effect of open green parks on the stress levels of KRB visitors. Therefore, 1) we measured visitor's perceived stress levels, 2) we identified visitor's characteristics (demographic and park use pattern) that affected the visitor's stress levels, and 3) we identified the effect of having a garden and the proximity to open green space to the visitor's stress levels.

METHOD

Research Location and Time

This research was carried out from January-February 2022 after the Lockdown policies in Indonesia were lifted. The research was conducted in Bogor Botanical Garden, Bogor, West Java. Location selection was determined purposively with the consideration that Bogor Botanical Garden was located in the center of Bogor City, which makes it easier for visitors to access it.

Instruments and Ethical Approval

The instruments used during this study were interview guides and questionnaire forms. This study has been ethically approved by The Human Research Ethics Committee of Bogor Agricultural University (IPB University) with letter number 617/IT3.KEPMSM-IPB/SK/2021.

Data Collection Methods

In this study, interviews were conducted with respondents who were visitors from KRB. The number of respondents was determined using the Slovin formula (Tejada and Punzalan 2012) based on the average number of domestic visitors to the Bogor Botanical Gardens in 2016–2019, which is as many as 98,301 visitors/month. The formula was as follows:

$$n = N/(1 + Ne^2)$$

Explanation:

n = Number of respondents

e = Maximum acceptable error limit (e = 10%)

N = Average number of visitors/month

The calculation results were as follows:

$$n = \frac{98,301}{1 + 98,301(10\%)^2} = 99.90 \approx 100$$

The respondents were selected by using random and accidental sampling methods. In the random sampling method, each visitor has the same possibility of being selected as a respondent. Accidental sampling method is a technique for selecting respondents based on ease and willingness to be interviewed. In the accidental sampling technique, respondents were selected by chance who were close to the researcher (Etikan et al. 2016) and were willing to be interviewed. The interview was carried out randomly throughout the Bogor Botanical Garden, and the interviews were carried out on the spot. Interviews were conducted face-to-face in compliance with existing health protocols. This was done because the respondents were KRB visitors, so the face-to-face method was chosen to be more targeted. The interview consisted of 3 stages, namely; 1) introduction to the study and questionnaires, 2) respondents were asked to fill in visitor profile data, and 3) respondents were asked to measure the level of perceived stress.

The questionnaire used in this study consists of respondent demographic characteristics, visit characteristics, and the Perceived Stress Scale (PSS) (Table 1). The age categories used refer to the Ministry of Health of the Republic of Indonesia in 2009, Sonang et al. (2019), and Wiranuta et al. (2019), which had been adjusted for research needs, namely 14–17 years, 18–25 years, 26–35 years, and over 36 years. The level of perceived stress by respondents in January–February 2022 was measured using the Perceived Stress Scale (PSS). The PSS is a questionnaire that measures an individual's response to an event that has occurred and can cause stress within a one-month period (Cohen et al. 1983; Cohen et al. 2007). Based on Joshi and Vaidya (2017) PSS has been used in several studies to assess the effectiveness of stress-reducing interventions. PSS consisted of 10 items of statements (six negative and four positive statements) with a response based on a five-point Likert scale (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, and 4 = very often) that produces a score between 0 and 40 (Cohen et al. 1983). Positively stated items were reverse-coded before being summed up. The categories of stress levels based on Backhaus et al. (2020) were low-stress level (0-13), moderate stress level (14-26), and high-stress level (27-40).

Table 1 Questionnaire

Questionnaire	Items
Demographic characteristics	Gender, age, place of residence, education, occupation, and income
Park use pattern	Frequency of visits, length of visits, travel time, purpose of visits, have a garden, close to green park, feeling comfortable in park, park can reduce stress
Stress level	10 items of PSS

Data Analysis

Data on respondent characteristics and stress levels were analyzed using descriptive analysis. The statistical analysis performed included linear regression analysis using the stepwise method, Shapiro-Wilk's test, Bartlett's test, and analysis of variance (ANOVA/Welch/Kruskall-Wallis). Statistical analysis was carried out for respondents' stress levels and variables (Table 2) using Rstudio. The Bartlett test was performed to determine the homogeneity of the variance of the data, and the Shapiro-Wilk's test was performed to test the normal distribution of the PSS data. Stepwise linear regression and analysis of variance were used to determine the factors that influence the stress level of the respondents. Multiple linear regression analysis with the stepwise method was used for continuous data and analysis of variance, followed by post hoc Tukey's test, for

categorical data. Analysis of variance was used to analyze the effect of owning a garden and being close to a green park on respondents' perceived stress levels.

