

## Article

# What Matters Most for Neighborhood Greenspace Usability and Satisfaction in Riyadh: Size or Distance to Home?

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**Abstract:** Much research work has been carried out on larger urban parks. Smaller neighborhood greenspaces have not received as much academic attention, particularly in sprawling large cities of the developing world. This paper examines the frequency of use and user satisfaction with smaller urban greenspaces within the residential neighborhoods of Riyadh metropolitan city, Saudi Arabia. To measure use frequency and satisfaction level differentials among neighborhood residents, gap analysis using paired samples *t*-test was performed to assess the differences between mean score ratings of expected (pre-use) and experienced (post-use) feelings of user satisfaction with local greenspace features. A five-point Likert scale questionnaire was used to measure user satisfaction. Pearson *r* correlation coefficient, chi-square test and F-test were also used to examine the relationships between dependent (usability and satisfaction) and independent variables. The findings show that smaller size, close-to-home neighborhood greenspaces in Riyadh fell short of drawing many users or meeting user expectations. Larger local greenspaces however, managed to attract much more users even from relatively far-away neighborhoods. Size rather than closeness to home is a much stronger determinant affecting use frequency and user satisfaction with local neighborhood green spaces. It is therefore recommended to amend the city's planning codes and regulations that require the provision of local greens based on service or catchment areas of 500–800 m. They should insist instead on the need for a minimum area requirement of such facilities if their usability and user satisfaction are to be enhanced.

**Keywords:** neighborhood; green space; Riyadh; use frequency; satisfaction



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## 1. Introduction

Neighborhood greenspaces are any piece of land covered by vegetation within residential urban built-up areas. They are relatively smaller in size and serve as places for rest and recreation of neighborhood residents. Being of smaller size, they were often underestimated and viewed as a surplus, which led to many of them being left to fall into neglect and degradation. As such, they have not received much attention, as was the case with parks or larger greenspaces [1,2]. Although the benefits of urban greens in the west are quite well documented, their impacts on Saudi neighborhood residents have not been the focus of much research attention.

As they offer opportunities for recreation and socialization, frequent use of open greenspaces is an indicator of neighborhood livability and residential satisfaction. That is, the more liveable a neighborhood, the more frequent the use of its greenspaces and the higher the satisfaction levels of its users [3,4]. Both use and satisfaction with neighborhood greenspaces are dependent on how these places are planned and designed. Good planning and management encourage residents' use and visits to these places.

This study is undertaken under the contention that exploring the factors underlying resident use and satisfaction with these spaces may hold promise for better management, planning and design of neighborhood greenspaces. Its main objective is to examine the

factors influencing use satisfaction to help Riyadh policy makers and city planners to better provide for and manage them. It also explores how frequently these spaces are used and the factors impacting their use. The following questions are therefore put forward. What are the characteristics of those who use neighborhood greenspaces in Riyadh, and how satisfied are they with them? What motivates residents to use their neighborhood greens? What are the factors that may lead to increasing neighborhood greenspace visitation? How the two dependent variables (usability and satisfaction) vary across the socioeconomic status, gender, and other resident characteristics?

Nearly four decades of research evidence suggests that frequent use of greenspaces has a restorative potential against stressful modern urban living. It also positively impacts residents' health and wellness [5–7]. Residents' perceptions and satisfaction with urban neighborhoods are, to some extent, dependent on their access to and use of their greenspaces. While most studies have been interested in the impact of greenspaces on property values, little research work has focused on the association between people's satisfaction and the use of neighborhood greens. Limited use and access to neighborhood greenspace were found to be related to lower residential satisfaction [8].

NGSs are an essential element for sustainable and healthy neighborhood living as they ultimately impact not only personal satisfaction but also individual and public health [9]. The World Health Organization (WHO) [10] asserts that greenness and health are both among the most effective indicators of any city's successful sustainable development. The United Nations (UN) [11] considers urban greens as a significant marker for achieving sustainable development goals (SDGs). Many other studies have argued for the perceived satisfying and restorative effects of NGS, as they help heal neighborhood residents mentally and physically from stressful modern urban living [12–20].

City planning decisions regarding the distribution and management of urban greenspaces have proved to have a positive impact on the neighborhood environment and ultimately lead to greater NGS use and visitors' greater overall satisfaction [21–23]. All in all, NGS help mitigate the stress associated with city life, alleviate social isolation, reduce pollution, and ultimately have a positive bearing on mental and physical health.

