

Urban green spaces: the role of greenery and natural elements in promoting visitors' attachment and well-being

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This study examines the relationship between the presence of greenery and natural elements in urban green spaces (UGSs), and visitors' attachment, and well-being. Four UGSs in Gaza City were selected based on criteria that ensured representation of various types, sizes, locations, and green features. A survey instrument was designed to assess visitors' perceptions of greenery and natural elements, attachment to UGSs, and well-being. The survey was validated by seven experts in landscape architecture and urban planning. Results show that visitors' perceptions of greenery and natural elements significantly affect their place attachment, happiness, health, and motivation to visit. The provision and maintenance of greenery and natural elements in UGSs should be a priority for urban planners and policymakers to create and maintain green spaces that are beneficial for visitors' well-being. These findings have important implications for urban planning and design in promoting sustainable and healthy urban environments. Further research is needed to investigate the potential causal relationships between visitors' perceptions, and their well-being, and to evaluate the effectiveness of interventions aimed at improving these perceptions.

Keywords: urban green spaces, natural elements, greenery, visitor perception, place attachment, well-being

1 Introduction

Urban green spaces (UGSs) are increasingly recognized for their numerous benefits to visitors' well-being and quality of life. Among the many factors that contribute to the positive experience of visitors to UGSs, greenery and natural elements have been found to be particularly important. Greenery refers the presence of vegetation, and the extent, and its density in UGSs, while natural elements refer to the presence of natural features, such as trees, plants, water bodies, and wildlife. In recent years, there has been a growing interest in the role of greenery and natural elements in UGSs and their impact on visitors' attachment and well-being. Greenery and natural elements in UGSs have been shown to contribute positively to visitors' emotional, social, and physical well-being. Visitors' attachment to UGSs is also influenced by the presence of these natural elements. Attachment to a place is a complex psychological construct that involves the emotional bonds and connections that individuals have with the physical environment. Attachment to

UGSs has been associated with a range of benefits, such as greater life satisfaction, lower levels of stress, and improved health.

The studies discussed have investigated the impact of greenery and natural elements on visitors' level of place attachment and well-being to UGSs. Findings suggest that green open spaces play a crucial role in community attachment, individuals' place attachment to new environments, and well-being. In the study by Mohamed and Othman (2012), the physical characteristics of UGSs, including green elements, were found to influence visitors' level of satisfaction. The research by Zhu et al. (2017) highlighted that the distribution and shape of green open spaces had a significant impact on community attachment, with centralized green open space layouts having a greater effect than dispersed green open spaces. Kim and Miller (2019) found that the closer the distance of visitors to green infrastructure sites, the more likely they are to experience positive psychological benefits and place attachment. Kil et

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al. (2012) examined the relationships between place attachment and future visit intentions at nature-based recreation and tourism areas. Liu et al. (2018) reported that local landscapes positively contribute to residents' place attachment, and the addition of familiar local landscape elements can enhance an individual's attachment to a new environment. Han et al. (2020) found that green physical surroundings at airports had a significant function in travellers' green intentions, which contributed to building their intentions for green behaviours. Chow et al. (2019) explored the association between visitors' place attachment and their satisfaction and environmentally responsible behavioural intention. Finally, Kothencz et al. (2017) showed that perceived green space characteristics were strong predictors of visitors' satisfaction and quality of life, with direct well-being benefits, such as green elements, having a more significant influence. Kothencz et al. (2017) predicted the influence of perceived green space characteristics in the city of Szeged, Hungary, on two well-being variables: the green space visitors' level of satisfaction and the self-reported quality of life. Overall, these studies indicate that greenery and natural elements in UGSs positively impact visitors' place attachment, satisfaction, and well-being.

While previous studies have explored the relationship between greenery, natural elements, and visitors' well-being and attachment to UGSs, there is still a need for a comprehensive understanding of the specific mechanisms by which greenery and natural elements influence visitors' well-being and attachment to UGSs. Additionally, there is a need to investigate the potential causal relationships between greenery and natural elements, and visitors' well-being and attachment to UGSs. A better understanding of these relationships would provide important insights for urban planners, policymakers, and designers in creating and maintaining UGSs that are beneficial for visitors' well-being and attachment.

1.1 Research questions

1. How do visitors' perceptions of greenery and natural elements in UGSs contribute to their sense of place attachment?
2. How do other factors, such as place identity, place dependence, environmental concern, social bonding, and emotional bonding, interact with visitors' perceptions of greenery and natural elements in UGSs to influence their attachment to these spaces?
3. How do visitors' perceptions of greenery and natural elements in urban green spaces (UGSs) influence their motivation to visit, health, and happiness?

