

Identifying and Assessing Uses of Public Parks: A Systematic Literature Review

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Abstract This research aims to identify the various ways public parks are used, which are assessed using multiple tools and methods used in extant literature. In this endeavor, a Systematic Literature Review (SLR) of research papers published in the last two decades was conducted. Public parks are mainly used for recreational, social, physical, economic, and ecological purposes. It is observed that various researchers have assessed the recreational, physical, and social uses of parks through direct observations surveys, and mixed-methods approaches. Further, the researchers have assessed the economic and ecological uses by studying the changes in the city dwellers' quality of life, and their surrounding environment. Interestingly, both the ecological and economical uses of parks seem to have an indirect impact on the users, while recreational, social, and physical uses have a direct impact. The findings also suggest that observations, surveys and mixed methods were indeed the appropriate ways to assess the parks' usage. The goal is to find an appropriate research direction and strategy for the assessment of uses of parks that may help the city planners/ policy makers to optimize the park uses.

Keywords Park Use, Park Visitors, Park Service

1. Introduction

Public parks are important for community sustainability and growth, providing a variety of benefits like cultural,

social, recreational, physical, and economic benefits [1-4]. Parks, in effect, serve as natural buffers that aid in the preservation of the urban environment while also enhancing the quality of life for urban dwellers. They also play a vital part in the overall growth and development of cities. Additionally, they facilitate social interactions amidst nature, which goes on to build a vibrant socio-cultural ethos among communities [5,6].

The parks serve as a place for physical activity, engagement with humans and nature [7]. In other words, they provide a public arena and social relief, allowing for socio-cultural contact while also appreciating the flora and fauna [8,9]. Urban dwellers often spend some time weekly engaging with nature in parks, playgrounds, historical sites, or other natural areas [8,10]. Through this engagement, they realize the benefits of open green spaces, resulting in improvement in the quality of life.

2. Usage of Public Parks

Certain features and qualities of public parks may be understood to promote or restrict the general public's interaction within a certain context for a specific purpose [11,12]. These are assessed by looking at the accessibility to the park, the activities performed therein (physical activities in particular), and the way people get involved in the park [13]. Park use is thus strongly intertwined to understand the connections between humans concerning their participation in physical activities [12,14].

The following sections specifically deal with different uses of parks, identified by various researchers around the

globe.

2.1. Recreation

Public parks do serve as an important recreational space for diverse communities of people. In the process, they fulfill the 'recreational demand' of users, such as viewing scenery, family picnics/ gatherings activities [15]. Park-based leisure amenities and facilities improve disposition, reducing perceived tension while increasing a sense of 'internal' wellness [16]. They also serve as places to promote physical activity, socialize with friends and family, engage in recreational activities, experience nature, and observe others [17,18].

2.2. Social

According to both qualitative and quantitative studies, open areas, shade, recreational amenities, and sitting places are significant factors for encouraging 'social park use' [19-21]. As a result, parks have frequently been advocated as means of promoting social cohesion since they provide space for social contact and offer shared spaces for people to spend more time engaging [22-24,18,14]. Several park features and facilities like barbecue areas, seating, shaded places, etc. are very appealing to parks users [21].

2.3. Physical

There have been several studies that show the connection between physical activities in public parks and improved health [14]. Parks have been shown to give psychological advantages such as stress management, anxiety relief, and restorative experiences, which are especially regarded as "perceived health benefits" for senior citizens [25,14]. As a result, public parks improve overall health by instilling sentiments of pleasure, satisfaction, tranquility, relief, and peacefulness [26,27]. Interestingly, it has been found that walking within a park, especially for old people, helps in managing several chronic diseases that are particularly associated with aging; they also help in relieving mental fatigue [28,29]. Physical activity in open green settings relieves tension, uncertainty, irritation, and depression [30-32]. Tsunetsugu et al. [33] in their study, found that parks and green spaces go on to enhance concentration capacity among its users. Green spaces within the parks contribute to health, and help in enhancing air quality, encouraging physical activity, stress reduction, and fostering social cohesion [34].

2.4. Ecological

Green parks in cities improve the temperature, filter the air, water, and soil, and remove various pollutants, all while providing a healthy environment for plant and animal life to grow [35-38]. Byrne and Sipe [39] suggested that parks could also act as a habitat for wildlife. Further,

Werner [40] might also be used as ideal habitats for a variety of plants and animals in the nearby areas, as suggested. Paoletti et al. and Davies et al. [41,42] stated that open green spaces like parks within urban jungles of concrete could sequester and store carbon within trees, along with other kinds of vegetation that are very valuable. Importantly, parks within cities could act as 'vital' spaces for 'carbon sinks', which could go on to play a significant role in mitigating climate change, and its cataclysmic effects. Additionally, they could also help in reducing energy costs of 'naturally' cooling the buildings, while providing thermal comfort with high mitigation potential [41,43-46]. Due to urban land scarcity, trees in parks provide cover and heat reduction, as well as generate opportunities for Water Sensitive Urban Design and animal habitat [47,48]. Parks within urban setups could be the perfect foil to encourage biodiversity [49,50].