## 2. Riyadh Neighborhood Greenspaces Greens

Faced with the challenge of accommodating a growing urban population and a host of problems associated with a staggering rate of urbanization, Riyadh city planning authorities seem to have given issues of housing, employment, and mobility a top priority. Issues of provision and maintenance of urban greenspaces were thus assigned a state of oblivion. This has led to rapid spread out of built-up areas and impervious surfaces at the expense of the existing scarce greenspaces making the urban community even more alienated from nature. Recently however, the Saudi government has initiated the Quality of Life Program to address the issue of urban greens in order to promote their use and improve urban living. Accordingly, Riyadh has lately accorded public greenspaces more importance and begun to revitalize municipal parks even though the maintenance of greenspaces in a desert hot arid climate is not a simple task. Municipality planners, however, need to pay more attention to neighborhood greenspaces, as they tend to better serve local residents than city parks since they are within easy reach, whereas larger public parks require traveling to get to.

By acknowledging the significance of neighborhood greenspace use satisfaction, this research becomes important in order to improve greenspace planning and management and, hence, increase its use and contribute to neighborhood quality of life and resident satisfaction. The fact that many studies have been undertaken on urban greens in cities of the developed world [24–26] but very little research was conducted on user satisfaction of these greens in cities of the developing nations [27] gives this research an added importance. This paper endeavors to fill this void in the literature on neighborhood greenspace use and perceptions in rapidly urbanizing and sprawling cities of the developing world such as Riyadh. It sets out to examine neighborhood greenspace usability by exploring preferences and satisfaction with neighborhood greens.

### 3. Factors Affecting Use and Satisfaction of NGS

Many studies have attempted to untangle the variables impacting neighborhood resident use and satisfaction with nearby urban small greenspaces. One study asserted that underuse and lack of public greenspaces were associated with lower quality of life for urban residents [28]. Other researchers have found that disadvantaged social groups are likely to show less interest in using neighborhood greenspaces. That is, some vulnerable categories of residents such as women, lower socioeconomic status groups, elderly, and less educated individuals tend to be less likely to use greenspaces and also less likely to be satisfied with than other population categories [25,29]. In his study, Schipperijn et al. [30] corroborated these findings when they argued that greenspace visitation and satisfaction differentials were highly correlated with gender, age, years of education along with size and distance of these spaces.

An investigation of neighborhood greenspace user satisfaction is believed to be of paramount importance. It helps planners and managers to bring about improvements to make neighborhood greenspaces more attractive, which would increase resident visitation frequency and satisfaction levels. Satisfaction has been defined as the perceived gap between need and aspiration [31]. Following this definition, satisfaction with neighborhood greenspaces can be described as the difference between what is experienced when using them and what is expected from their use. The lesser the difference, the higher the satisfaction level. Visitation frequency to greenspaces is linked to user satisfaction. That is, the more frequent the visits to these spaces and the more time spent in them, the more satisfied the visitors and the more likely they engage in common activities and socialization.

In his research on the relation between the built environment and greenspace use, Parra et al. [32] found a positive relationship between neighborhood greens density and user satisfaction. The frequency of visits is facilitated by the availability and accessibility of attractive greenspaces within the neighborhood. The quality and attractiveness of these spaces contribute greatly to neighborhood liveability, as they provide the community with urban greens that serve as places for rest, recreation, socialization, and interaction, which in turn would enhance the overall quality of urban life [33–36]. Their positive impacts on the social, economic, and environmental aspects are also well documented [37,38]. Improving quality and attractiveness would not be enough, however, to increase visitation and satisfaction with neighborhood greens. They must be sustained by improvements in availability and accessibility to these spaces.

### 4. Availability and Accessibility to Neighborhood

Accessibility, as measured by proximity to greenspaces, was thought to be associated with increased use and hence higher residential satisfaction levels. Many studies have confirmed that urban residents tend to have preferences for neighborhoods with greenspaces in and around them [2,39]. Many cities have introduced some distance requirements in their urban ordinances to allow a majority of neighborhood residents to have greenspaces within easy reach [24,40–45]. To increase neighborhood greenspace use, a threshold distance of 500–800 m is often recommended.