Therefore, the present study aims to investigate the role of greenery and natural elements in promoting

visitors' attachment and well-being in UGSs. Specifically, the study will explore the relationship between greenery and natural elements and visitors' motivation to visit UGSs, their happiness, health, and place attachment. The study will also investigate the potential causal relationships between greenery and natural elements, and visitors' well-being and attachment to UGSs. The findings of the study will contribute to the growing body of literature on the importance of greenery and natural elements in UGSs and their impact on visitors' well-being and attachment. The findings will also have important implications for urban planners, policymakers, and designers in creating and maintaining UGSs that are beneficial for visitors' well-being and attachment.

2 Material and methods

2.1 Study design and data collection

This study employed a cross-sectional survey design to investigate visitor attachment to urban green spaces (UGSs) in Gaza City. The study was conducted between April and May 2023 and data was collected from visitors to each square during peak hours on weekdays and weekends. In order to capture the full range of urban green spaces (UGSs) available in Gaza City, the study utilized a selection process that was informed by a set of rigorous criteria. To ensure a diverse representation of UGSs, a range of factors were taken into account, including the type of UGS, its size, location, accessibility, greenery, and natural features. Based on this criterion, four UGSs were selected for this study: Palestine Square, Municipality Garden, Alsaraya, and the Unknown Soldier Square. Figure 1 displays the locations of all the sites within the Gaza City Center map and Figure 2 displays views of the four selected sites.

The selected UGSs are all located in the heart of Gaza City, making them highly accessible to residents and visitors alike. Moreover, they were chosen for their diverse range of features and aspects, which include a rich history that has made them important landmarks within the city. These factors make the selected UGSs ideal candidates for examining the attachment of visitors to urban green spaces, as well as their well-being and perceptions of greenery and natural elements. By selecting these sites, the study aimed to provide a comprehensive analysis of visitor attachment to a range of UGSs in Gaza City.

Site (1): The Unknown Soldier Square: The Unknown Soldier Square is a prominent urban public space located in the Rimal district of Gaza City, situated along Omar Mukhtar Street. This square has significant cultural and historical value for Palestinians, serving as an important

