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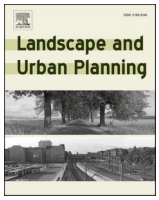

Perspective Article

Limitations of existing park quality instruments and suggestions for future research

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HIGHLIGHTS

- Existing park quality instruments heavily focused on generalizable measurement.
- Developing a universally applicable instrument is unrealistic due to several reasons.
- Developing an inventory of park quality indicators is more practical and desirable.
- Five distinctive limitations in existing park quality instruments.
- Recommendations for new park quality indicators.

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ABSTRACT

Public parks are critical urban infrastructures offering health, environmental, social, and cultural benefits to people. However, the idea of park quality has lacked a clear operational definition and normative standard for measurement. We provide critical insights into existing park quality instruments and advocate for an alternative approach. First, due to the significant diversity in parks, inherent ambiguity and subjectivity in the idea of quality, and previous instruments' inconsistent operationalizations of park quality, we recommend that future research shift its focus from creating instruments for universal application and standardized measurement to developing an inventory or list of park quality indicators that researchers and practitioners can selectively choose for their unique park contexts. Second, through our multidisciplinary examination, we identify five limitations in existing park quality instruments: (1) lack of attention to the histories of marginalized communities, (2) over-emphasis on physical activities and public health, (3) lack of attention to ecological function and biodiversity, (4) lack of subjective measurements, and (5) insufficient consideration of multiple parks or a park system. Overall, a more flexible and site-specific approach to park quality measurement and the adoption of new indicators of park

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quality are expected to accomplish a more comprehensive and fairer assessment of park quality, contributing to park equity research and practice.

Public parks are critical urban infrastructures that offer many health, environmental, social, and cultural benefits to people (Algretawee et al., 2019; Konijnendijk et al., 2013; Schipperijn et al., 2017; Twohig-Bennett & Jones, 2018; Vieira et al., 2018). However, studies have documented that affluent and White individuals often live closer to larger, high-quality parks and visit parks more frequently than less affluent residents and people of color (Boone et al., 2009; Lara-Valencia & Garcia-Perez, 2018; Nesbitt et al., 2019; Rigolon, 2016). Accordingly, growing research aims to adequately measure park accessibility and better understand the extent to which park benefits are equitably shared by all residents (Chen et al., 2023; Larson et al., 2022; Rigolon & Németh, 2018a).

Accessibility is a multifaceted and somewhat ambiguous construct in terms of its definition, measurement, and practical application (Handy & Niemeier, 1997; Miller, 2018). Yet, a general consensus within the park literature is that park accessibility is a two-dimensional construct that entails park availability and park quality (Chen et al., 2020a,b; Park, 2017; Rigolon, 2016; Wang et al., 2013). *Park availability*, described as the physical and spatial dimensions associated with geographic access, denotes parks' spatial characteristics such as size, proximity, location, and number of available parks (El Murr et al., 2023; Lara-Valencia & Garcia-Perez, 2018). In contrast, *park quality* focuses on (1) perceptions of park and neighborhood characteristics, such as attractiveness, quality of facility maintenance, and safety, and (2) the presence of certain park amenities, such as playgrounds, restrooms, trails, tables, and benches (Chen, Luo, et al., 2020; Joseph & Maddock, 2016; Park, 2017).

A distinctive research trend in the park accessibility literature is that park quality has received relatively little attention compared to park availability (Pearsall et al., 2020; Pearsall and Eller, 2020; Wang et al., 2013). The trend is understandable, given that geospatial datasets representing park availability are increasingly available, while measuring park quality is both conceptually challenging and resource-intensive, requiring field observations or surveys of local residents or park visitors (Evenson et al., 2016; Rigolon & Németh, 2018b; Tester & Baker, 2009). However, limited attention to park quality is problematic given its potential to provide better assessments of equitable access to high-quality parks that provide an array of benefits to nearby residents and visitors. In fact, several empirical studies have documented that park quality is an equally, if not more, important determinant of actual and intended park use compared to park availability (Kaczynski et al., 2016; Kaczynski et al., 2020; Wang et al., 2015).

