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Antecedents and consequences of park crowding: linking park attractiveness, perceived crowding, and revisit intention

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Abstract

Urban parks stand as vital recreational refuges for urban inhabitants. In the face of the growing phenomenon of park crowding, a marked knowledge gap persists regarding its causes and subsequent implications. To address this, our current study puts forth a conceptual model that aims to decipher the complex interplay between park attractiveness, visitors' perceived crowding, and their revisit intentions. We further probe the potential moderating roles of park accessibility and visitor satisfaction in shaping the link between perceived crowding and revisit intentions. Our findings suggest that the attractiveness of a park positively influences perceived crowding. Parks with greater allure tend to attract larger crowds, inadvertently intensifying feelings of congestion. More critically, these perceived congestions distinctly diminish the inclination to revisit and also vicariously affect this intention through the mediating lens of satisfaction levels. Remarkably, enhanced park accessibility exacerbates the detrimental link between perceived crowding and revisit intentions. The insights derived from this investigation shed light on strategies to redress challenges posed by park crowding and mollify its untoward ramifications.

Key Words: park crowing, perceived crowding, park attractiveness, revisit intention, satisfaction

Introduction

The swift pace of urbanization, coupled with burgeoning population growth, has imparted significant stress upon cities, amplifying strains on urban lifestyles and infrastructures (Johansson et al., 2012; Lin et al., 2023b; Parsons et al., 2018). Consequent health, safety, and destination loyalty concerns linked to crowding have been extensively documented in recent literature (Ruiz et al., 2021; Sharma et al., 2023; Wang and Liu, 2022).

Urban parks, positioned as critical recreational sanctuaries, bolster human well-being by proffering health, aesthetics, and leisure advantages (Dickinson and Hobbs, 2017; Grilli et al., 2020). However, the dual pressures of surging urban inhabitants and the heightened significance of green spaces—accentuated during events like the COVID-19 pandemic—have intensified crowding concerns (Geneletti et al., 2022; Sever et al., 2018). For instance, empirical findings from Oslo underscored a substantial 291% surge in local outdoor engagements during pandemic-induced lockdowns (Venter et al., 2020). Elevated park congestion often engenders adverse emotional reactions such as irritation and stress (Xiao et al., 2023), impairing the quality of the visitor experience (Sever et al., 2018), and potentially dissuading visits (Rivera et al., 2022). Despite its ramifications, there remains a profound knowledge gap regarding the determinants and broader impacts of park crowding.

The push-pull theory serves as a cornerstone for understanding tourist behavior (Dann, 1981). This theory delineates the motivations behind tourists' decisions, segregating them into "push"

and "pull" factors. Among these, the "pull" factors, such as the allure of the destination's natural environment and recreational amenities, are particularly pertinent to our discussion on parks (Jafari and Xiao, 2015). One could theorize that a park's amplified allure might beckon a higher influx of visitors, inadvertently fueling crowding.

Moreover, parks predominantly host repeat visitors (Zhan et al., 2021), whose sustained engagement proves vital for park longevity. These recurrent sojourns also fortify visitors' mental health (Lin et al., 2023a). Nevertheless, the deterrent potential of park crowding—especially its capacity to discourage revisit intentions—merits deeper academic scrutiny.

Navigating these academic gaps, our study pursues three central queries, harnessing data from ten urban parks in Hangzhou, China: (1) it elucidates the nexus between park attractiveness and perceived crowding; (2) it assesses how perceived crowding steers revisit intentions; and (3) it delves into potential moderating factors, with an emphasis on satisfaction and park accessibility. Through this investigation, we aim to offer actionable insights to park stewards, advocating for sustainable park practices that amplify visitor contentment. Simultaneously, this research aspires to harmonize the interplay between park attractiveness and visitor experiences.

1. Literature review and hypotheses

1.1 Perceived crowding and parks attractiveness

Environmental psychologists have put forth multiple theories to elucidate perceived crowding

(Altman, 1975; Knowles, 1978). For instance, stimulus overload theory posits that crowding arises when environmental stimuli exceed an individual's carrying capacity (Desor, 1972). Contemporary research adds that crowding is a subjective evaluation that accounts for environmental impact, loss of privacy, behavioral restrictions, and threats to personal autonomy (Ruiz et al., 2021). Such feelings typically signify negative evaluations (Vaske and Shelby, 2008).