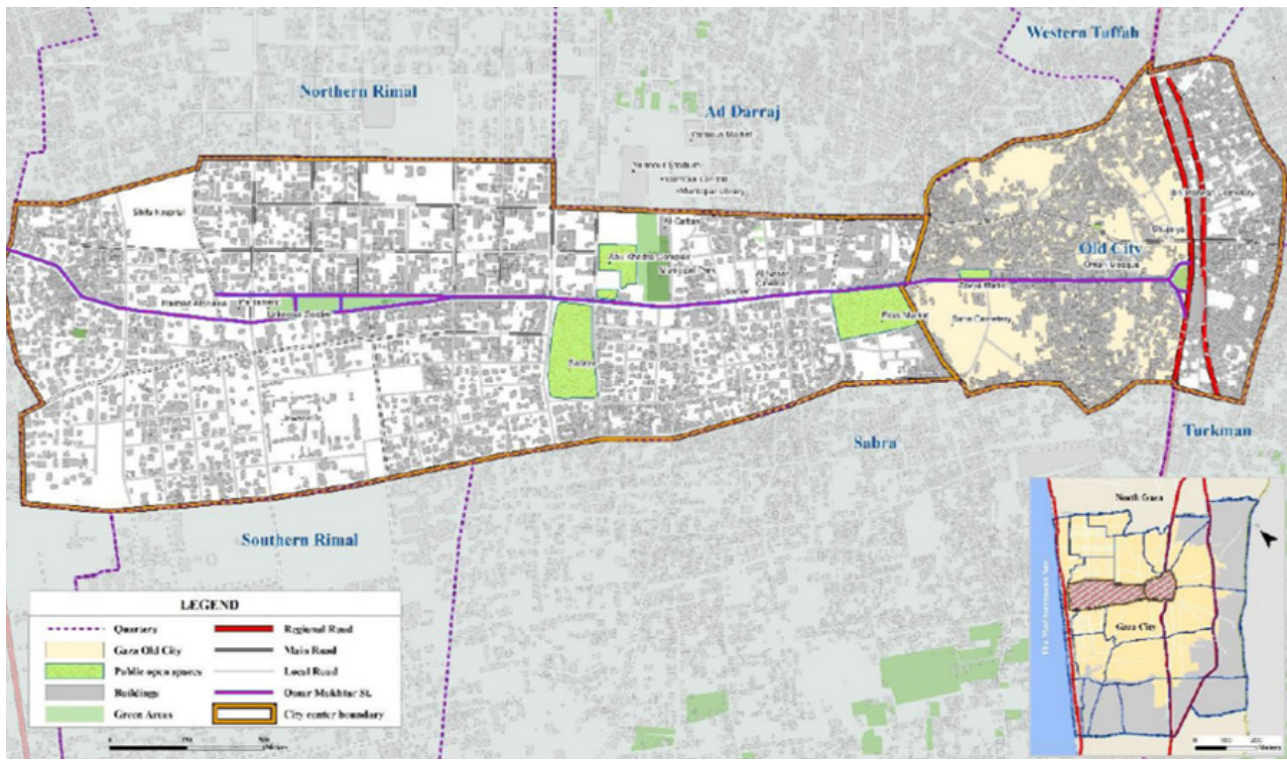


Figure 1 Map of selected urban green spaces (UGSs) in Gaza city center

public space in Gaza City. It provides a peaceful and verdant setting for social activities and community gatherings. The square has a unique triangular shape, which was designed as a public garden to cater to both visitors and locals. Consequently, it has become a vibrant hub of activity in Gaza City, catering to a diverse range of needs and interests. The Square of the Unknown Soldier is home to important public buildings and amenities that have established it as an important landmark within the city and a popular destination for both tourists and residents. Its triangular shape, combined with its range of facilities and attractions, make it an iconic symbol of urban life in Gaza City, embodying both the city's rich history and its vibrant present.

Site (2): Al-Saraya Square: Al-Saraya has been an important landmark in the Gaza Strip for centuries, serving as a site for various governmental and political activities, cultural events, and social gatherings. Its significance in Gaza's history and culture has remained intact over the years, even though the site is now mostly an empty lot. The site's strategic location, in the heart of Gaza City, and its vast open space make it a valuable asset for hosting major events and activities that require a significant amount of space, such as national celebrations, festivals, and exhibitions. The space's large size and accessibility also make it an ideal venue for hosting public meetings and demonstrations. Moreover, Al-Saraya has also become a popular urban green space for visitors to enjoy

its greenery. It serves as a vital source of recreational space and relief from the densely populated urban environment surrounding it. The location and size of Al-Saraya make it an ideal candidate for a large-scale green space, which can serve as a model for other urban green spaces in the Gaza Strip.

Site (3): Municipal Park of Gaza: The Municipality Park located in the central part of Omar Al-Mukhtar Street is a significant urban green space that extends from Firas market to Al-Saraya and the surrounding northern region. It is not only a natural haven, but also has significant ecological and cultural value. The park hosts a diverse range of trees, including some that date back to the era of Egyptian rule in the Gaza Strip. These trees are not only aesthetically pleasing, but also contribute to the park's ecological health by absorbing pollutants and providing shade. The Municipality Park spans over an area of approximately 12 dunums and serves as a popular recreational spot for many families residing in Gaza. It is a hub for leisure activities, particularly during holidays and weekends, attracting visitors from all over the city. Moreover, the park's strategic location, combined with its ample greenery and natural elements, make it a key contributor to the well-being and enjoyment of visitors, as well as an essential component of the urban fabric of Gaza City.



view of Palestine square



view of Municipal park of Gaza



view of the unknown Soldier square



view of Al-Saraya square

Figure 2 Views of the selected urban green spaces in Gaza strip

Site (4): Palestine Square: Palestine Square is a significant urban public space that occupies a central location in the historic core of Gaza City, serving as a gateway to the city from the west. The rectangular-shaped square spans an area of approximately 75 meters in width and 110 meters in length and is bounded by various public buildings and services. The square’s architectural features and sculptural composition depicting the mythological phoenix at the eastern border enhance its cultural and historical significance. This unique artwork represents the resilience and strength of the Palestinian people, making it a symbolic representation of the Palestinian struggle for freedom and independence. Despite its central location, Palestine Square is primarily paved, with minimal greenery. Nevertheless, it has been an important gathering place for the local community, serving as a venue for public events and activities. The division of the square by Omar Al-Mukhtar Street, which runs through the middle of the square from west to east, creates two distinct areas that serve different functions.

In this study, the validation of sites for the survey was an important step to ensure the accuracy and reliability of

the data collected. The selected sites were then visited and assessed by the research team to verify their suitability for the study. During the assessment, factors such as the quality and quantity of green spaces, the presence of amenities, and the overall condition of the site were considered. The research team also sought the opinions of two experts to ensure that the selected sites were representative of the larger population. By validating the sites in this manner, the study was able to ensure that the data collected was accurate, representative, and reliable.