In many case studies, it was found that the closer to home the local neighborhood greenspace, the more frequent its use [46–48]. This was not the case in the context of Riyadh city. Here, the closeness of neighborhood greenspaces does not necessarily lead to increasing user visitation, as these spaces often lack attractiveness and regular maintenance [49]. Sugimaya et al. [50] found that the critical variables affecting the usability increase in urban greenspaces are their attractiveness, size, and the activities they offer, regardless of their closeness to home. Being of relatively smaller size (often less than 0.5 hectares), Riyadh neighborhood greens cannot offer diverse elements to attract a variety of users.

The availability of neighborhood greenspaces is another factor affecting their visitation. Barrera et al. [51] argued that the per capita greenspace is the most important variable measuring the availability of urban greens. The United Nations set a standard of 30 m<sup>2</sup> per person, while the World Health Organization (WHO) adopted 9 m<sup>2</sup> per capita [49]. The per

capita urban green for Riyadh is only 1.18 m<sup>2</sup>. This indicates how their availability in the city is terribly lacking. This situation is likely to get even worse as more and more people move to settle in the city and more employees retire in relatively good health, which would lead to demand for neighborhood greenspaces far outstripping supply.

The state of some existing neighborhoods seems to worsen the situation even further. As they lack enough vegetation cover and recreation amenities, some Riyadh neighborhood greenspaces were reduced to mere vacant spaces lacking social activities, interaction, and vibrancy, which negatively impacted the liveability of such neighborhoods and hence the quality of life of their residents [52]. They have been criticized for producing social segregation, lifeless urban spaces, and a lack of sense of community and social participation [53,54]. Riyadh neighborhood greenspaces were neglected for several reasons, such as issues related to design, maintenance, and safety [49]. Better design of these spaces would improve their attractiveness and hence the quality of urban living, usability, and user satisfaction.

## 5. Materials and Methods

The present paper investigates usability and user satisfaction in Riyadh neighborhood greenspaces. For that purpose, the study examines user preferences and perceptions and explores accessibility, availability, and use frequency of neighborhood greens by size. On-site interviews and systematic observations of user activities within greenspaces were used for data collection. The interview was structured around six themes (accessibility, safety and security, cleanliness and maintenance, services and amenities, landscaping and attractiveness, and overall satisfaction with neighborhood greenspaces). Measurement items were developed for each theme. There were 20 items in all.

The interview was conducted among users of greenspaces in different neighborhoods covering the five sectors of the city (North, South, East, West, and Center). For the purpose of a representative sampling of city neighborhoods and to determine which greenspace to include in the analysis, aerial photos and site visits were used to select only usable neighborhood greenspaces with four size categories (less than 0.5 ha, 0.5–1.5 ha, 1.51–3 ha, and more than 3 ha). In total, 150 questionnaires were used for each category, and 30 responses were invalidated for different reasons, such as non-cooperative respondents or non-serious answers. Many supposed greenspaces on the map are nothing more than unusable vacant land. Interview participants were approached at random at the parking area just before getting into the neighborhood greenspace. Users were first asked about their area of residence, which allowed them to estimate the distance to the GNS. Then they were requested to rate the interview questionnaire items about their use frequency, importance, and satisfaction levels from 1 to 10, where 1 indicates least use frequency, least important or least satisfied, and 10 most use frequency, most important or most satisfied, depending on the wording of the question. Later after they were done with their visits, they were again requested to rank the importance or satisfaction level of the experience gained on the same scale for the same questionnaire items. The first interview questionnaire prior to the use of the greenspace would measure the expected importance or user satisfaction assigned to some attributes of NGS. The second would assess their user experience or satisfaction with the same attributes. Needless to say, both usability and satisfaction are to some extent determined by the quality of experience gained when using neighborhood greenspaces. The difference between expectation and experience would indicate the user satisfaction level. User experiences reveal an existing situation, whereas expectations indicate the desired one [55]. The smaller the difference, the higher the satisfaction level and vice versa. A gap analysis was undertaken to perform the appraisal of satisfaction levels. It consists of computing the difference between the rated expected importance and the ranked experience of the NGS elements and attributes covered by the questionnaire items.