The purpose of this paper is to contribute to ongoing park quality research in two ways. First, we provide a critique of the overall measurement approach of existing park quality instruments and recommend a more flexible and context-specific approach. Although researchers have provided systematic and selective reviews on park quality instruments (e.g., Chen, 2020; Joseph & Maddock, 2016; Park, 2017), our critique first concerned with the challenges associated with the operationalization and instrumentation of park quality and existing instruments' positivistic orientation focusing on the generalizable measuring of park quality within a large geographical context (e.g., park quality across the United States). Second, through our multidisciplinary evaluations, we point out five limitations in the existing park quality instruments and demonstrate the utility of new indicators of park quality. Thus, we aim to provide new insights into the park literature, make practical suggestions for park quality measurement, and contribute to equitable park planning and management.

1. Challenges in operationalization and instrumentation of park quality

Any discussions on the measurement of park quality first need to recognize the complexity and challenges associated with its operationalization and instrumentation. Parks comprise many different types of green infrastructure and vary considerably in size and by location, design, amenities, and amount and type of vegetation (Cranz, 1982; Cranz & Boland, 2004; Garvin, 2011). The variability of parks makes it challenging or even problematic to develop a standardized instrument for the generalizable assessment of park quality across different contexts. Similarly, quality is an elusive concept subject to multiple interpretations due to its inherent subjectivity (O'Neil & Gallagher, 2014). That is, what constitutes park quality is essentially a philosophical and contextual question.

Accordingly, within the park literature, the idea of park quality currently lacks a clear operational definition and normative standards in measurement, despite some researchers' previous attempts (e.g., Jerome et al., 2019; O'Neil & Gallagher, 2014). Existing park quality instruments exhibit several discrepancies in evaluation criteria, and many use a mix of objective and subjective indicators (see Chen et al., 2020a,b; Park, 2017). For example, safety, a frequently used indicator of park quality, has been measured objectively with neighborhood crime rates (e.g., QUINPY scale from Rigolon & Németh, 2018b) and subjectively by park auditors' perceptions of safety (e.g., CPAT scale from Kaczynski et al., 2012; EAPRS scale from Saelens et al., 2006). Notably, the same pattern is observable for park availability; the distance to park, a widely accepted indicator of park availability, has been measured by objective or factual information (e.g., Euclidean distance or network distance by El Murr et al., 2023; Robillard et al., 2023) as well as subjective data evaluating park visitors' perceptions (e.g., self-reported travel time or perceived accessibility to parks by Pham et al., 2019; Yasumoto et al., 2021). Fig. 1 summarizes the conceptual structure of park accessibility and how it has been measured in previous studies.

The literature on park accessibility instruments shows that measurements of park quality have been more inconsistent and diverse than those of park availability. Previous reviews (e.g., Chen et al., 2020a,b; Park, 2017; Wang et al., 2013) have indicated that proxies of park availability have been primarily based on the geometry of parks (either actual or perceptual), while those of park quality are not anchored to a particular scientific or disciplinary approach. For example, some of the most commonly used park quality indicators in existing park

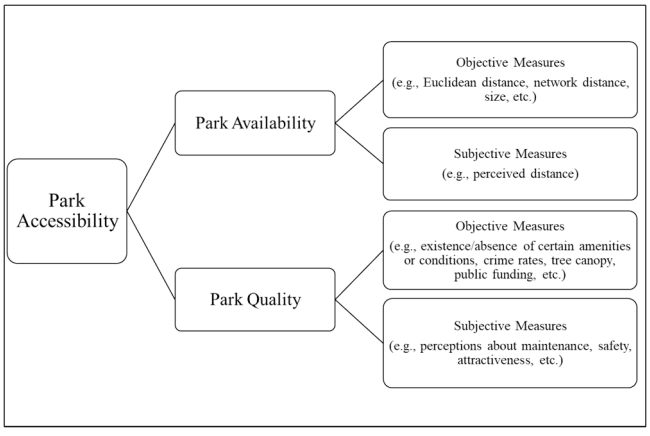

Fig. 1. A summary of the conceptual structure and measurement of park accessibility.

accessibility instruments and their corresponding academic disciplines include the existence of certain amenities (planning, e.g., SAGE scale from Byrne et al., 2005), residents' perceptions on different aspects of park (psychology, Structural Diversity scale from Voigt et al., 2014), crime rates (criminology, e.g., QUINPY scale from Rigolon & Németh, 2018b), and attractiveness (landscape architecture, e.g., PARK scale from Bird et al., 2015).