2.2 Sampling and sample size

The selection of an appropriate sample is crucial in ensuring the validity and reliability of survey results. In this study, the sample consisted of visitors to four urban spaces in Gaza City who met specific criteria, including being 18 years or older and willing to participate in the survey. To achieve a representative sample, a systematic sampling approach was employed, which involved selecting every 10th visitor who entered the urban space during the survey period. The sample size was determined based on statistical power calculations, which indicated

that a sample size of 400 visitors would yield a sufficient level of statistical significance and precision of estimates. This sample size was further divided equally across the four urban spaces, with 100 visitors surveyed at each site. The selection criteria and sampling approach used in this study were designed to ensure a diverse and representative sample of visitors to the four urban spaces, which would enhance the generalizability of the study findings and increase their validity.

2.3 Survey instrument

In this study, the survey instrument was designed with the aim of comprehensively assessing the perceptions of visitors towards greenery and natural elements in selected urban green spaces (UGSs). This was achieved by incorporating items from existing studies, including those by Lee and Kim (2015), Madureira et al. (2018) Lo and Jim (2012), Sanesi and Chiarello (2006), Campagnaro et al. (2020), which were adapted to suit the specific research questions of the current investigation.

The survey items were carefully selected and modified to ensure that they accurately captured visitors' attachment to the UGSs, evaluated their perceptions of the natural elements present in these areas, and assessed their overall well-being during their visit. By incorporating established items from previous studies, the survey instrument was able to draw on a wide range of expertise and research findings in this area, providing a comprehensive and reliable means of data collection.

In order to guarantee the accuracy and dependability of the questionnaire, a rigorous review process was undertaken. Specifically, seven experts, who were eminent in the fields of landscape architecture and urban planning, were invited to critically evaluate the survey instrument. This review process was essential in order to identify any potential flaws in the survey instrument and to ensure that the questions were appropriately framed and constructed. The experts examined the questionnaire from multiple angles, such as its design, wording, structure, and overall coherence. They provided feedback and recommendations to enhance the questionnaire's validity and reliability.

Through this process, the questionnaire underwent several iterations and revisions, based on the feedback provided by the experts. This rigorous review process was critical in ensuring that the questionnaire was not only comprehensive and relevant to the research questions but was also methodologically sound and scientifically rigorous. Thus, the input and expertise of these seven experts were instrumental in refining the survey instrument to make it a valid and reliable tool for

data collection, ultimately contributing to the rigor and validity of the research findings.

To ensure the reliability and validity of our questionnaire, we conducted a pilot study by distributing 30 questionnaires in a specific order. First, we randomly selected a small group of individuals who were representative of our target population. We then administered the questionnaire to this group and collected their responses. Next, we analysed the responses for any errors, inconsistencies, or ambiguities in the questions and revised the questionnaire accordingly. We then distributed the revised questionnaire to another group of individuals, again randomly selected, and collected their responses. This process was repeated until we had distributed and collected responses from 30 individuals. Finally, we analysed the responses for any patterns or trends and checked the reliability and validity of the questionnaire using statistical analysis methods. This pilot study allowed us to identify and correct any potential issues with the questionnaire, ensuring its reliability and validity for future use.

The survey consisted of four main sections:

1. Demographic information: participants were asked to provide information about their age, gender, residency status, occupation, frequency of visiting, visit length and education level.
2. Visitor perceptions: participants were asked to rate their agreement with a series of statements about the greenery and natural elements in the square, such as "The UGS incorporate large proportion greenery with high quality, and multiple uses" and "The UGS incorporate various natural features and elements."
3. Visitor attachment: participants were asked to rate their agreement with a series of statements about their attachment to the UGS, such as "I feel a sense of identity to this UGS" and "I have strong emotional ties to the UGS."
4. Visitor well-being: participants were asked to rate their agreement with a series of statements about their well-being aspects, such as "I feel happy when I visit the UGS" and "I feel healthy when I visit the UGS."

2.4 Data analysis

In the present study, descriptive statistics were employed to comprehensively analyse the collected data. Specifically, this involved conducting an in-depth examination of the demographic information, visitor perceptions, visitor attachment, and visitor well-being data, in order to gain a thorough understanding of the patterns and trends within the data.

To achieve this, a range of statistical techniques were applied to the data, including the calculation of mean scores for each item on the survey. This provided a comprehensive overview of the respondents' attitudes and perceptions towards the greenery and natural elements in the selected UGSs, as well as their overall well-being during their visit. Moreover, it allowed for the identification of any significant differences or similarities in visitor experiences across the various UGSs.

The statistical analysis was performed using the latest version of the Statistical Package for the Social Sciences (SPSS), version 27. This software package is widely recognized as a highly reliable and user-friendly tool for data analysis in the social sciences, and was therefore deemed suitable for the present study. The use of SPSS also allowed for the application of a range of advanced statistical techniques, such as inferential statistics, to explore the relationships and interactions between the different variables.