Five neighborhoods were selected from each sector. In total, 25 neighborhoods with varying sizes of local greenspaces and catchment areas were thus used to conduct the interviews. A pilot test was used on 12 subjects to check and refine the wording of the interview questionnaire items. From 20 to 23 respondents were chosen from each

NGS site, which made the total number of respondents 570 in all. Respondents were all Riyadh adult residents. The questionnaire items start with some general questions about gender, marital status, age, educational status and income level, and others covering the six above-mentioned themes. To assess satisfaction levels, the difference between pre-test and post-test mean values of satisfaction variables were computed. Weighted mean values were calculated for satisfaction indicators that have many items to measure them. Chi-square tests were used to examine any relationships between distance, NGS size, population demographics, family status, and frequency of visits. However, chi-square test reveals only if a relationship exists or not. It does not tell how strong this relationship is. To evaluate the strength of such a relationship, Pearson correlation analysis was performed. Other tests were also used, such as the *t*-test and F-test.

## 6. Results and Analysis

As previously stated, data were collected on users before and after using neighborhood greenspaces. Interviewees were asked to weigh up twenty items covering attributes set to measure usability and satisfaction. Both the expected and experienced importance of each attribute were rated from 1 to 10, as shown in Table 1. A gap analysis and paired-samples *t*-test were conducted to compare rating differentials between user expectations and experiences on these greenspace attributes.

**Table 1.** Gap analysis of mean score differentials between expected and experienced importance of neighborhood greenspace attributes and elements.

Measurement Elements	Expected Importance	Experienced Importance	Difference	<i>t</i> -Test
Comprehensive accessibility for people with special needs	9.5	4.74	4.76	18.91
provision of sanitary facilities	9.04	4.44	4.58	16.24
Landscaping and greenspace attractiveness	9.54	5.28	4.26	17.16
Tree cover	9.84	5.58	4.26	16.17
Availability of neighborhood greenspaces	9.7	5.48	4.22	14.53
Plants varieties	9.02	5.06	3.96	14.11
Provision of amenities	9.12	5.22	3.88	13.42
Greenspace maintenance	9.72	5.98	3.74	14.67
Seating places	9.44	5.88	3.58	13.36
Water elements	7.9	4.34	3.58	9.89
Proximity of the greenspace	8.98	5.54	3.44	10.48
Safety and security in the greenspace	9.42	6.08	3.34	10.93
Sports activities	8.54	5.3	3.24	10.19
Garbage and dirt collection	9.82	6.64	3.2	11.63
Kids' playgrounds	9.04	5.94	3.12	11.1
Walking to the greenspaces	9.24	6.28	2.96	8.96
Lighting elements	9.36	6.4	2.96	9.94
Frequency of visits to NGS	8.52	5.84	2.68	9.65
Walkable paths	9.5	6.9	2.6	9.72
Car parking	7.64	7.18	0.46	1.53 *

Statistical significance at 0.05. \* No statistical significance at 0.05. Evaluation from 1 to 10, where 1—least important and 10—most important.

The largest differences turned out to be related to comprehensive accessibility for people with special needs, followed by the provision of sanitary facilities and amenities and then greenspace landscaping and attractiveness. There were significant mean rating differentials between expected and experienced importance of the above criteria (4.76, 4.58, and 4.26, respectively), and with corresponding *t*-test values of 18.91, 16.24, and 17.16, at a significance level of 0.05 (Table 1). These results suggest that Riyadh neighborhood greenspaces are far from living up to users' expectations.

The gap value related to amenities for handicapped people was quite striking. This reveals that amenities of comprehensive accessibility to facilitate access for handicapped

individuals were terribly lacking. This is not surprising since Riyadh streets are known for being pedestrian-unfriendly [56,57]. Even fit people find it difficult to have a walk on its streets, let alone the handicapped. People with disabilities cannot move freely around in these greenspaces since they are not designed to provide comprehensive accessibility in the first place. The usability of neighborhood greenspaces is therefore greatly hampered for this category of unfit people and the elderly.

The gap analysis revealed the smallest mean differentials were related to parking space availability (0.46) with a *t*-test value of 1.53. This indicates that car users to neighborhood green spaces are, to some extent, quite well-served with car parking facilities. This was quite expected in a car-oriented city. Plenty of parking spaces are often available around neighborhood greenspaces in Riyadh, particularly after working hours when parking areas of nearby uses are vacant and freely available. In addition to this, greenspaces are often delimited by wide roads (15–20 m wide) from all sides, which provide extra parking spaces. This explains to a large extent why respondents showed little discontentment with parking facilities around the NGS.