Factors influencing perceptions of crowding are manifold. They encompass individual differences, spatial-temporal considerations, and crowd environment dynamics (Yin et al., 2020). For instance, an uptick in visitor numbers can escalate crowding perceptions (Machleit et al., 1994). Investigating reasons for clustered park visits can elucidate crowding's underlying causes.

The push-pull theory, rooted in migration studies (Ravenstein, 1885), remains pivotal in tourism and outdoor leisure research. It is the classic theory for studying visitors' behavior and decision-making. Here, "push" denotes visiting motivations while "pull" signifies destination appeal (Jafari and Xiao, 2015). Therefore, based on this theory, what makes crowds flock to a park is likely to be the fact that the park is highly attractive. Numerous studies have quantified park attractiveness using park attributes, such as amenities, natural elements, and adjacent commercial facilities (Gu et al., 2020; Zhang et al., 2023; Zhang et al., 2021). Based on these insights, the following hypothesis is proposed:

H1：There is a positive relationship between park attractiveness and perceived crowding.

1.2 Perceived crowding and revisit intention

Crowding undeniably spawns negative consequences. It curtails individual freedom, fosters feelings of confinement, and potentially incites confrontational attitudes (Veitch and Arkkelin, 1995). Such environments can exacerbate anxiety, reduce pleasure, and instigate tourist' aversion (Cheng et al., 2021; Jacobsen et al., 2019). Post-visit, tourists become more attuned to park crowding and its subsequent effects on their revisit intentions. Several studies underscore tourists' preference for less crowded locales (Jurado et al., 2013; Marušić et al., 2008).

H2：Perceived crowding inversely affects the intention to revisit.

1.3 Mediating Effect of Satisfaction

Satisfaction, which indicates a person's cognitive and affective evaluation of the environment, has been identified as a potent predictor of visitor behavioral intentions (López-Mosquera and Sánchez, 2014). Yet, crowding's adverse effects can dampen tourists' overall satisfaction (Li et al., 2017; Yin et al., 2024). Given the established positive link between satisfaction and revisit intention (Milman et al., 2020), the following hypotheses are posited:

H3: Perceived crowding negatively impacts satisfaction.

H4: Satisfaction positively influences revisit intention.

H5: Satisfaction mediates the relationship between perceived crowding and revisit intention.

1.4 Moderating role of accessibility

Park accessibility is a key variable in explaining urban park usage (Byrne and Wolch, 2009). Initially, accessibility was defined as the potential for interaction opportunities (Hansen, 1959) and the difficulty or cost of traveling from one location to another (Morris et al., 1979). With technological advancements and increased data availability, more methods for reachability analysis have emerged, such as the gravity model, space syntax tools, and ESRI walk-time and kernel density two-step floating catchment area (Zhou et al., 2022). However, their complexity often poses challenges for practical application (Siddiq and D. Taylor, 2021). Consequently, some scholars advocate for simpler methods to measure accessibility, for ease of interpretation and application (Bertolini et al., 2005). These methods include assessing the distance from the city center, evaluating public transportation facilities around the park, and considering the distance from homes to the park(Zhang and Li, 2023).

Among these factors, the density of bus stops has been found to positively affect urban park use (Li et al., 2020). Proximity to the city center typically results in higher park visitation rates (Zhang and Zhou, 2018). The distance of a residence from the park has been negatively associated with park visits (Zhan et al., 2021). Such findings hint at a potential linkage between park accessibility and park visitation, which might amplify the negative repercussions of park crowding. Given this understanding, the following hypothesis is proposed:

H6: Accessibility amplifies the relationship between perceived crowding and revisit intention.

1.5 Conceptual model

This study crafts a conceptual model, depicted in Figure 1, encapsulating the relationships between park attractiveness, perceived crowding, and revisit intention. Furthermore, it delves into the intricate mechanics underpinning the effect of perceived crowding on revisit intention, spotlighting the roles of satisfaction and accessibility.

