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A Study on Urban Park Design from the Perspective of Environmental Perception: Exploring Future Landscapes to Enhance Well-being and Social Inclusion for Vulnerable Groups

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Abstract: Urban green spaces, including parks, are essential for promoting well-being and social inclusion for vulnerable groups, such as the elderly, people with disabilities, and those living in low-income areas. This work examined how environmental perception influences the experience of these groups in urban parks, adopting a mixed-methods approach to collect both qualitative and quantitative data. Structured surveys, in-depth interviews and field observations assessed the aspects of park design that impact the users' experience, including accessibility, sensory stimulation and perceived sense of safety. The findings showed that accessible pathways, multi-sensory elements and areas for social interactions are positively associated with the experience of the users, ultimately promoting well-being and social inclusion. More specific challenges and preferences were also highlighted, such as the need for more ramps, the concentration of shaded seating close to sensory elements and the provision of more safety measures. The findings stress the importance of inclusive and considerate park design to support the needs of urban populations. This study provides valuable support for urban planners and policymakers in the creation of parks that promote well-being, social inclusion and community interaction.

Keywords: Urban park design, Environmental perception, Social inclusion, Well-being, Accessibility.

1. Introduction

As our urban environments continue to grow, public green spaces such as urban parks will be more important than ever before in promoting health, well-being and social interaction among citizens. Not only do urban parks improve air quality, decrease urban heat and provide spaces for recreation, but they can also be designed in ways that promote relaxation and socio-spatial connectivity. However, these benefits are not equally attainable for all groups within society. Vulnerable groups, like the elderly, the disabled, the poor and those suffering from mental health problems, can be reluctant park users due to the challenges they face in navigating some of these spaces. The concept of universal design in public parks suggests designing with all users in mind, but this principle is not always applied. Having a better understanding of how these groups perceive and use park spaces is therefore of utmost importance. The study questions: How do environmental perception and park experiences

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relate to each other for vulnerable groups? The research highlights the importance of accessibility, sensory engagement and perceived safety in creating inclusive and usable public spaces. By focusing on what aspects of urban parks these groups value and how features in these spaces promote user satisfaction, safer experiences and social inclusion, this research adds to the growing needs-oriented approach in urban park studies [1]. To shed light on how vulnerable groups use and experience their local parks, a mixed-methods approach will be used to combine quantitative data from questionnaires with qualitative data from interviews and field observations in four urban parks.

2. Methodology

2.1. Research Design

The study used a mixed-methods research design; a combination of quantitative and qualitative components, to holistically understand the impact of environmental perception on urban park experiences of vulnerable user groups. The quantitative component consisted of structured surveys and questions to quantify user experiences, for example, in reference to a number of park design elements that can support wellbeing. The qualitative component consisted of semi-structured interviews and field observations, to capture the nuanced and emotive aspects of users' experiences in public spaces. The use of triangulation, which merges qualitative and quantitative data, could help address limitations of relying on one method alone [2]. It provides a way to reconcile quantitative measurements and statistical relationships, which are parametric, with the more interpretive narratives and less directly measurable experiences of individuals and contextual differences in environmental perception. This blending of methods was intended to allow the exploration of both statistical relationships and lived experiences associated with the use of urban parks..

2.2. Participant Selection

To ensure a good representation of vulnerable groups, a purposive sampling method was used to select particular community groups known to encounter particular challenges in public spaces: the elderly, people with disabilities and residents from low-income backgrounds. Overall, 200 participants were recruited in four urban parks in diverse socio-economic areas in the city. This was to reflect differences in park uses and design preferences across different community settings. Basic demographic information such as age, gender, socio-economic status, and if the participant had any relevant health conditions, were collected [3]. This was to facilitate sub-group analyses on how specific demographic characteristics impacted perceptions towards park design and accessibility. By focusing on physically vulnerable groups, the study aimed to distil evidence of particular needs and challenges that might have been underrepresented in general population studies.

2.3. Data Collection

Data collection took place over the course of a three-month period from March to May 2024 in an effort to capture users' experiences at different times of day and on different days of the week. To gather the data, the research assistants approached park users in person. After the users gave their consent to participate in the study, the research assistant shared with them the purpose of the study. The user was then asked to complete a survey that consisted of questions with Likert-scale responses that measured user experiences with accessibility, sensory experiences, perceived safety, and satisfaction with amenities. Since this data collection method results in quantitative data, it allowed for an assessment of user satisfaction with the different features of the park's design [4].