The other variables to which interviewees showed some discontent, as revealed by the gap analysis, were the lack of cleanliness and maintenance of public toilets. The sheer number of neighborhood greenspaces makes it difficult for the municipality to take care of every greenspace in each neighborhood to provide all the necessary facilities. Riyadh counts a large number of neighborhoods, each of which has between 4 and 8 small greenspaces with areas ranging from 1200 to 5000 square meters. It is, therefore, difficult for the municipality to provide enough personnel to care for and maintain all these spaces. Being an arid hot region, water is a scarce resource. Recycling water stations are not common. Water is brought to Riyadh all the way from the desalinization stations in the Arab Gulf, some 400 km away. This statement was corroborated by the responses provided in the interviews, in which it is found a sizeable gap between the expected importance and the extent to which they are satisfied with the availability of water when using neighborhood greens. This explains the lack of cleanliness, maintenance, and absence of public toilets in some of these greenspaces that users tend to complain quite a lot about. This is why big differences are shown between the expected importance of these variables as perceived by the respondents and user satisfaction levels experienced when using these greens.

To examine the validity of the gap analysis between expected and experienced importance of services and attributes of neighborhood greenspaces, a user satisfaction analysis of these spaces was undertaken. Satisfaction levels were assessed using a five-point Likert scale of the same items. Mean and weighted mean scores are presented in Table 2.

**Table 2.** User satisfaction levels of neighborhood greenspaces (mean and weighted mean scores).

Attributes	Mean	STDV	Weighted Mean	STDV
Accessibility			2.88	1.58
Are you satisfied with the accessibility of your local NGS?	2.74	1.47		
Are you satisfied with the proximity of your local NGS?	2.77	1.60		
Are you satisfied with your walking to your local NGS?	3.14	1.66		
Safety and security			3.04	1.47
Are you satisfied with safety and security of your NGS?	3.04	1.47		
Cleanliness and Maintenance			2.84	1.36
Are you satisfied with the cleanliness and maintenance of your NGS?	2.99	1.35		
Are you satisfied with the toilets in your NGS?	2.22	1.25		
Are you satisfied with the neatness of your NGS?	3.32	1.50		
Services			2.96	1.33
Are you satisfied with the walkable pathways in your NGS?	3.45	1.41		
Are you satisfied with the seating places in your NGS?	2.94	1.31		

Table 2. Cont.

Attributes	Mean	STDV	Weighted Mean	STDV
Are you satisfied with the children's playgrounds in your NGS?	2.97	1.35		
Are you satisfied with car parking in your NGS?	3.59	1.41		
Are you satisfied with the services and amenities provided in your NGS?	2.61	1.33		
Are you satisfied with the facilities provided for people with special needs in your NGS?	2.37	1.23		
Landscaping and attractiveness			2.66	1.31
Are you satisfied with water elements in your NGS?	2.17	1.18		
Are you satisfied with areas for sporting activities in your NGS?	2.65	1.29		
Are you satisfied with trees in your NGS?	2.79	1.43		
Are you satisfied with trees and flowers varieties in your NGS?	2.53	1.19		
Are you satisfied with lighting elements in your NGS?	3.20	1.55		
Are you satisfied with natural elements in your NGS?	2.64	1.22		
Overall satisfaction with NGS			2.92	1.42
Overall, how satisfied are you with your NGS visits?	2.92	1.42		

Satisfaction intervals (very dissatisfied: 1–1.79, dissatisfied: 1.80–2.59, in between: 2.60–3.39, Satisfied: 3.40–4.19, very satisfied: 4.20–5).

Neighborhood residents in Riyadh do not seem to be quite satisfied with the use of local greenspaces, as shown by a weighted mean score for the overall satisfaction of 2.92 with a standard deviation of 1.42 (Table 2). To a direct question of how satisfied users are with their local greenspace, the mean was 2.92. This finding indicates a neutral position which is corroborated by the aforementioned gap analysis results in which the residents' use experience of local greenspaces does not live up to their expectations.

