Short communication

Association of composite park quality with park use in four diverse cities

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ABSTRACT

Park use has numerous health benefits. However, little research has investigated how the combination of park facilities, amenities, and conditions are related to park visitation. This study examined the association between a novel composite park quality metric and the use of specific parks, including variations by demographics. Data were collected in 128 census block groups across four diverse cities in the USA. Adults (n = 262) used an online, map-based survey to indicate which parks within one half-mile they had used within the past 30 days. All parks (n = 263) were audited using the Community Park Audit Tool, and a composite quality metric was calculated by standardizing and averaging six key components: access, facilities, amenities, aesthetic features, quality concerns, and neighborhood concerns. A total of 2429 participant-park pairs were analyzed. The average park quality score was 40.4/100 (s.d. = 30.2). For the full sample, a greater park quality score was significantly related to park use (OR = 1.02, 95% CI = 1.01–1.03) such that for each one unit increase in a park's quality score, there was a 2% increase in the likelihood of the park being used. There was also a significant interaction by gender, with park quality associated with park use among females (OR = 1.03, 95% CI = 1.02–1.05) but not males (OR = 1.00, 95% CI = 0.99–1.02). Enhancing overall park quality may increase the likelihood of a park being used. Future research can explore the utility of this comprehensive quality metric for predicting other health behaviors and outcomes and how interventions to enhance park quality augment park use and health over time.

1. Introduction

Park use has numerous health benefits. An increasing number of studies demonstrate that park use is influenced by attributes in and around a park, including those that may be modifiable by urban design policy or environmental strategies. For example, the design or safety of the neighborhood surrounding a park may affect a potential user's perceived and real access to the park (Park, 2020). Within a park, the facilities available for active and passive recreation provide spaces and resources for physical activity, relaxation, and socializing (Veitch et al.,

2022). Likewise, the quality and condition of park facilities and amenities can add to or detract from a user's perceptions and experience (Knapp et al., 2019). Moreover, supporting amenities related to comfort and safety may enhance the enjoyment of a park visit and how long someone wishes to remain in the park (Kaczynski and Havitz, 2009). Finally, other research has reported that the distance or proximity to parks or the size of a park may also be important, although findings have been mixed (Cohen et al., 2010; Koohsari et al., 2013).

Despite the growing body of evidence about factors influencing park use, several key limitations remain. First, most research has examined

diverse attributes of parks in relative isolation, such as whether the availability of park facilities is associated with physical activity or if crime is a deterrent to park visitation (Marquet et al., 2019; Sugiyama et al., 2010). In contrast, only a few studies have constructed and analyzed a composite metric related to overall park quality (Giles-Corti et al., 2005; Kaczynski et al., 2016; Mullenbach et al., 2018). Second, many studies have assessed how various park-related factors are associated with a global measure of park use or physical activity (e.g., amount of visitation to any/all parks in the past 30 days) without relating specific exposure variables to the use of specific parks (Kaczynski et al., 2014; Veitch et al., 2021). Third, reporting on how the influence of various park attributes may vary for different demographic groups has been inconsistent. Finally, with some notable exceptions (Cohen et al., 2017; Schipperijn et al., 2017), most such studies have occurred in only a single location or a limited number of parks, thereby limiting their generalizability.

Therefore, given these limitations, the objectives of this study, conducted across four diverse metropolitan areas in the USA, were to: 1) examine the association between a composite park quality metric and the use of specific parks; and 2) assess whether gender, age, and race/ethnicity modified the relationship between composite park quality and use of specific parks.

2. Methods

2.1. Study setting and design

Data for this analysis originated from the ParkIndex study (Kaczynski et al., 2020). Briefly, in four diverse locations in the USA – Raleigh, NC, Brooklyn, NY, Greenville County, SC, and Seattle, WA – 32 census block groups from each city were selected based on variations in park access and household income. As described below, randomly selected adults from the four locations provided data about park use and other variables using an online, map-based survey (Kaczynski et al., 2020). IRB approval was obtained from the University of South Carolina.