Following the survey, we conducted in-depth interviews with 30 selected respondents to probe more deeply into their experiences in the park. The semi-structured interviews took between 30

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minutes to 45 minutes, in which we asked participants to discuss specific aspects of the park that affected their wellbeing and experience of inclusion. In particular, we sought to uncover their favourite and least favourite park features, perceived barriers, and role of the sensory elements in their experience. All interviews were audio-recorded and fully transcribed verbatim [5].Third, researchers conducted observations of park usage and took notes on specific elements, including seating, sensory installations, and accessibility infrastructure. Observations were conducted using a checklist, which could record numbers of users, activities engaged in and interaction with other users. This was record was used, largely analysed afterwards, as a means of adding a visual/behavioural layer to survey and interview data. This observational layer was then used to cross-check survey and interview data, to identify particularly salient examples of discrepancies, and to contextualise field observations with the analysis of survey and interview data.

3. Experimental Process

3.1. Survey and Interview Administration

The survey was designed to be quantifiable with different questions addressing accessibility, sensory elements, safety, and overall experience with park layouts, which participants rated on a 5-point Likert scale from ‘strongly disagree’ to ‘strongly agree’. This allowed for some form of standardised measurement to determine how satisfied users are with park features. Questions from the survey that the participants answered included: ‘The pathways in the park are accessible’; ‘I feel safe when I visit here’; and ‘Sensory features increase my experience’. The survey also asked about demographics, including participants’ age, gender, and any special needs they required, which was beneficial for subgroup analysis. Following the survey, semi-structured interviews were conducted with a subset of 30 participants to gather richer context on individual experiences and perceptions. These interviews provided more flexibility to allow participants to share personal narratives and expand upon specific elements of the park design, such as its sensory features [6]. In the semi-structured mode of conversation, questions were more open-ended and sought to explore participants’ experiences with the sensory cues of the park (‘How do you experience the sounds and smells in the park?’), perceptions of safety (‘Are there areas of the park where you feel unsafe? Why?’), and engagement with social activities (‘How do you feel about the seating arrangements and communal spaces?’). All semi-structured interviews were recorded with participants’ consent and later transcribed verbatim to enable qualitative analysis on a wider range of responses than those collected through the survey. Table 1 Summary of survey findings. Share of participants indicating that they would recreate at the focal parkBoth in quantitative and qualitative terms, this combination of surveys and interviews enabled a robust assessment of the role of environmental perception in the park experience, encompassing both the breadth and depth of these experiences [7].

Table 1: Survey Results

Aspect	Quantitative Findings	Qualitative Feedback
Accessibility	78% agreed pathways are accessible; 15% disagreed.	Main pathways accessible but issues on hilly/unpaved paths; more ramps needed.
Sensory Elements	82% reported sensory features enhanced experience; 63% rated shaded seating highly.	Participants enjoy water and natural sounds; shaded areas preferred by older users.
Perceived Safety	68% felt safe overall; 20% felt unsafe in isolated areas.	Good lighting enhances safety; concerns over secluded areas, especially at night.
Overall Satisfaction	75% rated satisfaction positively with an average score of 4.1/5.	General layout appreciated; more benches and amenities suggested.

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3.2. Observation Protocol

Field observations of user behaviour took place in all four urban parks to record usage patterns and to assess on-site the presence and effectiveness of design features. Observers followed a structured protocol, visiting each park at different times of day (morning, afternoon and evening) and on weekdays and at weekends to record varied patterns of usage. Observational data included information on pathway accessibility, presence of sensory features (eg, water fountains, aromatic plants, tactile pathways) and their relative location, as well as the presence of facilities (eg, benches, shade, ramps). As indicated in Table 2, the observers also kept count of the park users and their distribution in various areas of the green space such as playgrounds, exercise zones, and seating areas, frequency of interaction with each other in groups and as individuals. Detailed description of activities documented what users were doing as a group or singularly, e.g., a gathering, a stroll or an event that engaged a community. All of these observations pointed to how park spaces get used for social engagements and contemplation [8]. A checklist was used for systematic recording of features concerning accessibility (eg: presence of ramps and railings), sensory engagement (eg: types of sensory elements present) and social interaction zones (eg: presence of communal tables or open lawn). This structured recording helped to quantify the access and use of park design elements for various groups, ie, how well a park is designed to allow engagement and/or restriction for vulnerable groups.