When looking closely at all the items that construct the use satisfaction overall scale, only the theme of safety and security turned out to be quite satisfactory, as indicated by a weighted mean score of 3.04 and a standard deviation of 1.47. The other five themes show neutral levels, that is in between satisfaction and dissatisfaction. This can be explained by the fact that neighborhood residents using the same local greenspaces tend to get acquainted with each other, which reinforces the feeling of mutual safety and security. The risk of aggression is very minimal in Riyadh. The incidence of all sorts of crimes and acts of violence remains far below most metropolitan cities in the world. Security police patrols are fairly regular all over the city, which enhances the feeling of security among neighborhood residents. However, the gap analysis scores tend to show quite a lag between the expected importance and the sense of safety and security felt in neighborhood greens. This apparent contradiction could be explained by the fact that residents tend to attach more importance to the safety and security theme, and they want to reinforce it even more. However, they may feel somehow threatened by the speedy cars on the wide roads surrounding neighborhood greenspaces. Speedy cars always constitute a potential threat to pedestrians and vulnerable groups such as children, women, and older people [57]. Feelings of safety and security are likely to boost usability and satisfaction with neighborhood greenspaces, but the potential risks associated with speedy cars and pedestrian unfriendliness could threaten it.

However, the feeling of safety and security alone does not suffice to make residents satisfied with their neighborhood greens if these spaces suffer many weaknesses in terms of services and amenities, cleanliness and maintenance, landscaping and attractiveness, etc. The mean scores and the gap analysis results of the related items are a case in point.

As far as the accessibility theme is concerned, it failed to show a satisfactory result as its weighted mean score was only 2.88. The reason may lie in the fact that Riyadh is a city dominated by cars. It is difficult to walk even for short distances, e.g., getting to the nearby local grocery store, barber shop, or local greenspace. Lack of walkable pavements, wide roads, and speedy cars hamper taking a walk [57]. This explains why neighborhood residents shy away from having even such a little walk to the nearby greenspace because of the surrounding wide asphalt roads that cars scour at a terrifying speed for pedestrians,

with attendant noise and pollution. When looking closely at the items composing the theme, they all fell short of having a score leaning towards satisfaction. When asked whether they were satisfied with the proximity of the local greenspaces or having a walk to, respondents' mean scores were both neutral, with 2.77 and 3.14, respectively (Table 2). This result was also substantiated by the gap analysis in which the difference was quite large between the expected importance of accessibility items and the satisfaction level gained from experience when using neighborhood greens (Table 1). This indicates that there is a lot to be done to improve accessibility and, by the same token, enhance usability and satisfaction with local neighborhood greenspaces.

On top of the variables described above, usability and satisfaction are also impacted by many other variables, such as those designating maintenance and cleanliness, attractiveness and landscaping, and services and amenities provision. The use satisfaction levels of these three sets of variables were all within the neutral interval with weighted mean scores of 3.04, 2.66, and 2.96, respectively (Table 2). As stated earlier, the huge number of small neighborhood greenspaces is a handicap for the city municipality to improve them and provide all the required personnel to take care of them. The gap analysis showed that a lot of improvements need to be made to meet user expectations (Table 1).

With regard to landscaping and attractiveness, users were dissatisfied as shown by mean scores registered to items dealing with the presence of tree cover, flower planting, and water elements. It is fairly predictable that it would be very difficult for an arid region to provide water for human needs, let alone plantation watering and public space cleaning.

This lends support to the idea that the larger the size of the neighborhood greens, the more their visitation. A relationship exists between NGS size and use frequency of these spaces, as revealed by the chi-square *p*-value, which is less than 0.05 (Table 3). However, when running this test to explore any association between NGS use frequency and closeness-to-home, no significant relationship was found (Table 4).

**Table 3.** Cross-tabulation of NGS size with visitation frequency.

NGS Size	How Many Times Do You Visit NGS per Month?					Grand Total
	Up to 2 Times	3–4 Times	5–6 Times	7–8 Times	9 Times or More	
Less than 0.5 ha	5.26%	1.93%	2.11%	0.00%	0.00%	9.30%
0.5–1.5 ha	10.53%	2.46%	4.21%	1.93%	0.00%	19.12%
1.51–3 ha	10.00%	6.32%	13.16%	2.81%	2.63%	34.91%
More than 3 ha	7.37%	6.14%	12.11%	7.89%	3.16%	36.67%
Grand total	33.16%	16.84%	31.58%	12.63%	5.79%	100.00%

Chi-square value =  $1.69953 \times 10^{-9} < 0.05$ .