Studies were done on ecological, social, and planning perspective shows that vegetation plays an important role in improving the quality of air [51]; they play a vital role in "Place-attachment" of users [52] and restoration of trees is important to maintain the ecological balance of the city [53].

2.5. Economical

It may be noted that very few studies have explored Public parks as an economical proposition. Public parks have always been known to be used for aesthetic, historical, and recreational values [1]. Nevertheless, if we are to evaluate on economic grounds, it may be noted that the values of properties near a public park are generally much higher because the park offers amenities like fresh air and passive recreation [54].

3. Methods

The criteria for conducting the Systematic Literature Review (SLR) for this paper include Peer-reviewed journal articles in English published in the last two decades that developed and used new approaches for measuring park use.

This study adopted Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [55] and also did an internet search in Google Scholar as well as in Scopus to identify methods for analyzing park utilization in the literature.

Keywords for the search are 'park' OR 'green space' AND 'use' OR 'physical activity' OR 'usage' OR 'usability' AND 'measure' OR 'assess' OR 'evaluate' OR 'exam' OR 'tool' OR 'approach' OR 'method'. Furthermore, by adopting the PRISMA, method the search results were further analyzed for titles containing the core keywords, with a particular focus on urban contexts. After this, a subsequent review process was done to identify the full text of those articles from the original keyword search. Then,

for the next round of screening, we located more records that fit the search parameters in the reference lists of the full-text articles. As a result, we reviewed the titles and removed the duplicate entries. In addition, to this, the search keywords were found in the titles of articles, were identified, their abstracts and full content, including Introduction, Methods, Analysis, Discussion, and Results, were read and understood to determine whether the articles measured park usage and whether their methodology was novel.

4. Data Analysis

Applying the PRISMA process, the included papers were re-evaluated, and data on park visitors, as well as methods for measuring park usage, were recovered. We looked for context, target population, methods, and measurements in addition to basic information like tool

name, author, and year. From grounded theory methods as advocated by Glaser and Strauss [56] to identify patterns within the extracted information an in-depth review was conducted. Then, we synthesized the tools' for the obvious purposes, practicability and effectiveness, issues of consistency, and how technological development influenced the development of park use measurement techniques were all discussed. Notably, from this analysis, we were able to identify the limitations within the current measurement techniques. Post analyzing the reliability, applicability, affordability, we provided recommendations for selecting the most suitable instrument for assessing park use, especially in the Indian context. The phases of PRISMA through the SLR phases are shown in Fig. 1.

Initially, 916 (832+84) papers were identified, out of which 884 papers were screened out for various reasons. For this paper, only 32 studies were selected.