Table 2 Nesting sites distance from the river and natural heat sources

Analysis	Items	Type of data
Stepwise linear regression	Age, place of residence, education, income, frequency of visits, length of visits, and travel time	Continuous
Variance analysis	Gender, occupation, purpose of visits, have garden, and close to green park	Categorical

RESULT AND DISCUSSION

Visitors Demographic Characteristics

The results showed that 72% of respondents who visited KRB in January–February 2022 were female (Table 3), which showed the same result by Gaffar et al. (2018) and Affandi et al. (2020). Women tend to visit tourist sites that have a low risk, have a natural feel, and can provide a relaxing experience (Meng et al. 2008; Carballo et al. 2021). According to Wang et al. (2004) women tend to be the most important decision-makers in family vacations. The respondents aged between 14–62, with an average of 25.14 years. The highest percentage of respondents age ranged from 19–25 years (59%), with the majority of the respondents living in Bogor (52% from Bogor Regency).

Table 3 Demographic characteristics of respondents

Variable	Category	Percentage (%)	Variable	Category	Percentage (%)
Gender	Male	28	Education level	Diploma	7
	Female	72		Bachelor	24
Age	14–16	10	Occupation	Student	12
	17–25	64		College student	38
	26–35	12		Civil servant	3
	> 36	13		Private worker	14
				Housewife	11
Place of residence	Bogor City	14	Others	22	
	Bogor Regency	52	Income (Rupiah)	< 2,500,000	33
	Other Cities	34		2,500,001–5,000,000	42
Education level	Elementary	4		5,000,001–7,500,000	14
	Middle school	10	7,500,001–10,000,000	6	
	High school	55	> 10,000,000	5	

As many as 55% of the respondents graduated from high school, and a majority of the respondents were college students (38%). Gamayanti et al. (2018) and Ambarwati et al. (2019) explained that college students, especially in the final year, tend to experience moderate to high levels of stress, this is what is suspected to cause the high number of student visitors. Based on Hanai and Oguchi (2016), someone who is experiencing stress will tend to travel to reduce stress. In addition, this research was conducted during the student holiday season, towards the start of the new semester, thus contributing to the high number of students. This result also coincides with the high number of young visitors (aged < 25 years), who according to Dinda and Ghosh (2021) tend to visit the park on holidays. More than 70% of respondents had incomes below 5,000,000 rupiahs.

Visitors Park Use Patterns

In Table 4 it can be seen that 84% of respondents visited KRB once in the period of January–February 2022, with the majority of the visits being 1–3 hours (55%). The most common purpose for visits was to enjoy the beauty of nature (50%). The results showed that 55% of respondents took more than 45 minutes from home to KRB. Park use patterns related to the frequency of visit, length of visit, travel time, and purpose of visit. The restorative effect that a person feels from a park can increase or decrease depending on their park use patterns. Based on Lanki et al. (2017), several studies state that there is a relationship between patterns of park use and a person's health, especially psychological health recovery (Sonntag-Öström et al. 2014). In addition, based on Carrus et al. (2015), Berg et al. (2016), Kim and Miller (2019), and Xie et al. (2020), visiting for a long time and high frequency of visits can increase the restorative perception of the garden.

Table 4 Visitors park use patterns

Variable	Category	Percentage (%)	Variable	Category	Percentage (%)
Frequency of visit	1 time	84	Travel time	30–45 minutes	22
	2–3 times	13		> 45 minutes	55
	> 3 times	3	Purpose of visit	Exercise/health	17
Visit length	≤ 1 hour	12		Bird watching	2
	1–3 hours	55		View the collection of plants/monuments	6
	3–5 hours	24		Sightseeing/enjoy the view	50
	> 5 hours	9		Spending time with family/friends	19
Travel time	< 15 minute	4	School assignments	6	
	15–30 minute	19			

Visitors Perceived Stress Level

The results of the interviews showed that 22% of respondents felt low-stress levels, 73% moderate-stress levels, and 5% high-stress levels. The use of the PSS showed that 78% of respondents feel that in the January–February 2022 period, they experienced many negative events. This was thought to cause the respondent to become stressed. All (100%) of respondents stated that they felt comfortable and calm when visiting the KRB, and as many as 97% stated that visiting the KRB could reduce their stress. It can be concluded that the majority of respondents perceived KRB as restorative.

According to previous studies, when feeling depressed or stressed, a person will tend to do activities that can reduce their stress level (Roe et al. 2017; Ganesan et al. 2018; Gustems-Carnicer et al. 2019; Park et al. 2020), such as visiting green open spaces that can provide a sense of comfort and relaxation (Irvine et al. 2013; Ugolini et al. 2020; Geng et al. 2021). The comfort felt by respondents was thought to be related to Kaplan and Kaplan's (1989) theory of compatibility, extend, fascination, and being-away. Respondents can enjoy the surrounding conditions (Compatibility), explore the scenery (Extend), be stimulated and interested in nature (Fascination), and feel far from the daily bustle (Being-away) because of the natural conditions of the Bogor Botanical Gardens (Wang et al. 2019; Dahlkvist et al. 2020).

