

# Impact of Nature Exposure on Stress Levels in Urban Population

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**Abstract:** *Rapid urbanization exposes city residents to persistent stressors while reducing everyday contact with nature. This study examined the relationship between nature exposure and perceived stress among urban residents. A cross-sectional online survey was completed by 100 adults. Nature exposure was measured with six frequency items (Nature Exposure Index, NEI) and stress with the 10-item Perceived Stress Scale (PSS-10). Data were analysed using percentage analysis, mean analysis, Pearson correlation, one-way ANOVA and multiple regression. Most respondents reported moderate (73.7%) or high (12.1%) stress ( $M = 19.62$ ,  $SD = 5.65$ ). Nature exposure was largely occasional ( $NEI M = 1.66$ ), although more than 90% agreed that nature helps them relax and improves their mood. Nature exposure was negatively correlated with stress ( $r = -0.33$ ,  $p < .001$ ). Mean stress fell from 22.06 in the low-exposure group to 17.26 in the high-exposure group ( $F = 5.44$ ,  $p = 0.006$ ), and the association remained significant after controlling for age (partial  $r = -0.29$ ,  $p = 0.004$ ). Visiting parks or gardens showed the strongest association with lower stress ( $r = -.42$ ). The findings suggest that regular, habitual contact with nature, rather than access or attitude alone, is associated with lower stress in urban populations.*

**Keywords:** nature exposure; perceived stress; PSS-10; urban green space; mental well-being; India

## 1. Introduction

Stress has become one of the most common health concerns in modern urban society. Chronic stress is linked to cardiovascular disease, hypertension, anxiety, and depression. City residents face overcrowding, traffic congestion, noise and air pollution, and demanding work schedules, while the fast pace of urban life limits opportunities for relaxation and recovery. At the same time, urban growth reduces access to restorative natural settings such as parks, trees, water bodies and open landscapes.

A substantial body of research indicates that contact with nature lowers physiological stress markers, improves mood and restores attention. Such evidence suggests that nature exposure could be a simple, low-cost and preventive strategy for stress management. However, most of this evidence comes from developed countries, and relatively few studies have examined urban populations in India using standardized stress measures.

The present study addresses this gap by examining whether more frequent exposure to nature is associated with lower perceived stress among urban residents. The study tested the following hypotheses:

H<sub>0</sub>: Nature exposure has no significant impact on stress levels among the urban population.

H<sub>1</sub>: Nature exposure significantly reduces stress levels among the urban population.

## 2. Review of Literature

Two theories explain the restorative effects of nature. Attention Restoration Theory (Kaplan & Kaplan, 1989) proposes that sustained, demanding attention leads to mental fatigue, and that natural settings restore this capacity by engaging effortless attention. Stress Reduction Theory (Ulrich, 1984; Ulrich et al., 1991) emphasizes rapid emotional

and physiological recovery: participants viewing natural scenes recovered faster in heart rate, blood pressure and muscle tension than those viewing urban scenes.

Empirical studies support both theories. Hartig et al. (2003) found faster stress recovery and improved mood after walks in natural compared with urban settings. Bratman et al. (2015) showed that a 90-minute nature walk reduced rumination and activity in the subgenual prefrontal cortex, a region linked to depression. Population studies report similar patterns: residents of greener areas report better mental health (Maas et al., 2006) and show healthier cortisol profiles and lower self-reported stress (Thompson et al., 2012). Reviews conclude that nature experience benefits both cognitive function and mental health (Bratman et al., 2012).

Gaps remain. Evidence from Indian cities is limited; many studies measure general mental health rather than stress with standardized instruments; and the roles of frequency, type of setting and accessibility are not well understood. This study uses the PSS-10 and examines several types of nature contact separately.

## 3. Methodology

**Design and sample:** A quantitative, descriptive and correlational design was used. Data were collected online through Google Forms between 26/08/2026 and 29/09/2026 using convenience sampling. Of 101 responses, one blank response was excluded, leaving 100 respondents.