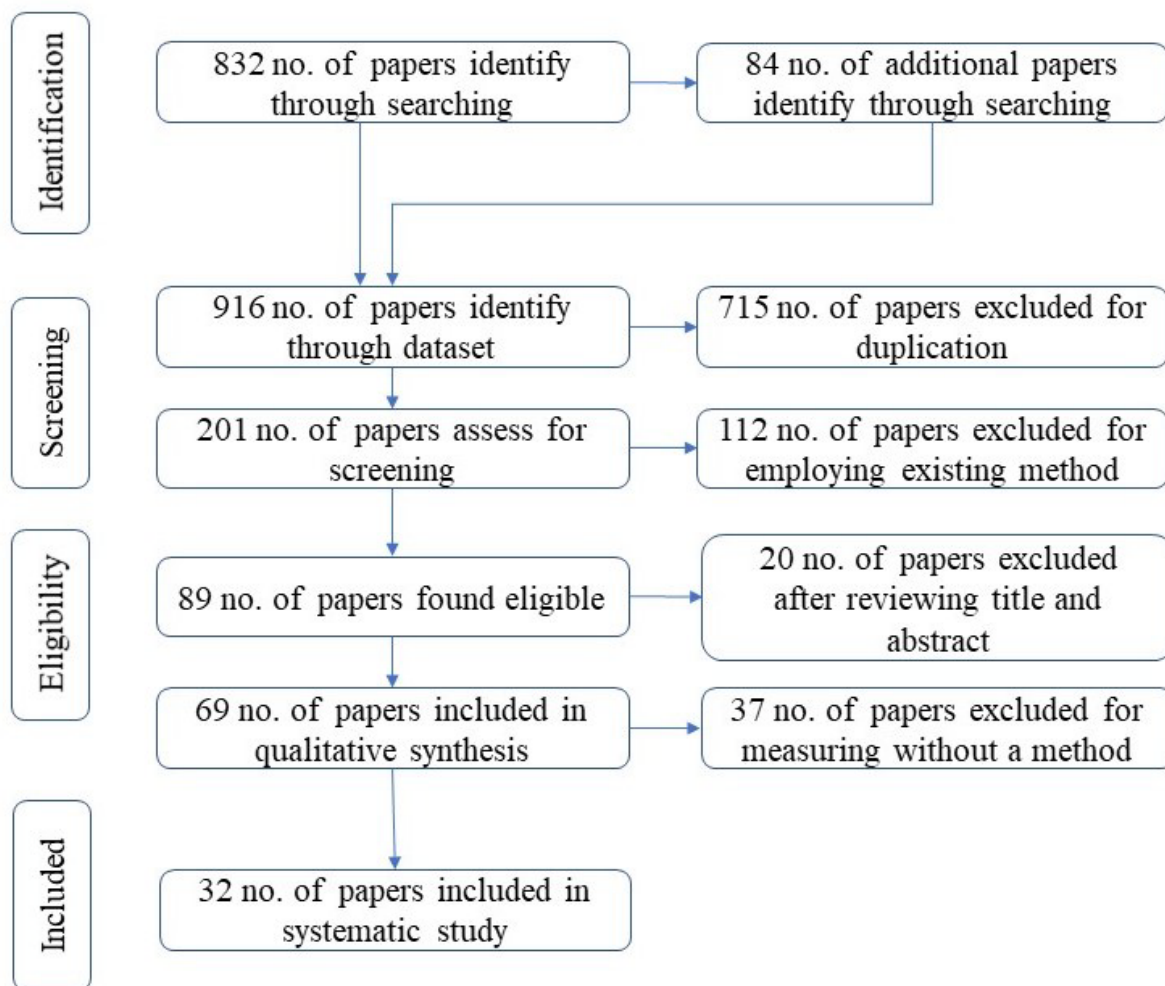


Figure 1. PRISMA phrase of SLR (done by authors)

5. Park Use Measurement Tools and Methods

In the past, certain direct metrics of park utilization and contribution to physical activity were utilized. McKenzie et al. [57] developed a method to obtain direct information on park and recreation areas. This System for Observing Play and Recreation in Communities (SOPARC) was used to identify park users' physical activity levels, gender, estimated age, and ethnicity, as well as activity modes and kinds. It also included details on the park activity areas' accessibility, usage, supervision, and organization. Other park audit matrices included the Bedimo Rung assessment Tool Direct Observation (BRAT-DO) [15] which assesses park environmental attributes. Furthermore, the Environmental Evaluation of Public Recreation Spaces (EAPRS) [58] instrument was employed to give a full direct observation assessment of park and playground physical settings. The Path Environment Audit Tool (PEAT) [59] a computer-based instrument, has been used with the help of trained observers to assess the physical features of community trails and paths; while the Core Measures of Trail Use [60], has been used as a set of a questionnaire about trail use, and factors that may influence it in different communities.

Brown et al. [61] established the Public Participation Geographic Information System (PPGIS), which provided an option to identify the locations and degrees of physical activities, as well as the types of park benefits online for park users. The assessment is done through surveys along with other tools like interview and mail back questionnaires. This is one of the mixed-method approaches applied in assessing park use.

According to our SLR, the researchers adopted various survey methods to measure park use until McKenzie et al. developed Observing Play and Recreation in Communities (SOPARC) and the System for Observing Play and Leisure Activity in Youth (SOPLAY) in 2002 and 2006, respectively. Remarkably, both SOPARC and SOPLAY were designed to collect information on park visitors' physical activities, with brief time sampling employed to capture their behavior [57]. Notably, virtually all observational research used a pre-existing method to collect park usage data [62]. In 2016, % of direct-observation studies employed the SOPARC method to collect park use, whereas just 11 percent used SOPLAY [63]. Other studies used global positioning systems (GPS) devices to estimate the time spent in parks and the percentage of Moderate to Vigorous Physical Activities (MVPA) performed [63-65]. In this method, participants were required to wear a GPS device and it also required the availability of digital maps to match the GPS data [66].