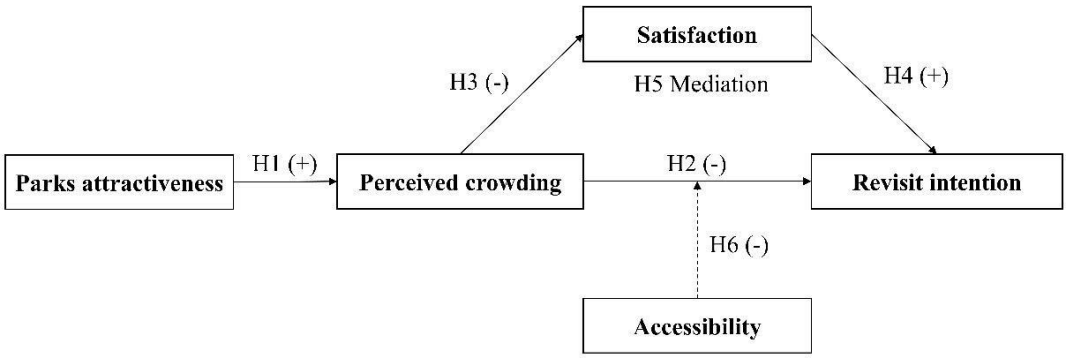

Figure 1. The conceptual model of six hypotheses. Here, "+" indicates a positive effect, "-" indicates a negative effect.

2. Methods and data

2.1 Study sites

Urban parks in Hangzhou served as the study area. Hangzhou, a prominent city in eastern China, is central to the Yangtze River Delta and was the host city for the 2023 Asian Games. Famous for its rich history and cultural heritage, it is often referred to as "Paradise on Earth". As of 2022, the city boasted a population of 12.376 million and a GDP of 187.53 billion RMB.

Selecting approximately 10 parks for conducting field surveys to study visitor behavior and psychology has been deemed feasible (Lin and Feng, 2023; Mak and Jim, 2019; Wang et al., 2022). Accordingly, ten urban parks situated in central Hangzhou were selected (Figure 2). The chosen parks fulfilled the following criteria: (1) No entry fee, open to all visitors. (2) Strategically located with a sufficient number of visitors, allowing for potential crowding. (3) Absence of major construction or renovation during the study period. (4) Representation of various geographic locations. (5) Distinct unique features for each park, as detailed in Table 1.

(6) Most of the 10 parks have been used in other park studies and are a classic sample of Hangzhou park studies (Yang, 2021; Zhan et al., 2021; Zhang, 2021).