**Instrument:** The questionnaire had four sections:

(A) demographics (B) nature exposure – daily time outdoors and the frequency of six types of nature contact (parks or gardens, walks in green areas, time near trees, water bodies, forests or natural landscapes, and intentional time in nature to relax); (C) eight agreement statements on access, engagement and perceived benefits, plus a single item on the overall effect of nature on stress; and (D) the PSS-10 (Cohen et al., 1983).

**Scoring:** All rating items were scored 0–4 (Never/Strongly disagree = 0 to Very often/Strongly agree = 4). The Nature Exposure Index (NEI) is the mean of the six frequency items. An Engagement and Access score (five items) and a Perceived Benefit score (relaxation, mental tiredness and mood) were also computed. PSS-10 items 4, 5, 7 and 8 were reverse-scored, giving a total of 0–40, classified as low (0–13), moderate (14–26) or high (27–40). Internal consistency was acceptable to excellent: Cronbach's  $\alpha = 0.90$  (NEI), 0.72 (Engagement and Access), 0.88 (Perceived Benefit) and 0.80 (PSS-10).

**Analysis:** Percentage and mean analysis described the sample and responses. Pearson correlation tested the association between nature exposure and stress. One-way ANOVA compared stress across low (NEI  $\leq 1.0$ ), moderate (1.0–2.0) and high ( $> 2.0$ ) exposure groups. Because age was strongly related to stress, partial correlation and multiple regression were used to control for age. Significance was set at  $p < .05$ .

**Ethics:** Participation was voluntary and anonymous; no names or contact details were collected, and data were used only for academic purposes.

## 4. Results

### 4.1 Profile of Respondents

Table 1 summarises the sample. Most respondents were aged 26–35 years (55%;  $M = 34.7$  years), female (65%), graduates or postgraduates (75%) and employed or self-employed

(75%). A large majority (87%) had lived in an urban area for more than 10 years.

**Table 1:** Demographic profile of respondents (N = 100)

| Characteristic             | n  | %  | Characteristic    | n  | %  |
|----------------------------|----|----|-------------------|----|----|
| <b>Age</b>                 |    |    | <b>Education</b>  |    |    |
| Up to 25 years             | 11 | 11 | Higher secondary  | 4  | 4  |
| 26–35 years                | 55 | 55 | Undergraduate     | 17 | 17 |
| 36–45 years                | 17 | 17 | Graduate          | 30 | 30 |
| 46–55 years                | 9  | 9  | Postgraduate      | 45 | 45 |
| Above 55 years             | 3  | 3  | Other             | 4  | 4  |
| Not stated                 | 5  | 5  | <b>Occupation</b> |    |    |
| <b>Gender</b>              |    |    | Employed          | 51 | 51 |
| Female                     | 65 | 65 | Self-employed     | 24 | 24 |
| Male                       | 35 | 35 | Student           | 13 | 13 |
| <b>Years in urban area</b> |    |    | Homemaker         | 8  | 8  |
| Less than 1 year           | 3  | 3  | Retired           | 4  | 4  |
| 1–5 years                  | 6  | 6  |                   |    |    |
| 6–10 years                 | 4  | 4  |                   |    |    |
| More than 10 years         | 87 | 87 |                   |    |    |

### 4.2 Nature exposure, attitudes and perceived benefits

Nature exposure was mostly occasional (Table 2). All six items had means below the scale midpoint of 2 (“Sometimes”). Contact with trees was the most frequent form of exposure ( $M = 1.99$ ) and time in forests or natural landscapes the least frequent ( $M = 1.23$ ; 22% never). Only 22% visited a park or garden often or very often, and only 19% often spent time in nature specifically to relax. Half of the respondents (50%) spent less than one hour outdoors per day.