6. Analysis and Discussion

Extant literature has provided an overall understanding

of park uses concerning human activities. Park users have thereby been closely connected to recreation, social, and health uses. Furthermore, most of the economic and ecological uses have been connected to urban dwellers, wildlife, and to a lesser extent, park users. The reason for this is that economic benefits, such as park revenue and increases in property prices in park-adjacent regions mostly affect city inhabitants. As per the concerns of ecological usage of parks, such as lowering the temperature of surrounding regions and providing a habitat for birds, reduction of carbon footprint by trees in parks are related to parking visitors in a subtle manner that is not directly related to parking visitors.

Van den Berg et al. [67] advocated that various literatures support multiple benefits to urban park users. Even though several studies have been conducted to assess the advantages of urban green spaces, such as ecosystem services and psychological well-being [68-70,32].

According to the SLR, numerous tools are applied to measure park utilization. The application of these instruments is situational, and it varies from one scenario to the next. The tools each have their own set of benefits and drawbacks. PPGIS, for example, solely focused on socio-environmental, psychological, and physical advantages [12]; nevertheless, long-term benefits such as psycho-physiological and economic benefits are still beyond quantification. The present tools frequently list social, environmental, and health care usage, which have not overcome the measurement limitations of PPGIS to meet the inclusive evaluation for park utilization [12].

SOPARC is increasingly being used to assess park use behaviors and preferences in a variety of communities and environments [71,72]; however, it is still important to understand how factors such as park users' characteristics are being observed or contextual conditions may compromise the reliability of the observations [12].

It is important to highlight that, while these tools have been utilized in the past, they have not been thoroughly proven via significant use [12]. Nonetheless, they carry the possibility of giving more trustworthy information regarding physical activity and its correlation in outdoor recreational places [12]. Park and recreation experts are commonly oblivious of these tools, and they may lack qualified personnel to use them. As a result, training in measuring physical activity in parks and outdoor places, as well as other health-related measures, is vital; and, thus far, it appears to be a difficult area of concern.

For using the observation, surveys, and social media methods, various tools like photo sharing services sound pressure level, Realtime Tencent User Density, geocoded panoramically and flicker images, accelerometer [73-79] are also used for assessing and analyzing park uses.

From the SLR it is observed that whatever tools are to be used for park use assessment, they must be robust, and must have efficiency, reliability, accuracy, and affordability. The usefulness of the tool may be contextual and specific to individual cases.

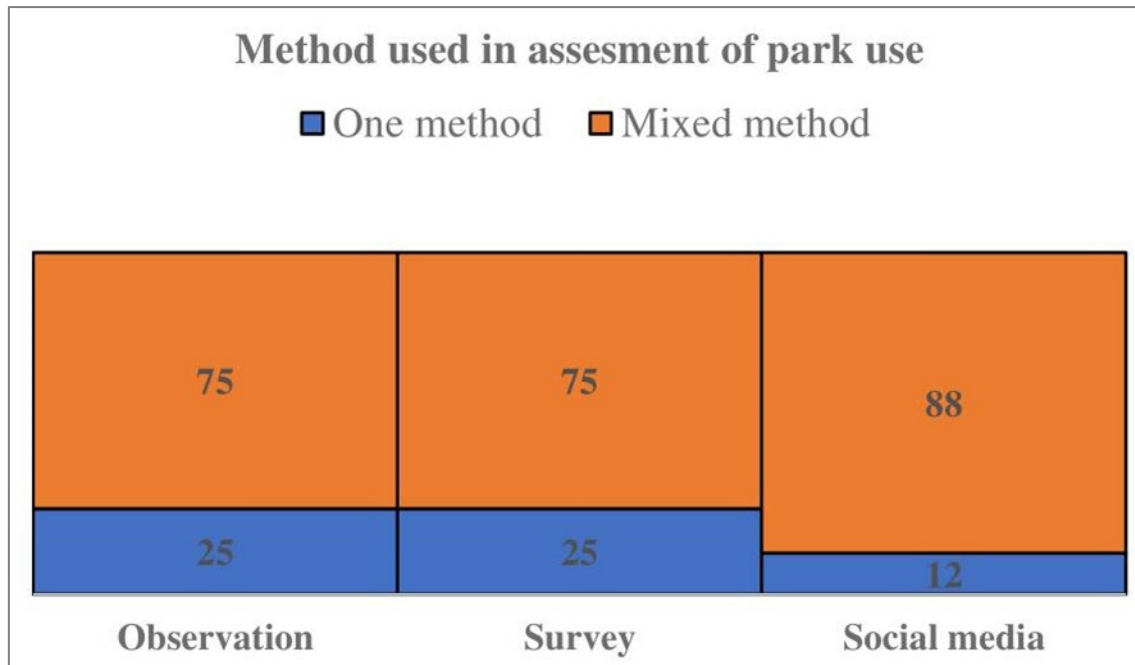


Figure 2. Methods used in the assesment of park use from SLR.