What makes park quality measurement even more complicated is that different studies have used the same indicator to gauge both park availability and park quality. Specifically, park size has been commonly used as a measure of park access (e.g., Boone et al., 2009; Sister et al., 2010; Vaughan et al., 2013) or as an explanatory factor for park use (Kaczynski et al., 2008), yet it has also been used as a proxy of park quality (e.g., Cutts et al., 2009; Rigolon & Németh, 2018b). Similarly, some reviews of previous park accessibility instruments summarized quantity and proximity as important criteria for park quality (e.g., Jerome et al., 2019; O'Neil & Gallagher, 2014), while other reviews recognized them as indicators of park availability rather than quality (Chen et al., 2020a,b; Park, 2017; Wang et al., 2013).

Taken together, the considerable heterogeneity of parks, innate definitional ambiguity and subjectivity of the term quality, and inconsistent indicators used in different park quality instruments suggest that developing a universal instrument that can adequately capture the quality of any park across different contexts is impractical or even unrealistic. Therefore, we recommend that future efforts for measuring park quality not focus on creating a universally applicable instrument for generalizable measurement across large geographies but incorporate a more flexible and customized approach that considers the unique characteristics of different parks and the communities that they serve. Specifically, such flexibility could be accomplished by focusing on developing *an inventory or list of park quality indicators* from which researchers and practitioners can selectively choose based on their particular situation and goals. Furthermore, the inventory or list could be accompanied by a guiding framework that advises users on what kinds of indicators are useful in different circumstances (e.g., Jerome et al., 2019). We envision that this approach essentially entails three tasks for park researchers and practitioners: (1) understanding the goals of their evaluation, (2) analyzing the context of the evaluation, such as the number of parks and their characteristics, and (3) reviewing the inventory of park quality indicators and the guiding framework. Hence, we advocate for a context-specific and customizable approach that would provide greater flexibility to park researchers and practitioners.

To further demonstrate the merits of the context-specific approach in park quality measurement, the next section of this paper points out five limitations of existing park quality instruments and recommends new park quality indicators.

2. Five limitations in existing park quality instruments

2.1. Lack of attention to the histories of marginalized communities

One commonality of existing park quality instruments is that they do not account for the extent and ways in which parks communicate the histories of marginalized communities. Historically, public parks in the United States have been designed, built, and managed by affluent and powerful White individuals to benefit themselves or other White middle- and upper-class individuals (Rosenzweig & Blackmar, 1992; Taylor, 1999). Thus, the White ruling class deliberately used parks as a means of materializing their own interests, and many parks were built to destroy communities of color or erase their history (Lee et al., 2023). For example, Central Park in New York, the first landscape public park in the US, was created by razing Seneca Village, a thriving multiracial community particularly important for African American New Yorkers for their economic mobility and voting rights (Rosenzweig & Blackmar, 1992). Similarly, in Baltimore, Maryland, Mayor James H. Preston (in office 1890–1894) used condemnation laws to demolish prospering multiracial communities near the city's courthouse and built a linear park stretching from Lexington Street and Centre Street (Pietila, 2012). Preston's intention was to destroy communities and accentuate racial segregation within the city. These are a few of the many examples in which the rich and powerful used parks to materialize their own interests while displacing and excluding people and communities.

However, racial and ethnic minorities, immigrants, and the working class are not simply victims of historical discrimination but active users and contributors of parks in the US. They have not only provided critical financial and political support for the creation of new parks but have also actively sought parks to escape from social controls and strengthen their ethnic bonding (Fisher, 2020; McCammack, 2017). For instance, Central Park initially prohibited baseball because it was deemed a working-class sport, yet the park later added multiple baseball fields because the working class and immigrant New Yorkers repeatedly challenged the rules and claimed legitimacy within the park (Rosenzweig & Blackmar, 1992). Additionally, people of color have a long and rich history of ecological and environmental stewardship and management in support of their communities through public and private green spaces (Finney, 2014; Francis, 2009; Lee, 2023; Lloréns, 2021; Reese & Johnson, 2022; Roane, 2018).