2.5 Ethical considerations

Ethical considerations were taken into account in this study. The survey was voluntary, and participants were informed that their participation was anonymous and confidential. Participants were also informed that they had the right to withdraw from the study at any time without giving a reason. Informed consent was obtained from all participants before they completed the survey.

2.6 Limitations

One limitation of this study is the use of a cross-sectional survey design, which limits the ability to establish causality between the independent and dependent variables. Additionally, the study was conducted in only four urban spaces in Gaza and may not be representative of visitor attachment to all urban green spaces in the city. Finally, the sample size may not be large enough to fully capture the diversity of visitor attachment to urban green spaces in Gaza. Despite its limitations, this study provides

valuable insights into visitor attachment to urban green spaces in Gaza and highlights the potential implications for urban planning and design decisions in the city. By identifying the factors that contribute to visitor attachment to urban green spaces, this study can inform the development and maintenance of green spaces in Gaza, potentially improving the quality of life for residents.

3 Results and discussion

3.1 Visitors' perception on greenery and natural elements

This section shows the results of a questionnaire that was administered to measure the opinions of respondents on the incorporation of green spaces in urban areas, specifically the urban green spaces (UGS). The questionnaire had four items, and respondents were asked to rate their agreement with each item on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Results are shown in Table 1.

Firstly, visitors reported that the UGS incorporates a large proportion of greenery with high quality and multiple uses (mean = 2.718, SD = 1.466). This suggests that visitors value the presence of greenery in the UGS, as it contributes to the aesthetics and recreational activities. The proportional mean percentage for this item is 54.35%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-3.855) and p -value of 0.000 indicate that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This item was ranked third out of four.

Secondly, visitors reported that the UGS incorporates various natural features and elements (mean = 2.635, SD = 1.499). This suggests that visitors appreciate the diversity of natural elements present in the UGS, such as trees, plants, and water features. The proportional mean percentage for this item is 52.70%, indicating that slightly

Table 1 Means and test values for visitors' perception on greenery and natural elements

| # | Item | Mean | S.D | Proportional mean(%) | Test value | p -value (Sig.) | Rank |
|--------------|--|--------|-------|----------------------|------------|-------------------|------|
| 1 | The UGS incorporate large proportion greenery with high quality, and multiple uses | 2.718 | 1.466 | 54.35 | -3.855 | 0.000 | 3 |
| 2 | The UGS incorporate various natural features and elements | 2.635 | 1.499 | 52.70 | -4.869 | 0.000 | 4 |
| 3 | The UGS contribute to the overall recreation and aesthetics | 2.795 | 1.387 | 55.90 | -2.957 | 0.003 | 2 |
| 4 | The UGS provides landscape and green experience | 2.878 | 1.472 | 57.55 | -1.664 | 0.097 | 1 |
| Total | | 2.7565 | 1.456 | 55.125 | -11.494 | 0.000 | |

more than half of the visitors agree with this statement. The significant negative test value (-4.869) and p -value of 0.000 indicate that visitors' responses are unlikely to occur by chance. This item was ranked fourth out of four.

Thirdly, visitors reported that the UGS contributes to overall recreation and aesthetics (mean = 2.795, SD = 1.387). This suggests that visitors appreciate the UGS as a space that offers both recreational opportunities and visual appeal. The proportional mean percentage for this item is 55.90%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-2.957) and p -value of 0.003 indicate that visitors' responses are unlikely to occur by chance. This item was ranked second out of four.

Finally, visitors reported that the UGS provides a landscape and green experience (mean = 2.878, SD = 1.472). This suggests that visitors appreciate the UGS as a space that offers a unique natural experience which includes greenery and landscape features. The proportional mean percentage for this item is 57.55%, indicating that more than half of the visitors agree with this statement. The test value (-1.664) and p -value of 0.097 are not statistically significant, indicating that visitors' responses could potentially occur by chance. This item was ranked first out of four.

The total row for Table 1 shows that the overall mean score for visitors' perceptions of the UGS is 2.7565 (SD = 1.456). This mean score indicates that visitors generally have positive perceptions of the UGS. The proportional mean percentage for all items is 55.125% which suggests that more than half of the visitors agreed with the statements. The significant negative test value (-11.494) and p -value of 0.000 indicate that the visitors' responses are highly unlikely to occur by chance, and that the results are statistically significant. This implies that the visitors' perceptions of the UGS are consistent and can

be generalized to the larger population. Overall, the UGS providing landscape and green experience received the highest mean score (2.878) and was ranked first, while the item "The UGS incorporate various natural features and elements" received the lowest mean score (2.635) and was ranked fourth.