Respondent's Characteristics Affecting Perceived Stress Level

The results of the linear regression analysis in Table 5 show that the age factor significantly influences visitor stress levels (p -value < 0.001). These results were supported by Aldwin (1991), American Psychological Association (2018), Manita et al. (2019), Ozamiz-Etxebarria et al. (2020), Xiong et al. (2020), Lei et al. (2021), Öztürk Çopur and Karasu (2021), which indicates that a person's age is a predictor of stress levels. Based on the results of the analysis, the older the visitor, the lower their stress level. This result was in

line with Aldwin (1991) and the American Psychological Association (2018), which states that the older a person was, the lower their stress level will be. Aldwin (1991) explains that this was because older people were more in control of their lives and could accept their living conditions easier than younger people. The older a person was, the easier it is for them to experience emotions and a more positive outlook on life (Scott et al. 2013).

Table 5 Stepwise linear regression results

Variabel	Estimate	t value	Sig.
Intercept	22.13228	16.13	0.000***
Age	-0.18466	-3.62	0.000475***

***p-value < 0.001

A person's pattern of use of a place with natural nuances, such as a city park, was closely related to that person's stress level. Based on the results of the analysis of variance conducted (Table 6), only respondents' purpose of visits showed statistically significant results. Respondents who visited with the aim of exercising had significantly lower stress levels compared to respondents who came to see a collection of plants/monuments (22.2 vs 14.9; with p-value < 0.0409). These results indicate that doing exercise or physical activity related to health in parks or other urban green areas can have a positive effect on one's mental health. These results were in line with Marselle et al. (2015), Pretty et al. (2016), and Nath et al. (2018). According to Nath et al. (2018), being in nature can have mental and physical health effects, which researchers call "Green Exercise". Mackay and Neill (2010) explained Green Exercise as a physical activity or sport carried out in a natural environment such as a park. Stults-Kolehmainen and Sinha (2014) explained that exercise was an activity that can be done to deal with stress. Doing moderate exercise can improve a person's mental health, and this effect was further enhanced when exercising in a natural environment.

Table 6 Results of analysis of variance

Variable	Category	N	PSS mean	P-value	Post test
Gender	Male	28	16.7	0.326	-
	Female	72	17.8		
Occupation	Student	12	18.5	0.154	-
	College student	38	18.8		
	Civil servant	3	14		
	Private worker	14	16.9		
	Housewife	11	14.6		
	Others	22	17		
	Purpose of visit	Exercise/health (a)	17		
Bird watching (b)		2	16		
View the collection of plants/monuments (c)		6	22.2		
Sightseeing/enjoy the view (d)		50	17.2		
Spending time with family/friends (e)		19	18.7		
School assignments (f)		6	19.2		

*p-value < 0.05

Effect of Owning a Garden and The Proximity to Open Green Space to The Visitor's Stress Levels

In Table 7 it can be seen that there was no significant difference between respondents who have gardens and those who don't, as well as respondents whose houses were close to green open space or not. Although a lot of research suggested that living close to and having easy access to green spaces could improve mental health (Ekkel and de Vries 2017; Dzhambov et al. 2018; Hazer et al. 2018; Houlden et al. 2019; Yigitcanlar et

al. 2020), this research found no significant relations between KRB visitors perceived stress level and the proximity to green space. This result was presumably due to the research being carried out not long after the Lockdown policy in Indonesia was lifted. As it was known that during the COVID-19 pandemic, the stress level of Indonesian people tended to increase (Kaligis et al. 2020) regardless of the presence of green open spaces. This is due to the implementation of the lockdown policy in Indonesia (Fauk et al. 2022; Khasanah et al. 2021) which limits community activities, one of which is visiting green open spaces, which were restricted during the pandemic to reduce crowds. Further research needs to be carried out when conditions are close to normal so that the effects of the lockdown policy can be reduced.

Table 7 The effect of proximity to green open space on stress levels

Variable	Category	N	PSS mean	P-value	Post test
Have gardens	Yes	70	17.3	0.699	-
	No	30	17.8		
Close to green parks	Yes	81	17.5	0.832	-
	No	19	17.3		

CONCLUSION

The respondents who felt low, medium, and high-stress levels were 22%, 73%, and 5%, respectively. The majority of the respondents perceived Bogor Botanical Garden as restorative. Factors that significantly affect the stress level of respondents are age and purpose of visit. The older the respondent, the lower their stress level tends to be. Visitors who visit for exercise/health activities have significantly lower stress levels than for other visits. In this study, no significant relationship was found between garden ownership and proximity to green parks on the stress level of the respondents.

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