Historic examples raise questions as to why previous park quality measures ignore how the experiences of marginalized communities are communicated within and beyond the park. Studies have found that people of color perceive certain parks or park areas as "White Space" and express little interest in visiting them despite close proximity and good quality (Harris, Rigolon, et al., 2020; Harris, Schmalz, et al., 2020; Lee & Scott, 2016). Additionally, how people are perceived in public spaces is often racialized and classed, with Black parkgoers and other visitors of color disproportionately experiencing negative forms of policing or surveillance from White users of the space (Hoover & Lim, 2021). Although the aforementioned examples are limited to parks in the United States, researchers have demonstrated that racism, power imbalance, and oppression toward powerless groups in the context of urban green and leisure spaces are global phenomena (Mowatt, 2022).

Thus, if we were to measure park quality across different contexts from a social justice standpoint, it is essential to account for the extent to which parks amplify the voices of marginalized communities and recognize their significant contribution to park development. Practically, park researchers can accomplish this goal by consulting local historians or historical societies who are knowledgeable about the park's past. Historians have collaborated with park agencies in many cases and have provided recommendations for proper interpretations of uncomfortable and controversial histories (see Baumann et al., 2011). Moreover, although existing park quality instruments are dominated by quantitative ratings and scales, an evaluation of the extent and ways in which parks communicate the histories of marginalized communities could be conducted using qualitative methods so that historians can capture the nuance and complexity of the histories.

2.2. Overemphasis on physical activities and public health

Another distinctive limitation of existing park quality instruments is that, as noted by several researchers, most define and evaluate quality primarily from a public health standpoint, focusing on the extent to which a park promotes physical activity (Chen et al., 2020a,b; Pearsall and Eller, 2020; Pearsall et al., 2020; Rigolon & Németh, 2018b) and, to some degree, quality of life or well-being (Jerome et al., 2019). For instance, in their systematic review of existing park quality protocols, Chen et al. (2020a,b) found that most instruments evaluating park quality give more weight to a park's contribution to visitors' physical activities. Similarly, Jerome et al. (2019) found that enhancing health and well-being was one of three main principles for understanding high-quality green infrastructure, while the other two principles were sustainable water management and nature conservation.

This emphasis on physical activity is unsurprising given that regular

physical activity can be an effective preventative strategy against chronic diseases, such as lower respiratory disease, cardiovascular disease, obesity, cancer, diabetes, and stroke (Anderson & Durstine, 2019). Indeed, Pearsall et al.'s (2020), Pearsall and Eller (2020) review noted a longstanding interest in evaluating parks and built environments for physical activity and public health outcomes. Accordingly, researchers who developed the above park quality protocols were predominantly from public health and medical sciences, although more recently developed instruments incorporated indicators that are rather tangential to promoting physical activity or public health; for example, the QUality INdex of Parks for Youth (QUINPY) developed by Rigolon and Németh (2018b) accounts for tree canopy, and ParkScore developed by the Trust for Public Land (2024) incorporates public and nonprofit investments and volunteer support.

The emphasis on physical activity (or other health measures) alone might be an inadequate assessment of park quality since parks have historically been built for different purposes and vary considerably by size, location, design, amenities, and amount and type of vegetation. For example, the first generations of American public parks still popular today were created with little to no intention of promoting physical activity (Cranz, 1982; Cranz & Boland, 2004). Pioneers of park designers in America, such as Andrew Jackson Downing, Fredrick Law Olmsted, and Calvert Vaux, defined parks as artistic expressions of the cultural and social advancement of the city and nation (Taylor, 1999). Their main goal was to create pastoral spaces to foster a contemplative atmosphere by making a clear separation from urban environments; as such, they discouraged or even prohibited vigorous physical activities and sports in their parks (Rosenzweig & Blackmar, 1992; Thompson, 1998). In contrast, later generations of public parks were built with the clear intention of promoting play, recreation, and sport among youth and adults (Cranz, 1982). The most recent generation of American parks tend to focus more on addressing urban ecological problems through native plants, ecological restoration, and sustainable construction and maintenance practices (Cranz & Boland, 2004).