3.2 Level of place attachment to the UGS

To understand the questionnaire consisted of statements related to five dimensions of place attachment: place identity, place dependence, emotional bonding, social bonding, and environmental concern. Based on the analysis of the questionnaire, the mean scores and test values for the level of place attachment to the urban green space (UGS) are presented in Table 2. The respondents were asked to rate their agreement with various statements related to place attachment on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The results show the level of place attachment to the UGS, it measured five variables related to place attachment: place identity, place dependence, emotional bonding, social bonding, and environmental concern.

Firstly, visitors reported feeling a strong sense of place identity with the UGS (mean = 2.838, SD = 1.457). This indicates that visitors perceive the UGS as an important and meaningful place to them, which may contribute to their willingness to visit and support the park. The proportional mean percentage for this item is 56.75%, indicating that more than half of the visitors agree with this statement. The negative test value (-2.231) and p -value of 0.026 suggest that this item is statistically significant, indicating that visitors' responses are unlikely to occur by chance. This item was ranked first out of five.

Secondly, visitors reported feeling a sense of place dependence on the UGS (mean = 2.685, SD = 1.458).

Table 2 Means and test values for level of place attachment to the UGSs

| # | Item | Mean | S.D | Proportional mean (%) | Test value | p -value (Sig.) | Rank |
|--------------|--|-------|-------|-----------------------|------------|-------------------|------|
| 1 | Place identity: I feel a sense of identity with this UGS | 2.838 | 1.457 | 56.75 | -2.231 | 0.026 | 1 |
| 2 | Place dependence: I rely on this UGS for my recreational and social needs. | 2.685 | 1.458 | 53.70 | -4.321 | 0.000 | 2 |
| 3 | Emotional bonding: I have strong emotional ties to the UGS. | 2.598 | 1.505 | 51.95 | -5.347 | 0.000 | 5 |
| 4 | Social bonding: I feel a sense of community and visitors in the UGS. | 2.628 | 1.501 | 52.55 | -4.962 | 0.000 | 4 |
| 5 | Environmental concern: I feel a sense of responsibility to protect and preserve the UGS. | 2.673 | 1.495 | 53.45 | -4.380 | 0.000 | 3 |
| Total | | 2.684 | 0.678 | 53.68 | -9.319 | 0.000 | |

This suggests that visitors rely on the UGS for their recreational and social needs, which may explain their motivation to visit the park. The proportional mean percentage for this item is 53.70%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-4.321) and p -value of 0.000 suggest that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This item was ranked second out of five.

Thirdly, visitors reported having strong emotional ties to the UGS (mean = 2.598, SD = 1.505). This indicates that visitors may feel a sense of emotional attachment to the UGS, which may contribute to their motivation to visit and support the park. The proportional mean percentage for this item is 51.95%, indicating that slightly more than half of the visitors agree with this statement. The significant negative test value (-5.347) and p -value of 0.000 suggest that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This item was ranked fifth out of five.

Fourthly, visitors reported feeling a sense of social bonding with other visitors in the UGS (mean = 2.628, SD = 1.501). This suggests that visitors perceive the UGS as a place where they can connect with others and form a sense of community, which may contribute to their overall satisfaction with the park. The proportional mean percentage for this item is 52.55%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-4.962) and p -value of 0.000 suggest that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This item was ranked fourth out of five.

Finally, visitors reported feeling a sense of environmental concern for the UGS (mean = 2.673, SD = 1.495). This indicates that visitors perceive the UGS as an important environmental resource and feel a sense of responsibility to protect and preserve the park. The proportional mean percentage for this item is 53.45%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-4.380) and p -value of 0.000 suggest that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This item was ranked third out of five.

The total row of Table 3 provides an overall summary of visitors' level of place attachment to the UGSs. The mean score for all items is 2.684, with a standard deviation of 0.678. This suggests that visitors have a moderate level of place attachment to the UGSs. The proportional mean percentage for all items is 53.68%, indicating that more than half of the visitors agree with the statements. The significant negative test value (-9.319) and p -value of 0.000 indicate that visitors' responses are statistically significant and unlikely to occur by chance. This indicates that visitors have a considerable level of attachment to the UGSs, and the factors of place identity, place dependence, environmental concern, social bonding, and emotional bonding contribute significantly to visitors' attachment to the UGSs. The items are ranked based on their mean scores, with place identity ranked first, followed by place dependence, environmental concern, social bonding, and emotional bonding. Overall, visitors' level of attachment to the UGSs is a significant factor to consider in the management and development of these spaces to ensure that visitors' needs are met, and the UGSs are protected and preserved for future generations.

3.3 Visitors' perceptions well-being aspects (motivation, happiness and health)

The Table 3 shows the results of a study examining the relationship between visitors' perceptions of greenery and natural elements in urban green spaces (UGS) and three variables: motivation, happiness, and health. The mean score, standard deviation, proportional mean, test value, p -value (significance), and rank are provided for each variable.