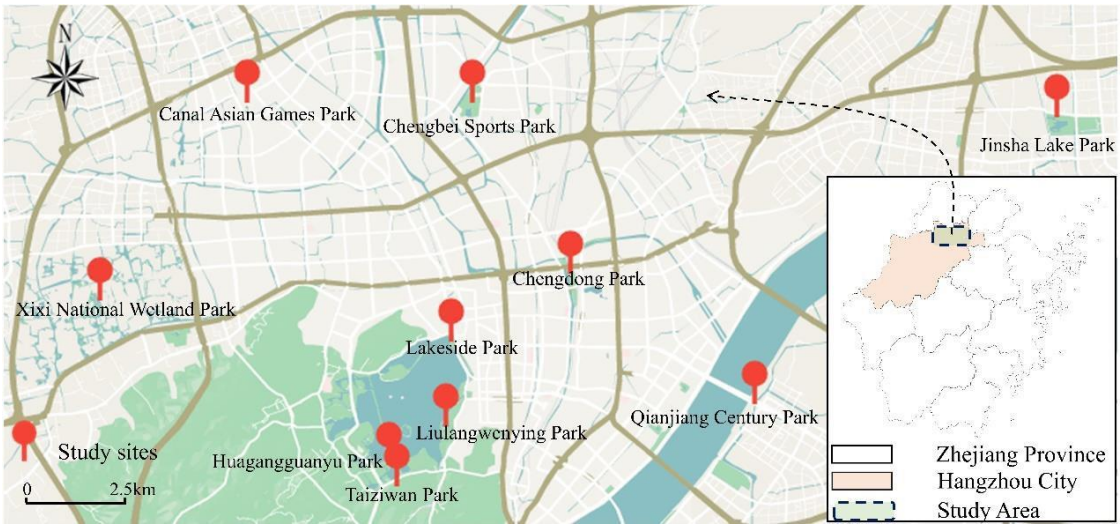

Figure 2. Location of study sites in Hangzhou. Table

1. Brief description of each research park.

Urban Park	**Area （km2）**	**Percentage of water area**	**Administrative district**	**Description**
Fish Viewing at the Flower Pond	0.26	21.57%	Xihu	Situated within the West Lake Scenic Spot, this park, with the large number of red carp, lush and layered plant landscapes, and a spatial layout representative of classical Chinese-style gardens, stands as a major attraction.
Taiziwan Park	0.21	9.75%	Xihu	Positioned in the southwest corner of the West Lake Scenic Area, the park features paths, waterways, expansive lawns, and service buildings. Abundant Japanese Tokyo cherry blossoms and tulips make it a renowned venue for weddings and tulip exhibitions.
Orioles Singing in the Willows	0.18	7.18%	Shangcheng	Nestled in the West Lake Scenic Spot, this locale, once the imperial garden during the Southern Song Dynasty. Rich in trees, it offers spaces for

				cultural and recreational activities, attracting citizens and tourists seeking respite under its shaded areas.
Qianjiang Century Park	0.52	12.13%	Xiaoshan	Situated on the south bank of the Qiantang River, adjacent to the Hangzhou Olympic Sports Center, this park features expansive lawns, greenways, and specialized areas for dining and business.
Lakeside Park	0.11	5.32%	Shangcheng	Located in the West Lake Scenic and Historic Spot, arranged along the West Lake, the park is surrounded by commercial districts, fountains, and boat piers, drawing a large influx of visitors.
Chengdong Park	0.07	5.29%	Gongshu	Surrounded by residential areas, this park boasts various sports fields, pavilions, plazas, and spaces under viaducts, creating ample areas for activities. Shady greenery provides a natural habitat for diverse bird and insect species.
Jinsha Lake Park	0.64	46.42%	Qiantang	Home to Hangzhou's largest artificial lake, bordered by palm trees and a sandy beach, this park offers forest paths suitable for fitness, walking, and weddings.
Chengbei Sports Park	0.43	10.26%	Gongshu	A sports-themed park featuring indoor and outdoor fields, including basketball courts, soccer fields, and tennis courts, complemented by abundant greenery.

Canal Asian Games Park	0.52	10.49%	Gongshu	As the first comprehensive urban sports park in Zhejiang Province, integrating a gymnasium, park, sports fields, and commercial facilities, this park serves as a competition venue for the 19th Asian Games.
Xixi National Wetland Park	11.13	14.40%	Xihu	Rich in ecological resources, with numerous rivers, ponds, lakes, and marshes, the park features architectural sites and various tourist facilities, including markets, boutique hotels, and restaurants.

2.2 Data collection on perceived crowding, revisit intention and satisfaction

Between May and June 2023, a questionnaire survey was administered in the selected parks, mainly targeting weekends and holidays when park visits peaked. The surveyors, consisting of trained undergraduate and graduate students collected the questionnaires through face-to-face interviews. Respondents were randomly selected at various strategic locations within the parks, such as entrances, along major routes, significant landscape nodes, and popular rest areas (Kelfve et al., 2020; Mak and Jim, 2019). The surveys were carried out from 8:00 am to 9:00 pm. From the 773 collected questionnaires, those with excessively similar responses were excluded, resulting in 551 valid questionnaires. Among the parks surveyed, Chengdong Park had the highest questionnaire response rate at 92.50%, while Jinsha Lake Park had the lowest at 59.21%.

Perceived crowding was gauged using four items adapted from prior research (Pradhan et al., 2023; Ruiz et al., 2021): (1) PC1:This park seems very crowded to me； (2) PC2: it's too busy or I have to wait in line to do activities; (3) PC3:it interferes with my ability to do what's expected of me because of the crowding; (4) PC4:it seems stuffy to me because it's too crowded. Revisit intention was measured using three items (Meng and Han, 2018; Pradhan et al., 2023): (1) RI1:I have a strong desire to revisit this place next time; (2) RI2:I will revisit this place in the near future; (3) RI3:I'll make this my first choice for my next visit to the park. Satisfaction was assessed with two items (Ruiz et al., 2021; Shaykh-Baygloo, 2021): (1) SA1: I was very satisfied with the park experience overall; (2) SA2: The park experience met or exceeded my pre-trip expectations. Responses for all items utilized a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