**Table 4.** Cross-tabulation of NGS distance to home with visitation frequency.

Distance	How Many Times Do You Visit NGS per Month?					Grand Total
	Up to 2 Times	3–4 Times	5–6 Times	7–8 Times	9 Times or More	
Less than 800 m	5.26%	1.93%	2.11%	0.00%	0.00%	9.30%
800–2000 m	10.53%	2.46%	4.21%	1.93%	0.00%	19.12%
2001–5000 m	10.00%	6.32%	13.16%	2.81%	2.63%	34.91%
Over 5000 m	7.37%	6.14%	12.11%	7.89%	3.16%	36.67%
Grand total	33.16%	16.84%	31.58%	12.63%	5.79%	100.00%

Chi-square value = 0.233231 > 0.05.

## 7. Correlation Analysis, Chi-Square, and F Tests

In this section, the study attempts to unravel the relationships between dependent and independent variables. The dependent variables are usability and satisfaction with neighborhood greenspaces, whereas the independent variables are demographic background

factors such as age, gender, income, employment, education, and many other variables, such as place of residence, provision of clean toilets, tree cover, children's playgrounds etc.

The correlation analysis revealed a strong negative relationship between usability and distance to neighborhood greenspaces with a coefficient of  $-0.61$ . This finding confirms what has been previously stated that proximity to greenspaces in Riyadh does not necessarily lead to higher frequency visitation. It also supports the results of the gap analysis in which residents were not quite satisfied with walking to the nearest greenspace where the urban environment is essentially designed for car movement, not for pedestrians.

However, there is a strong positive relationship between user satisfaction level and the provision of clean toilets or restrooms, as the correlation coefficient was  $0.56$ . This result is also in line with what has been said earlier that large number of small greenspaces in the city makes it very difficult for the city to provide all the necessary services, such as toilets, in every neighborhood greenspace. This lends validity to the previous finding in which many users show some reluctance to go to nearby greens if they lack such services as toilets. As expected, relatively strong correlations were found to associate use satisfaction with the provision of amenities and services such as the presence of seating places at  $0.57$ , tree cover at  $0.68$ , plantation variety at  $0.54$ , and attractive landscaping at  $0.59$ .

The chi-square test was also used to examine associations between usability and satisfaction with neighborhood greenspace use on one side and resident demographic characteristics such as gender, age, number of children, family status, educational attainment, employment, and income on the other. No association between the above-mentioned variables was found. When running the cross-tabulation between satisfaction and area of residence, the statistical test revealed a chi-square of  $0.92$ , which was larger than  $0.05$ , indicating no association between the two variables (Table 5). Similar results were also found between usability and marital status (Chi-square =  $0.95$ , which was larger than  $0.05$ ) (Table 6).

**Table 5.** Cross-tabulation of sector of residence with use satisfaction levels with NGS.

Riyadh Sector	Satisfaction with NGS					Grand Total
	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	
East	1.41%	5.65%	15.25%	4.52%	2.82%	29.66%
North	1.13%	10.17%	13.56%	5.65%	12.71%	43.22%
West	0.00%	3.95%	4.24%	3.39%	1.41%	12.99%
South	0.28%	2.26%	2.54%	0.00%	1.41%	6.50%
Center	0.28%	2.26%	2.54%	1.13%	1.41%	7.63%
Grand total	3.11%	24.29%	38.14%	14.69%	19.77%	100.00%

Chi-square value =  $0.233231 > 0.05$ .

**Table 6.** Cross-tabulation of family status and frequency of visits to NGS.

Family Status	Usability of NGS						Total
	1	2	3	4	5	6	
Married	2.38%	8.73%	2.38%	11.90%	7.94%	26.98%	29.66%
Single	0.79%	7.14%	2.38%	6.35%	4.76%	18.25%	43.22%
Grand total	3.17%	15.87%	4.76%	18.25%	12.70%	45.24%	100.00%

Chi-square value =  $0.95 > 0.05$ .

Again, when running the F-test to examine the association between the area of residence in Riyadh and user satisfaction level with NGS, the F value was  $1.16$ , which was higher than the critical  $p$ -value ( $1.34$ ). This indicates that there are no significant differences in the interview responses regarding use satisfaction levels that were due to the five areas of residence in the city (North, South, East, West, and Center).

When using the F-test to examine the association between usability of NGS and educational attainment, the F value was 0.14, which is smaller than the critical  $p$ -value (0.74). This indicates that there are no significant differences in the interviewees' usability that can be attributed to the educational attainment of users. Similarly, no differentials in usability nor in satisfaction with neighborhood greenspace were found to be linked to income, SES, gender, or age.