**Table 2:** Frequency of nature exposure (% of respondents) and item means (0–4)

| Item                            | Never | Occas. | Some-times | Often | Very often | Mean | SD   |
|---------------------------------|-------|--------|------------|-------|------------|------|------|
| Visit a park or garden          | 5     | 42     | 31         | 15    | 7          | 1.77 | 1    |
| Walk in a green/natural area    | 4     | 38     | 30         | 17    | 11         | 1.93 | 1.08 |
| Spend time near trees           | 2     | 40     | 28         | 17    | 13         | 1.99 | 1.09 |
| Visit a lake, river or beach    | 10    | 52     | 26         | 10    | 2          | 1.42 | 0.88 |
| Spend time in forest/landscapes | 22    | 47     | 22         | 4     | 5          | 1.23 | 1    |
| Spend time in nature to relax   | 13    | 37     | 31         | 15    | 4          | 1.6  | 1.02 |
| Nature Exposure Index           |       |        |            |       |            | 1.66 | 0.83 |

Attitudes towards nature were strongly positive (Table 3). Most respondents had easy access to green spaces (75%) and felt safe in them (86%). More than 90% agreed that nature helps them relax, reduces mental tiredness and improves their mood, and 94.9% reported that time in nature reduces their

stress (65.3% “significantly”). The weakest item was making time for nature in one’s routine: only 38% agreed ( $M = 2.16$ ). Respondents therefore value nature highly but do not regularly build it into their schedules.

**Table 3:** Access, engagement and perceived benefits of nature

| Statement                                  | Agree % | Neutral % | Disagree % | Mean | SD   |
|--------------------------------------------|---------|-----------|------------|------|------|
| Easy access to green spaces near home      | 75      | 15        | 10         | 2.87 | 1    |
| Make time for nature in routine            | 38      | 32        | 30         | 2.16 | 1.1  |
| Feel comfortable and safe in green spaces  | 85.9    | 12.1      | 2          | 3.14 | 0.7  |
| Natural surroundings are pleasant          | 83.8    | 10.1      | 6.1        | 3.07 | 0.87 |
| Time in nature is important for well-being | 88.9    | 11.1      | 0          | 3.34 | 0.67 |
| Nature helps me feel more relaxed          | 93.9    | 6.1       | 0          | 3.52 | 0.61 |
| Less mentally tired after time in nature   | 89.9    | 8.1       | 2          | 3.37 | 0.76 |
| Nature improves my mood                    | 92.9    | 7.1       | 0          | 3.52 | 0.63 |

Agree = Agree + Strongly agree; Disagree = Disagree + Strongly disagree. Mean on a 0–4 scale.

### 4.3 Stress levels

The mean PSS-10 score was 19.62 (SD = 5.65), within the moderate range. 73.7% of respondents reported moderate

stress, 12.1% high stress and only 14.1% low stress. Feeling “nervous and stressed” was the most frequent distress experience, reported often or very often by 40.4% of respondents. Stress declined with age, from a mean of 24.8

among those aged up to 25 years to 14.4 among those aged 46–55 years. Women reported slightly higher stress than men (20.29 vs 18.39), but the difference was not significant ( $t = 1.61, p = .11$ ).

#### 4.4 Relationship between nature exposure and stress

Table 4 presents the correlations. Nature exposure was moderately and negatively correlated with stress ( $r = -0.33, p < .001$ ): respondents with more frequent nature contact reported lower stress (Figure 1). In contrast, daily time

outdoors ( $r = -.12, p = .25$ ), engagement and access ( $r = -.15, p = .13$ ) and perceived benefit ( $r = -.02, p = .88$ ) were not significantly related to stress. Perceived benefit was also unrelated to actual exposure ( $r = .03$ ). At the item level, visiting parks or gardens showed the strongest association with lower stress ( $r = -.42, p < .001$ ), followed by walks in green areas ( $r = -.28$ ), time near trees ( $r = -.27$ ), making time for nature in one's routine ( $r = -.26$ ), intentional time in nature ( $r = -.23$ ) and time in forests ( $r = -.21$ ; all  $p < .05$ ). Visits to water bodies were not significant ( $r = -.19, p = .06$ ).