The SLR also helped us in understanding the various methods that were adopted for assessing the uses of parks. This is shown in Fig. 2.

These methods are used either singularly or are used in combination with other methods, termed ‘mixed-methods.’ From Fig. 2, it becomes clear that 25 % of papers adopted observation as the only method for assesment of park use, whereas 75% of papers adopted a mixed-method approach along with observation. Similarly, survey methods are only adopted in 25 % of the studies whereas mixed method, with surveys as one of the components, is used in 75% of the cases. 12% of the papers assess park use with the help of social media only, and 88% of papers adopted mixed methods along with social media. Hence, from the SLR, it becomes clear that the mixed-method approach is a very common method for assesment park use.

Observation is an important method of data collection in environmental behavior research because it helps to understand the relationship between the physical characteristics of a place and how humans interact with that place [80,81,14]. Direct observation is a qualitative approach that is mostly used by researchers in the Indian context [10,82,83,14], to analyze active-passive activities, users’ behaviors, facilities, and services provided in space. It also gives a clear understanding of the current situation, of the space. This method was found to be used mostly in developing countries like India.

The survey methods are the ideal method for understanding the park users' perception of the quality of the space and its benefit. Questioner survey, focus group, and structured interviews give a better understanding of quality [84-87,10,14,82], and user perception about the space; also, it is less expensive and take less time

[10,89,14]. Telephonic surveys and web-based survey methods are also used by some researchers [90,91].

Household surveys [92-99] and on-site surveys were also used to assess park usage [44,100-103]. According to these researches, household surveys allow for the identification of both users and non-users but are constrained by low response rates. It is recommended that studies employ both direct observation and questionnaires to catch both users and non-users, as well as to balance objective and subjective measurements.

Depending on the number of park visitors, social media-based methods could only evaluate park use and forecast many of the park's appealing aspects depending on its location [77]. While they are useful for analyzing park use in some cases, they do not provide precise data on individual behaviors or the use of particular park amenities. Future researchers interested in assesment park usage using Huge Data sets or social networking sites must identify such limitations as well as strive for more reliable information in this sector while keeping larger privacy concerns in mind [77].

Mixed method approaches using observation, interview, survey, data collection from concerned authorities, SOPARC, GPS, smartphones are widely adopted by the researcher to assess the park use [102-105,66].

7. Conclusions

The approaches to assesment park usage must be changed concerning the research area's context. Physical observation and survey are the most often used methods for measuring park use, according to our literature review. SOPARC [57] was the most extensively utilized

application among the observation methods. In contrast to self-reported data, observation is an objective assessment that can provide higher internal validity as well as the instantaneous collection of information about the context (physical & social) in which the activity is occurring [107].

The survey, observation, and mixed methods have been mostly adopted by researchers [10,82,83,14,8] in developing countries like India.

New approaches/ tools should be investigated for analyzing additional park usages, such as social cohesion, comfort, and awareness about the environment. Notably, the majority of existing usage measurement technologies, such as those with GPS and accelerometers, SOPARC, and SOPLAY, continue to use physical behavior as the prime focus. The relative significance of physical behavior may be consistent with others depending on the settings, context, or study purpose, or the value/ scale of other park usage categories may be adjusted. A questionnaire survey approach aids in understanding users' impressions of the space's functional, aesthetic, and perceptual features [80,14,107]. Low response rates and subjective reactions, on the other hand, may enhance implicit bias and hence limit sample size [108]. Existing research has found that objectively measured physical activity is frequently substantially lower than self-reported physical activity [109].

The SLR makes it clear that survey and observation are the most preferable methods adopted by researchers for assessment of park use; as they are efficient in terms of gathering the data, affordable due to non-requirement of skilled trained persons, or costly equipment's and, reliable because of their good statistical significance. The accuracy of these methods can be checked through their precise result.

A combination of observation and survey methods will lead to form a mixed-methods approach. It includes the advantages of both methods. Mixed methods are especially beneficial for analyzing differences between quantitative and qualitative data. These methods may also include other modern methods like GPS, Artificial intelligence, GIS, etc. They also enable a research question to be thoroughly investigated from various perspectives. When used correctly, it permits the advantages of one approach to compensate for the limitations of another.

It is observed that researchers combine several aspects of park assessment—both spatial and non-spatial, physical, and nonphysical—to fully perceive and comprehend park uses. A model developed on Mixed Method Approach, designed suitably for the context, is what is required, as that may help the city planners/policy makers to optimize the park uses.

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