Visitors reported that they feel motivated to visit the UGSs (mean = 2.633, SD = 1.484). The proportional mean percentage for this item is 52.65%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-4.952) and p -value of 0.000 indicate that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This suggests that visitors' motivation to visit the UGSs is driven by various factors, such as the recreational activities, natural beauty, and health benefits. This item was ranked third out of three.

Table 3 Means and test values for aspects of motivation, happiness, and health.

| # | Item | Mean | S.D | Proportional mean(%) | Test value | p -value (Sig.) | Rank |
|---|--------------------------------------|-------|-------|----------------------|------------|-------------------|------|
| 1 | I feel motivated to visit the UGSs | 2.633 | 1.484 | 52.65 | -4.952 | 0.000 | 3 |
| 2 | I feel happy when I visit the UGSs | 2.765 | 1.389 | 55.30 | -3.383 | 0.001 | 2 |
| 3 | I feel healthy when I visit the UGSs | 2.810 | 1.444 | 56.20 | -2.632 | 0.009 | 1 |

Visitors reported that they feel happy when they visit the UGSs (mean = 2.765, SD = 1.389). The proportional mean percentage for this item is 55.30%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-3.383) and p -value of 0.001 indicate that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This suggests that visitors' emotional well-being is positively impacted by their visit to the UGSs. This item was ranked second out of three.

Visitors reported that they feel healthy when they visit the UGSs (mean = 2.810, SD = 1.444). The proportional mean percentage for this item is 56.20%, indicating that more than half of the visitors agree with this statement. The significant negative test value (-2.632) and p -value of 0.009 indicate that this item is statistically significant and that visitors' responses are unlikely to occur by chance. This suggests that visitors perceive UGSs as a place that contributes positively to their physical and mental health. This item was ranked first out of three.

The results indicate that visitors' perceptions of greenery and natural elements in UGS have a significant impact on their motivations, happiness, and health when visiting the UGSs. The negative relationship between visitors' perceptions of greenery and natural elements in UGS and feeling motivated to visit, happy, and healthy when visiting the UGSs suggest that the design and management of UGS should take into account the importance of natural elements and greenery in creating an attractive and enjoyable environment for visitors. Moreover, the results suggest that visitors are more likely to attach to the UGSs emotionally if they feel healthy, happy, and motivated to visit, which further emphasizes the importance of creating a positive visitor experience in UGS.

3.4 Greenery and nature's impact on place attachment and well-being in UGSs

This section discusses visitors' perceptions of the relationship between greenery, natural elements, and their level of place attachment to urban green spaces (UGS). The Table 4 presents the correlation coefficients between visitors' perceptions of the UGS's greenery and

natural elements and their motivation to visit, happiness, health, and level of place attachment.

The results of the study indicate that visitors' perception of greenery and natural elements has a significant impact on their motivation to visit UGSs. The mean score for the item "I feel motivated to visit the UGS" was 2.633 with a standard deviation of 1.484. The proportional mean percentage was 52.65%, indicating that slightly more than half of the visitors agreed with this statement. The negative test value (-4.952) and p -value of 0.000 suggest that the item is statistically significant, and the likelihood of visitors' responses occurring by chance is low. This finding suggests that visitors' motivation to visit UGSs is influenced by the presence of greenery and natural elements.

The second item, "I feel happy when I visit the UGS," had a mean score of 2.765 with a standard deviation of 1.389. The proportional mean percentage was 55.30%, indicating that more than half of the visitors agreed with this statement. The negative test value (-3.383) and p -value of 0.001 suggest that the item is statistically significant, and the likelihood of visitors' responses occurring by chance is low. This finding suggests that the presence of greenery and natural elements contributes to visitors' happiness when visiting UGSs.

The third item, "I feel healthy when I visit the UGS," had a mean score of 2.810 with a standard deviation of 1.444. The proportional mean percentage was 56.20%, indicating that slightly more than half of the visitors agreed with this statement. The negative test value (-2.632) and p -value of 0.009 suggest that the item is statistically significant, and the likelihood of visitors' responses occurring by chance is low. This finding suggests that visitors perceive UGSs as a source of health benefits, and the presence of greenery and natural elements enhances this perception.