**Table 4:** Means, standard deviations and Pearson correlations

| Variable                 | M     | SD   | 1       | 2     | 3      | 4     | 5       |
|--------------------------|-------|------|---------|-------|--------|-------|---------|
| 1. Nature Exposure Index | 1.66  | 0.83 | —       |       |        |       |         |
| 2. Daily time outdoors   | 1.5   | 1.23 | 0.34**  | —     |        |       |         |
| 3. Engagement and Access | 2.91  | 0.61 | 0.50**  | 0.19  | —      |       |         |
| 4. Perceived Benefit     | 3.47  | 0.6  | 0.03    | -0.02 | 0.36** | —     |         |
| 5. Age                   | 34.72 | 9.76 | 0.14    | -0.11 | 0.12   | -0.01 | —       |
| 6. PSS-10 stress score   | 19.62 | 5.65 | -0.33** | -0.12 | -0.15  | -0.02 | -0.47** |

$N = 94-100$ . \*\*  $p < .01$ ; \*  $p < .05$  (two-tailed). Rating scales 0–4; daily time outdoors 0 (< 30 min) to 3 (> 2 hours); PSS-10 0–40.

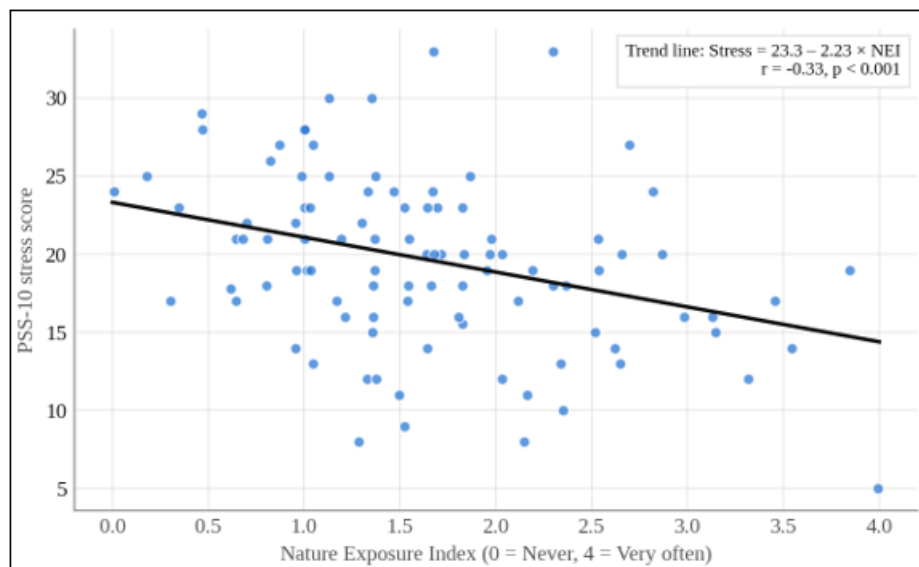


**Figure 1:** Relationship between the Nature Exposure Index and PSS-10 stress score

Stress declined steadily across exposure groups (Table 5; Figure 2), from 22.06 in the low-exposure group to 19.51 (moderate) and 17.26 (high), a significant difference ( $F = 5.44, p = 0.006$ ). Only 3.6% of low-exposure respondents had low stress, compared with 25.9% of high-exposure respondents.

**Table 5:** Mean PSS-10 stress score by level of nature exposure

| Exposure group (NEI) | n          | Mean        | SD   |
|----------------------|------------|-------------|------|
| Low ( $\leq 1.0$ )   | 28         | 22.06       | 4.34 |
| Moderate (1.0–2.0)   | 44         | 19.51       | 5.34 |
| High ( $> 2.0$ )     | 27         | 17.26       | 6.42 |
| One-way ANOVA        | $F = 5.44$ | $p = 0.006$ |      |