Table 2: Field Observation Data Summary of Urban Park Usage and Design Features

Park Area	Average Daily Users	Peak Usage Time	Interaction Frequency (per hour)	Accessibility Score (out of 10)	User Satisfaction (out of 5)
Pathways	120	Afternoon	15	8	4.1
Sensory Elements	85	Morning	25	7	4.3
Seating Areas	150	Afternoon	35	9	4.5
Playgrounds	95	Weekend Mornings	40	5	3.8
Exercise Zones	60	Morning	10	6	4

3.3. Data Analysis

The analyses were conducted in two phases – quantitative and qualitative, based on the nature of the data from the surveys and from interview and observational data. The quantitative analysis entailed descriptive statistics for characterising general trends in user satisfaction and perceptions of certain park features. Mean score and standard deviation was calculated for each of the items within the survey, providing some qualitative overview of participant response. Regression analysis was used to assess the strength of the association between certain park features (eg, accessibility, sensory elements) and the general satisfaction with the park. This helped to pinpoint the elements that had the greatest impact on users' experience, particularly for vulnerable groups. The qualitative data followed a more iterative process of thematic analysis, which allowed us to pinpoint recurring themes and patterns in the interview transcripts and observational notes. The transcriptions were coded using NVivo software and sub- grouped under three themes: 'sensory engagement', 'safety concerns' and 'community interaction' covering the full range of user experience in the park [9]. Each theme was

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further broken down into sub-themes, for example the shade under the trees was a significant factor in how comfort level in the park was measured by different users, but was more important to one group than any other. Clarity of the signage had an equal impact on how well park visitors understood the park spaces, but had less direct implications on other park users and our observations validated these reported distinctions and helped identify discrepancies between reported perceptions and observed behaviours.

4. Results and Discussion

4.1. Accessibility and User Satisfaction

Survey findings showed that higher levels of accessibility were strongly correlated with higher levels of user satisfaction, especially for those from vulnerable groups. Higher degrees of satisfaction were also found among participants who rated wheelchair-accessible paths and clearly marked paths and signage highly. These findings confirm that accessibility features are critical in enabling equitable use of urban parks. Interviews with park users revealed several challenges. Participants with mobility challenges described the inadequate number of ramps and rest areas in the parks. For example, older users described having difficulty moving between sections of the park because of the lack of sufficient spacing between seating, which reduced their chances of being able to participate in activities at the park. Likewise, individuals with visual impairments described that, while some parks provided Braille signage, these were not consistently placed and therefore not as reliable in navigating the parks [10]. These researchers' findings emphasise the importance of comprehensive and consistent planning for accessibility in urban park design, which can significantly enhance the experience of using parks for all users, particularly those with mobility challenges and impairments of physical and sensory abilities. Urban planners might want to prioritise the construction of universally designed pathways and rest areas that accommodate a variety of users with varying physical abilities.

4.2. Sensory Engagement and Well-being

The study also focused on the role of sensory elements in mental wellbeing, finding that participants valued a heterogeneous sensory profile of the parks, more so than other features. In particular, features such as water fountains, fragrant floral beds and textured walking surfaces were cited frequently by participants. Older park users often had a preference for seats under shady trees near to sensory features, which they perceived as providing serenity and reducing stress levels. We observed higher usage rates on these areas, not only by more vulnerable groups but generally by as entire cohort who often did 'little tours' of sensory features. This proved that the multi-sensory design of urban parks can contribute to mental wellbeing by providing a more restorative experience that brings emotional resilience and relaxation to more users. Therefore, a well-balanced mix of sensory features in an urban park can make it more attractive and engaging for users. Park managers and designers should take active steps to plan for the inclusion of a wide range of sensory experiences in urban parks – allowing for the placement of natural features that bring along desirable smells, sounds and textures.

4.3. Social Inclusion and Community Interaction

Survey and interview data pointed out that urban parks were particularly valued as inclusive spaces that promoted social interactions and generated a sense of community. Those participants from lower-income backgrounds especially pointed out that parks served as accessible venues for family gatherings and community events. Participants described engaging with friends and families in the parks for cultural celebrations and family picnics, and highlighted the importance of parks in fostering intergenerational bonding and cross-cultural exchange. Correspondingly, our observational data also

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showed higher use of communal spaces, such as open lawns, picnic tables, and amphitheatres, for exercise classes, live cultural performances or children's playdates. The interviews further underscored how parks with more adjustable seating typologies, as well as large open areas, helped to facilitate varied interactions among people of different age groups and from diverse cultural backgrounds, which in turn generated a stronger sense of belonging for the community. In sum, the findings suggest that inclusive socialisation – where all individuals, irrespective of background, are able to participate fully (or to the best of their ability) in the social life of their neighbourhood – can be promoted through the design of well-articulated communal spaces in urban parks.

5. Conclusion

The study also shows how thoughtful urban park design contributes substantially to wellbeing and social inclusion, especially for vulnerable groups. For example, accessible routes, multi-sensory rich features and flexible spaces for rest are particularly beneficial for older people, those with disabilities and people on lower incomes. The research identified key areas for improvement such as increasing the provision of ramps and shaded seating, as well as better safety standards so that all users felt safe. Adopting a more integrated and understandable approach to park design can help urban planners develop green space solutions that can enhance wellbeing, promote relaxation and provide places for social interaction and community engagement. These findings advocate for the consideration of environmental perception in urban park planning and offer a model for how we can improve public spaces to benefit all urban residents.

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