The diversity of parks and the goals for their creation indicate that a myopic focus on physical activity promotion in the evaluation of park quality is impractical or problematic, suggesting that a more appropriate approach is to assess why the park was created and how it serves the needs and interests of diverse community members (see Alwah et al., 2021; Francis, 2003). In other words, alternative park quality instruments could incorporate new indicators gauging the extent to which parks fulfill their intended purposes and the needs of the local community. Those intended purposes can be found in park bills, the legislative documents articulating the creation or designation of public parks. These documents should be accessible via online and offline government archives and public libraries. Working with local historians and historical societies is another way to understand the purpose of parks. Whether parks accomplish their intended purposes can be recognized as an important benchmark of park quality.

2.3. Lack of attention to ecological function and biodiversity

Existing park quality instruments were created from predominantly human-centered perspectives and give little to no consideration to parks' *ecological* function and *biodiversity* (Pearsall et al., 2020; Pearsall and Eller, 2020). Although some instruments such as the Structural Diversity Approach (Voigt et al., 2014), the Neighborhood Green Space Tool (Gidlow et al., 2012), and QUINPY (Rigolon & Németh, 2018b) assess the existence of natural or biotic features, such as trees, hedges, shrubs, flowerbeds, lakes, and canals, they do so from the proposition that those features influence human activities. Such examples demonstrate how existing instruments focus on the ways in which humans benefit from parks, showing relatively limited attention to parks' contributions to ecosystem services and biodiversity.

The lack of consideration of ecosystem services and biodiversity appears to be a clear disconnection between park quality instruments and existing empirical findings. Parks are a complex array of green infrastructures that provide *both* ecological and societal benefits (Bolund & Hunhammar, 1999; Johnson et al., 2019; Konijnendijk et al., 2013; Vogt et al., 2015). For example, parks provide many health benefits (Alcock et al., 2014; Hartig et al., 2014; Reuben et al., 2020; Twohig-Bennett & Jones, 2018), yet they also provide many ecological benefits such as habitat for birds and other wildlife (Jokimäki, 1999; La Sorte et al., 2020; Nielsen et al., 2014), as well as ecosystem service benefits including alleviating air pollution and noise (Cohen et al., 2014), counteracting the urban heat island (Cao et al., 2010), and reducing stormwater runoff (Konijnendijk et al., 2013). Furthermore, researchers have found that park biodiversity was positively associated with visitors' physical and mental health (Marselle et al., 2021; Rantakokko et al., 2018; Skevington et al., 2019), suggesting that the ecological and societal benefits of parks are inseparable (Bolund & Hunhammar, 1999). Overall, the identified gap between park quality instruments and previous research findings on parks' ecosystems and biodiversity benefits appears to be a major limitation. The disconnection is also unfortunate, given the emergence of urban greening initiatives emphasizing the ecological and sustainability benefits of parks (Cranz & Boland, 2004), as well as the fact that biodiversity is a central theme in green space planning across the world's cities (Davies & Lafortezza, 2017; Hoover et al., 2023; O'Neill et al., 2023).

While overlooking parks' ecosystem services or contributions to biodiversity could result in only a partial appraisal of parks, how we measure them is the next critical consideration. A distinctive challenge here is in the fluidity of the concept; similar to the idea of quality, ecosystem services and biodiversity are broad and complex concepts, so their definitions are subject to the interpretations of researchers and local contexts (Fisher et al., 2009; Swingland, 2000). However, scholars have attempted clear conceptualizations and fair assessments of parks' ecological quality and biodiversity (e.g., Soto-Navarro et al., 2021). For ecosystem services, metrics utilizing Landsat data, such as land surface temperature for assessing the ameliorative effect of urban green spaces on heat (Yao et al., 2020) and carbon sequestration of urban forest patches (Landsat combined with field surveys; Guo et al., 2024), represent two important ecosystem services that urban parks provide. Species richness (Nielsen, Van Den Bosch, Maruthaveeran, & Van Den Bosch, 2014), habitat diversity or heterogeneity (San Francisco Estuary Institute, 2019), and native vegetation (Threlfall et al., 2017) have been shown to be important metrics for assessing biodiversity in urban green spaces. Moreover, the presence of birds and butterflies (Blair, 1999; Herrando et al., 2012), canopy cover (Prather et al., 2018), and large trees (Stagoll et al., 2012) are some of the most frequently used surrogates for biodiversity that could be incorporated into park quality instruments.