Finally, the results show that visitors' perception of greenery and natural elements has a significant impact on their level of place attachment to the UGSs. The correlation coefficient between the perception of greenery and natural elements and the level of place attachment was 0.050, which is a weak positive correlation. The correlation coefficient between the

Table 4 Relationship of greenery and natural elements with place attachment and well-being aspects.

| | Level of place attachment to the UGS | Health: I feel healthy when I visit the UGS | Happiness: I feel happy when I visit the UGS | Motivation to visit: I feel motivated to visit the UGS |
|---|--------------------------------------|---|--|--|
| Visitors' perception on greenery and natural elements | 0.339** | 0.109* | 0.052 | 0.050 |

perception of greenery and natural elements and the level of place attachment was 0.339, which is a moderately strong positive correlation. These findings suggest that the presence of greenery and natural elements plays a significant role in visitors' level of place attachment to UGSs.

The present study investigated the relationship between visitors' perceptions of greenery and natural elements in urban green spaces (UGSs) and their motivation to visit, happiness, health, and place attachment to these spaces. The results of this study provide valuable insights into the relationship between visitors' perception of greenery and natural elements, and their level of place attachment to UGSs. Furthermore, natural elements have a restorative effect, which may contribute to visitors' positive experience in UGSs and their subsequent attachment. The weak positive correlation between the perception of greenery and natural elements and the level of place attachment implies that other factors, such as place identity, place dependence, environmental concern, social bonding, and emotional bonding, also contribute to visitors' attachment to the UGSs.

The findings indicate that visitors who perceive greenery and natural elements in UGSs report greater levels of place attachment. This could be attributed to the fact that greenery and natural elements provide visitors with a sense of place, which is essential in forming place attachment. The findings of the current study are consistent with several previous studies. Zhu et al. (2017) found that green open spaces had a significant impact on community attachment, and the degree of satisfaction with these spaces influenced attachment directly and indirectly. Kim & Miller (2019) found that higher visitor frequency to green infrastructure resulted in positive place attachment. Liu et al. (2018) and Han et al. (2020) both found that local landscapes and green physical surroundings, respectively, positively contributed to residents' place attachment. While Chow et al. (2019) reported that place attachment to nature-based areas positively correlated with visitor satisfaction and environmentally responsible behavioural intention. These findings suggest that the provision and maintenance of greenery and natural elements in UGSs can not only attract visitors but also promote environmentally responsible behaviours. Therefore, these studies support the idea that the presence of greenery and natural elements is crucial for fostering place attachment in urban green spaces and its dimensions.

In terms of visitors' motivation to visit UGSs, the findings suggest that there is a positive association between visitors' motivation to visit and their perception of greenery and natural elements. Visitors who perceived

high levels of greenery and natural elements reported higher levels of motivation to visit UGSs. The current study's finding that the presence of greenery and natural elements influences visitors' motivation to visit UGSs is supported by previous research. Han et al. (2020) found that green physical surroundings were significantly associated with building travellers' intentions for green behaviors, Kil et al. (2012) also found that recreation benefit attainment from UGSs significantly predicted visitors' future visit intentions. Mohamed and Othman (2012) found that the factors pushed the visitors to visit the park are associated with the elements that appear as beautiful, cooling, well-maintained. These supported the results of this study on the importance of natural elements including the presence of greenery in UGSs.

The findings also suggest that visitors who perceived high levels of greenery and natural elements reported higher levels of happiness and health when visiting UGSs. This is consistent with previous studies that have found a positive relationship between the presence of green space and visitors' psychological and emotional well-being. For example, Han et al. (2020) found that higher visitor frequency to green infrastructure resulted in positive psychological benefits, while Kothencz et al. (2017) found that perceived green space characteristics with direct well-being benefits were strong predictors of visitors' level of satisfaction and self-reported quality of life.

4 Conclusion

In conclusion, the present study has revealed that visitors' perceptions of greenery and natural elements in urban green spaces (UGSs) have a significant impact on their motivation to visit, happiness, health, and place attachment. The findings indicate that visitors who perceive high levels of greenery and natural elements in UGSs report greater levels of place attachment, and are more motivated to visit these spaces, which also results in higher levels of happiness and health. These findings suggest that the provision and maintenance of greenery and natural elements in UGSs should be a priority for urban planners, policymakers, and designers to create and maintain green spaces that are beneficial for visitors' well-being. However, it is important to note that other factors, such as place identity, place dependence, environmental concern, social bonding, and emotional bonding, also contribute to visitors' attachment to UGSs. Future research should focus on exploring the potential causal relationships between visitors' perceptions of greenery and natural elements and their motivation to visit, happiness, health, and place attachment to UGSs,

as well as investigating the effectiveness of interventions aimed at improving these perceptions.

The present study contributes to the growing body of literature on the importance of greenery and natural elements in urban environments. The findings highlight the potential benefits of providing and maintaining greenery and natural elements in UGSs, including increased motivation to visit, greater levels of place attachment, and improved well-being of visitors. These findings have important implications for urban planners, policymakers, and designers who are responsible for creating and maintaining green spaces in urban areas.

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