2.2. Measures

We created a half-mile buffer around each study block group and then audited all parks in person by trained research assistants using the Community Park Audit Tool (Kaczynski et al., 2012). For each park, we calculated an overall park quality score that included the following elements: i) sum of the presence of 14 unique park facilities (e.g., trail, tennis court), ii) sum of three key park amenities (i.e., restroom, drinking fountain, lighting), iii) sum of six park access amenities (e.g., connecting bike lane, traffic signal), iv) sum of eight park quality concerns (e.g., vandalism, excessive animal waste), v) sum of ten neighborhood quality concerns (e.g., graffiti, excessive noises that are unpleasant or annoying), and vi) sum of seven park aesthetic features (e.g., water feature, artistic feature) (Kaczynski et al., 2016). The full audit items can be found online here: https://ars.els-cdn.com/content/image/1-s2.0-S0749379711009032-mmc1.pdf. As is described more fully elsewhere, we created a standardized sub-score (0–100) for all variables (after reverse-coding the two 'concerns' scores) and then took the mean of all six variables to calculate an overall quality score for each park (0–100) (Kaczynski et al., 2020). We also obtained the park size (in acres) and distance from home for all parks within each participant's half-mile block group buffer.

Within the online survey, participants provided their gender, race/ethnicity, and age. They were also shown a map of their census block group (including half-mile buffer) and all parks therein and told to select any parks they had visited within the last 30 days. They were then prompted to click on any additional parks they had visited until all had been selected. In the current analysis, the main dependent variable was whether a participant indicated using each park within their neighborhood (block group half-mile buffer) in the past 30 days (Kaczynski et al., 2020).

2.3. Analyses

Multi-level logistic regression was used to analyze the association between the park quality score and the respondent reporting using the park. To assess model fit, likelihood-based criteria were calculated (i.e., −2 Res Log Pseudo-Likelihood). Covariates were chosen *a priori*, including park size and distance, participant gender, age, and race/ethnicity. Given that park use van vary by demographic characteristics, we also examined interactions between the park quality score and participant gender, age, and race/ethnicity in predicting park use. For significant interactions, stratified analyses were presented for crude and adjusted models.

3. Results

A total of 262 adults provided complete data about their use of parks, with 12.8% in Brooklyn, NY, 22.8% in Greenville, SC, 26.7% in Raleigh, NC, and 37.8% in Seattle, WA. Table 1 shows characteristics of the sample. Overall, there was a greater proportion of female (58.0%) versus male (42.0%), white (78.6%) versus non-white (21.4%), and 34–55 year old (65.3%) versus less than 34 year old (13.0%) or over 55 year old (21.8%) respondents. The mean park quality score for all parks within one half-mile of respondents was 40.4/100 (s.d. = 30.2).

Table 2 shows the relationships between composite park quality and park use. There were a total of 2429 participant-park pairs (based on participants matched with all parks within the half-mile buffer of their block group), which served as the units of analysis (mean = 14.2 parks/person, s.d. = 7.5). Before adjustment, a greater park quality score was significantly related to the park being used (OR = 1.03, 95% CI = 1.02–1.04). Likewise, after controlling for gender, age, race/ethnicity, and distance to and size of parks, for every one unit increase in park quality, there was a 2% increase in odds of the park being used (OR = 1.02, 95% CI = 1.01–1.03).

There was a significant interaction between park quality and gender (Table 2). Stratified analyses indicated that greater park quality was associated with an increased likelihood of the park being used among females (OR = 1.03, 95% CI = 1.02–1.05) but not males (OR = 1.00, 95% CI = 0.99–1.02). No interactions were observed between park quality and park use based on age or race/ethnicity.

4. Discussion

The present study is one of few to examine the association between a composite park quality metric and park use and to explore the modifying

Table 1
Distribution (n (%)) of sample sociodemographic characteristics (USA, 2017).

Participant Characteristic	N (%)
Total	262 (100)
Location	
Brooklyn	30 (11.5)
Greenville County	47 (17.9)
Raleigh	71 (27.1)
Seattle	114 (43.5)
Gender	
Male	110 (42.0)
Female	152 (58.0)
Age	
<34 years	34 (13.0)
34–55 years	171 (65.3)
>55 years	57 (21.8)
Race/Ethnicity	
Non-White	56 (21.4)
White	206 (78.6)

Table 2
Relationships between composite park quality and park use (N = 262) (USA, 2017).