## 8. Conclusions and Recommendations

Understanding the determinants of neighborhood greenspace usability and satisfaction can be of paramount importance to policy makers and planners to develop and design greenspaces that can be highly valued and usable. The main finding was that neighborhood greenspaces in Riyadh did not live up to user expectations. This was corroborated by the above results in which many greenspace attributes and elements did not have scores high enough to reach the user satisfaction levels.

Not only did neighborhood greenspaces fail to win users' satisfaction, but they were also unable to meet residents' needs and wishes. Many undesirable activities and incivilities are commonplace in some places, which leads to the exclusion of many users, particularly among vulnerable groups such as women, children, and older people. The involvement of users in the planning and design of greenspaces could enhance residents' usability. Their participation in designing new activities and improving existing ones would also increase their satisfaction. Residents who hold favorable perceptions of their greenspaces are more likely to show higher usability and satisfaction levels than their counterparts who do not.

It appears from the analysis that both usability and satisfaction are determined by the greenspace attributes rather than the user socio-demographic background characteristics. The greenspace attributes consisted of cleanliness and maintenance, tree cover and landscaping, seating places and playgrounds, pedestrian walkways and accessibility, etc. Demographic characteristics were educational level, age, job, income, family size, gender, etc. They do not seem to have a bearing impact on usability and satisfaction.

It is therefore important for urban policies to focus more on upgrading and rehabilitating neighborhood greenspaces and improve their natural setting and attractive landscaping, such as tree cover, flower plantations, water elements, seating places, children's playgrounds, and pedestrian paths. It is also of paramount importance that municipal authorities pay more attention to facilitating pedestrian access to these greenspaces by easing the inconveniences that hinder accessibility, such as proper sidewalks, reducing the speed of cars, and the like.

The urban codes and regulations of greenspace provision within residential neighborhoods should be reconsidered. Urban policies should insist more on greenspace quality rather than quantity. Instead of providing many small greenspaces in each neighborhood, a large local neighborhood park should be planned and established. This would facilitate the allocation of varied activities and attractive landscapes and provide the necessary personnel to ensure cleanliness and maintenance, collect waste, and take care of plants, furniture, and facilities. All these factors taken together would enhance attractiveness, usability, and satisfaction with neighborhood greenspaces in Riyadh. The case of Tilal Al-Riyadh is a good example. Instead of smaller greenspaces, it has a large greenspace with an area of 49,497 m<sup>2</sup> and has all the required services. A local committee of residents was established to take care of its management.

Proximity and close-to-home greenspaces do not seem to have a substantial impact on the usability and satisfaction of Riyadh residents. This finding tends to substantiate the arguments of other researchers, such as Addas and Maghrabi [49] in Saudi Arabia and Sugimaya and his team [50] in Perth, Australia. It does not support, however, the assertion that the closer the distance to greens, the higher the usability and satisfaction developed by Rigolon [46] and Griffin [48] in their works.

Similar results on residents' satisfaction with larger urban parks were found in Addas and Maghrabi's (2018) [49] work on the metropolitan city of Jeddah and also in Maniruzza-

man et al.'s [58] (2020) research on the metropolitan city of Dammam. These two studies were interested only in larger city parks. The smaller neighborhood greenspaces were not their focus. Hashim et al. [18] (2019) studied pocket parks in Malaysia to suggest their satisfactory and restorative potential for Kuala Lumpur's inner-city residents.

The study of Ostoić et al. [59] (2017) lends some support to the fact that smaller urban greens were associated with lower satisfaction because of so many management issues faced coupled with so many problems specific to post-socialist countries. In their analysis of the literature on urban green environments, Navarrete-Hernandez and Laffan [60] found that research evidence confirms the existence of positive relationships between existing large-scale greenspaces and the satisfaction and wellbeing of residents living nearby. White et al. [61] came up with similar findings in their analysis of longitudinal samples of British residents. They concluded that higher satisfaction levels were found among residents living in cities with higher urban greens. Similarly, the work of Volker et al. in Germany lends support to these conclusions.

Being the capital city of the nation, Riyadh will continue to know a rapid population increase as more and more people move to settle in the city. As a result of improving health conditions, more and more people are practicing walking exercises to keep fit, and more and more people are going to retire in relatively good health. All these factors would lead to increasing demand for greenspaces that offer walking, rest, and recreational opportunities.

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