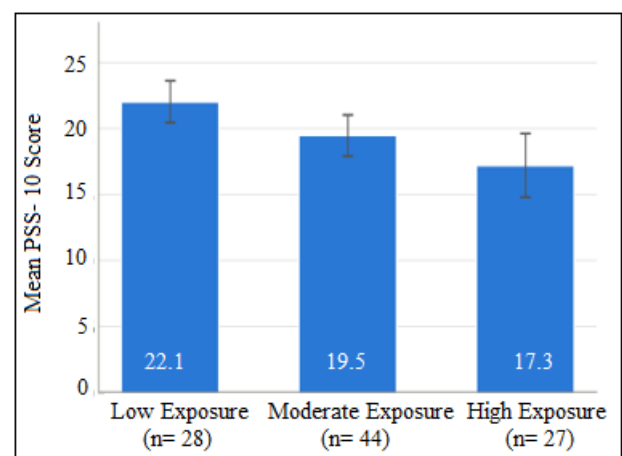


**Figure 2:** Mean stress score by level of nature exposure (error bars show 95% confidence intervals)

Because younger respondents reported much higher stress ( $r = -.47, p < .001$ ), age was entered as a control (Table 6).

Nature exposure remained a significant predictor of lower stress ( $B = -1.82$ ,  $p = 0.004$ ; partial  $r = -0.29$ ,  $p = 0.004$ ). Holding age constant, each one-point increase in the NEI was associated with a 1.8-point decrease in the PSS-10 score. Together, the two predictors explained 29% of the variance in stress.  $H_0$  was therefore rejected and  $H_1$  accepted.

**Table 6:** Multiple regression predicting PSS-10 stress score

| Predictor             | B     | SE   | t     | p      |
|-----------------------|-------|------|-------|--------|
| Constant              | 31.67 | 2.03 | 15.62 | < .001 |
| Nature Exposure Index | -1.82 | 0.62 | -2.92 | 0.004  |
| Age (years)           | -0.26 | 0.05 | -4.94 | < .001 |

$N = 94$ ;  $R^2 = 0.292$ .

## 5. Discussion

The study found that urban residents who spend time in nature more often report significantly lower stress, and this association holds after controlling for age. The size of the association ( $r = -.33$ ) is moderate and consistent with population studies linking green space to better mental health (Maas et al., 2006) and lower stress (Thompson et al., 2012). The result also fits Stress Reduction Theory and Attention Restoration Theory: 90% of respondents reported feeling less mentally tired after time in nature, which is the restorative effect described by Kaplan and Kaplan (1989).

Two further findings are notable. First, the type of exposure matters. Regular visits to parks and gardens, which are the most accessible natural settings in a city, showed the strongest association with lower stress, while general time outdoors did not. This suggests that the benefit comes from time spent in natural settings, not from being outside as such, which may include commuting or outdoor work.

Second, there is a clear gap between belief and behaviour. Almost all respondents believed that nature helps them relax, and most had easy and safe access to green spaces, yet actual exposure was mostly occasional. Positive beliefs were unrelated to both exposure and stress, whereas making time for nature in one's routine was associated with lower stress. For this sample, the main barrier appears to be time and habit rather than access or attitude. Interventions should therefore focus on building regular routines, such as scheduled park walks or outdoor breaks at work, rather than only on raising awareness.

The higher stress among younger adults and students points to a group that may benefit most from such interventions. Employers, colleges and urban planners can support this through green campuses and workplaces, well-maintained neighbourhood parks with convenient opening hours, and the restoration of public access to urban lakes, which were among the least-visited settings.

## 6. Limitations

The study used convenience sampling and a cross-sectional design, so the findings show association, not causation; less-stressed people may also find it easier to spend time in nature. The sample was skewed towards women and adults aged 26–35, and all measures were self-reported. Future research should use larger and more representative samples,

longitudinal or experimental designs, measures of visit duration and green-space quality, and physiological stress markers.

## 7. Conclusion

Stress was common among the urban residents studied: about 86% reported moderate or high stress. More frequent contact with nature, especially regular visits to parks and gardens, was significantly associated with lower stress, independently of age. Most respondents already have access to green spaces and believe in their benefits; the challenge is turning this into regular habit. Nature exposure is a simple, low-cost and accessible strategy for stress management, and these findings support integrating green spaces into urban development and encouraging individuals and institutions to make time in nature a regular part of urban life.

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