Furthermore, even though collecting ecological and biodiversity data might be time- and resource-demanding, citizen science and crowdsource web-based platforms such as BioBliz, eBird, and iNaturalist can not only promote the public audience's understanding of parks' ecological function and biodiversity but also enhance their environmental and conservation stewardship (Leong & Kyle, 2014; Nugent, 2018). Accounting parks' contribution to ecosystems and biodiversity in park quality instruments is expected to integrate the social science approach focusing on health and well-being benefits and the ecological approach focusing on ecosystem services and biodiversity. This integration will accomplish fruitful cross-disciplinary fertilization and provide a more holistic assessment of park quality.

2.4. Lack of subjective measurements

Existing park quality instruments give little attention to park visitors' subjective evaluations of park quality (Larson et al., 2022; Wang et al., 2015). For instance, Chen et al. (2020a,b) reported that park visitors' impressions or subjective evaluations were the least frequently used criterion in existing park instruments. However, perceived, or subjective

park quality could be more widely used for at least two reasons. First, empirical findings showed that the subjective evaluation of park quality was an equally, if not more, important determinant of actual or intended park visitation compared to objective measures of park quality (Larson et al., 2022; Wang et al., 2013; Wang et al., 2015). Second, different demographic groups perceive and use the same local park or park system differently, and socially vulnerable or marginalized groups tend to encounter more constraints to park visitations. For instance, women and children reported feeling intimidated in parks with dense vegetation and natural areas (Sonti et al., 2020; Sreetheran & Van Den Bosch, 2014), while other groups regard these features as an attractive component of park and green space design (Kuo et al., 1998). Similarly, studies from various contexts have commonly shown that outdoor recreation activities of people of color tend to be more collectivist in nature and centered on relationships and community building compared to White Americans (Gobster, 2002; Le, 2012; Whiting et al., 2017). Studies conducted in North America showed that safety concerns and the fear of crime were the most frequently cited constraints among women, and this barrier to park visitation tends to worsen with age (Raymore & Scott, 1998; Zanon et al., 2013). Researchers have also found that official instruments for identifying and preserving the historic, cultural, or environmental value of landscapes and architectures tend to reflect the values of professionals and elites rather than local communities (Gillette & Hurley, 2018).

Collectively, the importance of diverse public perspectives on parks underscores that if parks are built to serve their community members, excluding their perspectives in the conception and evaluation of park quality is antithetical to their mission. Additionally, different data collection methods, both qualitative interviews and quantitative surveys, are readily available for assessing park visitors' viewpoints. We recommend actively adopting park users' opinions on park quality in future park quality assessments.

2.5. *Insufficient consideration of multiple parks or a park system*

None of the existing park quality instruments have considered the quality of a single park in the context of a park system or multiple parks. In other words, all instruments focus on evaluating one park in isolation and fall short of assessing how the park serves the city or neighborhood relative to other parks. This singular approach is another distinctive limitation because, given the considerable heterogeneity of parks that we pointed out earlier in this paper, it is not realistic to expect one park to possess all possible criteria of park quality. For instance, suppose a park containing rich vegetation and a water reservoir but it is not equipped with any exercise amenities or playgrounds. Although this particular park could be scored lower and deemed "inferior quality" by the existing park quality instruments due to their emphasis on public health and physical activity, such a judgment might be unreasonable if no other parks in the city provide comparable ecological and ecosystem services. A more holistic assessment of park quality in this case would evaluate the park's value and significance with respect to a collection of multiple parks, which reflects the whole park system within a city or metropolitan area.