	Unadjusted		Adjusted[1]	
	OR	95% CI	OR	95% CI
Full Sample	1.03*	1.02 – 1.04	1.02*	1.01 – 1.03
Females	1.03	1.02 – 1.05	1.03*	1.02 – 1.05
Males	1.02	1.00 – 1.03	1.00	0.99 – 1.02

*p <.05.
OR = Odds ratio; CI = Confidence intervals.
[1] Adjusted for gender (male, female), age (<34 years, 34–55 years, 55 + years), race (non-white, white), distance to park, and size of park.

effects of demographic factors. Overall, findings from this study demonstrated that a composite park quality was significantly associated with park use in a geographically diverse community sample in the USA. This is consistent with two previous studies showing that a multi-faceted measure of park quality was related to the overall park visitation (Giles-Corti et al., 2005; Kaczynski et al., 2016). For example, Giles-Corti et al. (2005) developed and tested a composite measure of park attractiveness consisting of 88 items and found it was related to increased park-based physical activity in Australia. Similar to other built environment attributes (Koohsari et al., 2020), park attributes (e.g., features and conditions) also co-exist and interact with each other in the actual environment. Consequently, it is essential to explore their effects on park users in combination with each other. Our study provided unique information on the usefulness of a composite park quality metric across several geographically diverse locations. Future research can examine its utility in other settings for predicting park use and other health behaviors and outcomes. From a practical standpoint, this study suggests that improvements to park quality may have a substantial impact on park use among proximal residents. For each one unit increase in a park's quality score, there was a 2% increase in the likelihood of the park being used in the past month. Such quality improvements may be achievable via the addition of facilities (e.g., tennis court) or supporting amenities (e.g., drinking fountain), aesthetic upgrades (e.g., landscaping, water features), or by rectifying quality concerns (e.g., graffiti, litter) within the park or surrounding neighborhood. Such investments may pay substantial dividends in facilitating the monthly (or more frequent) visitation of residents to nearby parks.

Our results also showed that the relationship between park quality and park use differed among male and female respondents. These findings align with a body of research showing that the same built environment attribute may differentially influence health behaviors and outcomes depending on gender (Valson and Kutty, 2018). Specifically, we found that only females demonstrated a significant relationship between composite park quality and park use in our sample. A gender disparity has been documented in park use, with women less likely to engage in park-based physical activity than men (Cohen et al., 2021; Derose et al., 2018). For instance, a study conducted in high-poverty neighborhoods in Los Angeles found that women were less likely to visit parks and engage in park-based physical activity than men (Derose et al., 2018). Our study provides evidence that women might benefit most from improved park quality in their neighborhoods, potentially from improvements to perceived or real safety or the availability of supportive features and amenities. These findings and follow-up research can provide important insights into park interventions that may mitigate the observed gender disparity in park use and park-based physical activity.

This study had several limitations and strengths. Our sample size was relatively small and was limited in scope geographically and racially/ethnically; future research should explore the association between park quality and use in more diverse locations and samples. Participants' use of parks was also based on self-report, and it is possible they may have visited parks beyond the half-mile buffer of their block group. However, key study strengths included a comprehensive park quality measure collected via an established tool, integration of a map-based survey platform to capture visitation to specific parks, multi-level data collection about both park and individual characteristics, and this being one of the first studies to compare park quality with reported use of those parks directly.

5. Conclusion

Parks are key urban design destinations within neighborhoods that can support residents' health and well-being, especially as communities continue to struggle with issues related to obesity and COVID-19. Using a map-based platform, this study contributes to the growing evidence base about how park quality affects park use. This is one of the few studies that tested a composite park quality metric in relation to park use, and greater park quality was found to be associated with an increased likelihood of use, especially among women. These findings suggest that enhancing park quality may be beneficial for women's park use and help in mitigating the gender disparity in park-based physical activity. Future research can explore which elements of this comprehensive quality metric are most associated with use among specific groups and how interventions to enhance park quality augment park use over time.

CRediT authorship contribution statement

Andrew T. Kaczynski: Conceptualization, Methodology, Investigation, Writing – original draft. **Marilyn Wende:** Methodology, Investigation, Writing – original draft. **Morgan Hughey:** Methodology, Investigation, Writing – review & editing. **Ellen Stowe:** Methodology, Investigation, Writing – review & editing. **Jasper Schipperijn:** Methodology, Investigation, Writing – review & editing. **Aaron Hipp:** Methodology, Investigation, Writing – review & editing. **Mohammad Javad Koohsari:** Writing – original draft.

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

The authors do not have permission to share data.

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