Data from the Trust for Public Land (2024), among other sources, enable this kind of evaluation. In particular, ParkScore© data, which have been available since 2012 and focus on the largest 100 US cities, provide an annual index and subindices that measure overall park quality based on accessibility, acreage, and amenities of municipal parks, in addition to public investments in them and their equitable distribution. Meanwhile, ParkServe© data covers over 15,000 US towns and cities, including downloadable data for park polygons, 10-minute walk service areas, priority areas for parks, and details on amenities such as trails and playgrounds. Thus, analyzing particular parks within the broader park system is feasible with existing data for select locations. However, for a fine-scale understanding, combining these datasets with park data from municipalities may be necessary as national data, while comprehensive, often lacks specific information on points of access. Further, local municipalities' information on park characteristics may be limited by a lack of coordination between agencies and local conservancies, which manage publicly accessible but privately owned parklands. Thus, to understand a park's characteristics with reference to the broader spectrum of park services offered within a certain geographical context (e.g., neighborhood, city, and metropolitan area), multiple sources should be considered simultaneously to provide a more comprehensive and nuanced assessment of park quality.

From a practical standpoint, shifting the focus from one park to a park system equates to additional work for park researchers and practitioners, such as redefining the idea of park quality and additional data collection and analysis for multiple parks to better understand the totality of their functions and how they complement each other. Although this might sound labor-intensive and time-consuming, there has been growing research interest in the relationship between the ecological characteristics of different urban green spaces, suggesting the merits of moving beyond the singular approach in park quality measurement (Band et al., 2005; Resler et al., 2023). For instance, the Single Large or Several Small (SLOSS) debate (Diamond, 1975; Le Roux et al., 2015; Valente et al., 2020) provides insights into the importance of a broader analytic scope in urban park provision. The concept of SLOSS describes the tradeoff between protecting larger ecologically intact areas that support more diverse species and several smaller patches that maintain a degree of connectivity and ecological function. While both types of areas can provide benefits, in the case of parks, the latter can serve as an effective alternative to the former when and where larger patches are not possible or practical. For example, creating a large park containing multiple amenities may not be feasible in highly urbanized areas due to high property values, land availability, and population density, yet building multiple parks within walking distance of each other may accomplish a similar goal.

Furthermore, geospatial analyses examining the distributional patterns of different parks and a park's connectivity or network with other parks can shift the research focus from assessing one park to multiple parks. In fact, researchers have examined the distributional patterns of parks in different contexts (Chen et al., 2023; Nesbitt et al., 2019; Yuzhen et al., 2021), and some have already incorporated park quality indictors in their analysis (e.g., Dobbs et al., 2023). The network or connectivity of parks has been an important consideration in park planning since its early stages (Bryant, 2006). Many researchers and practitioners have advocated that connecting multiple parks through greenways and trails can promote residential mobility, species richness, biodiversity, and ecological benefits (Newman et al., 2017). Greenways or linear parks also provide more access per area, owing to their perimeter/area ratio (Maddox, 2016). In sum, examining the distributional pattern of parks or park benefits, as well as the degree of park connectivity, can help us understand one park's quality in the context of the larger park system and community needs.

3. Conclusion

In this paper, we offer a critical review of the previously developed park quality instruments and advocate for a more flexible and context-specific approach. Due to the significant variability of parks, inherent ambiguity and subjectivity in the idea of quality, and inconsistent operationalizations of park quality from previous instruments, we believe scientific inquiry on park quality assessment could shift its focus from creating standardized instruments for universally acceptable measurement to developing an inventory of park quality indicators that researchers and practitioners can selectively choose depending on their park contexts. Moreover, the inventory or list could be accompanied by a guiding framework explaining each indicator's utility for measuring different aspects of parks. Subsequently, park researchers and practitioners can utilize the inventory or list by completing three tasks: (1) understanding the goals of their park evaluation, (2) analyzing the context of the evaluation, such as the number of parks and their

characteristics, and (3) reviewing the inventory of park quality indicators and the guiding framework. This approach is a more flexible and effective method for park quality evaluation.

We also pointed out five limitations of the existing park quality instruments: (1) lack of attention to the histories of marginalized communities, (2) overemphasis on physical activities and public health, (3) lack of attention to ecological function and biodiversity, (4) lack of subjective measurements, and (5) no consideration of multiple parks or a park system. Following these critiques, we believe that future assessments of park quality could utilize new indicators concerning the extent to which the experience of marginalized groups is reflected in parks, parks' ecological and biodiversity benefits, park users' subjective evaluations of park quality, and one park's quality or value in relation to other parks within a specific geographical context. We hope that the current paper provides a new perspective on the ongoing research effort in park quality measurement and contributes to more equitable park assessment and planning.

CRediT authorship contribution statement

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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