2.3 Assessing parks attractiveness

Park attractiveness indices were derived from a previous study(Zhang et al., 2023). As detailed in Table 2, the metrics for evaluating park attractiveness comprised the natural environment (Zhang et al., 2021), artificial elements (Guo et al., 2019; Zhang et al., 2022), and reputation (Wolch et al., 2014). Park reputation, in particular, is acknowledged for reflecting the quality of a park's usage, maintenance, and design (Han et al., 2021; Li et al., 2021; Rigolon, 2017; Wolch et al., 2014) and is a well-recognized factor influencing park visitation(Guo et al., 2019; Li et al., 2021; Rigolon, 2017; Stessens et al., 2020; Yuzhen et al., 2021). It is noteworthy that while satisfaction in questionnaires measures the experience of tourists in potentially crowded settings. In contrast,

satisfaction within the attractiveness indices was used in this study as part of the park attributes and pertains to overall park contentment, including a variety of scenarios.

Data for these metrics were acquired from Baidu Maps, AMAP (or Gaode Map) in 2023, and Sentinel-2 imagery in 2022. Sentinel-2 imagery marks a departure from the conventional use of Landsat 8 satellite imagery, which typically offers 30-meter spatial resolution for calculating the Normalized Difference Vegetation Index (NDVI) or the Normalized Difference Water Index (NDWI) in park areas (Li et al., 2023; Wang et al., 2022; Zhang et al., 2023). The Sentinel-2 imagery used in our study, offers a finer 10-meter spatial resolution. The weights for each indicator were computed using the Analytic Hierarchy Process (AHP) and the Delphi method, as established in previous research (Zhang et al., 2023).

Table 2. Park attractiveness evaluation indicators.

Category	Indicator	Description	Data sources	Temporal reference	Weights
Natural environment	Vegetation configuration	The NDVI of the park	Sentinel-2（Google Earth Engine）	Mean for 2022	0.2195
	Water coverage	The ratio of water area and park area	Baidu Maps（https://lbsyun.baidu.com/）	Jun.2023	0.0521
	Water quality	The NDWI of the park	Sentinel-2（Google Earth Engine）	Mean for 2022	0.0617
Artificial elements	Facilities in the parks	The number of POIs in the park	AMAP (https://lbs.amap.com/)	Jan.2023	0.2123
	Commercial facilities and office buildings surrounding	The number of commercial and office POIs around the park	AMAP (https://lbs.amap.com/)	Jan.2023	0.0349
	Trail density	The ratio of trail length and park area	Baidu Maps（https://lbsyun.baidu.com/）	Jun.2023	0.0861
Reputation	Rating scores	The score from historical visitors provided by AMAP	AMAP mobile application	Aug.2023	0.0667
	Popularity	Travel Popularity index, the numbers of historical comments and favorites provided by AMAP	AMAP mobile application	Aug.2023	0.0667
	Satisfaction	The experience satisfaction index provided by AMAP	AMAP mobile application	Aug.2023	0.2

2.4 Measuring accessibility

Park accessibility was determined by counting Points of Interest (POIs) related to bus and subway stations within a 500-meter buffer surrounding each park. This buffer range was chosen based on the influence radius (183 m to 610 m) of urban parks cited in prior research (Crompton, 2001, 2005; Lin et al., 2013). POI data were sourced from AMAP.

2.5 Statistical analysis

Initially, the reliability and validity of the questionnaire items were evaluated. Cronbach's alpha coefficient gauged the internal consistency of the questionnaire, while convergent and discriminant validity tests assessed data validity. Potential multicollinearity issues were scrutinized for all variables.

To validate the structural relationships between park attractiveness, perceived crowding, satisfaction, and revisit intention, we applied Structural Equation Modeling (SEM). SEM, a robust statistical technique, measures and analyzes relationships between observed and latent variables. Unlike simpler methods such as path analysis, SEM evaluates both direct and indirect variable relationships and considers measurement error (Beran and Violato, 2010). SEM's suitability for this study is also supported by its application in other crowding phenomenon research (Jacobsen et al., 2019; Pradhan et al., 2023; Yin et al., 2020). Both moderating and mediating effects were tested. All computations were executed on the SPSSAU (https://www.spssau.com) online data processing platform.

3. Results

3.1 Respondents’ profiles

The distribution of the 551 respondents' profiles were illustrated in Figure 3, as shown that 45% were male, and 55% were female. The age group with the highest representation was between 18 and 25, accounting for 39%. Additionally, 60% of respondents held a Bachelor's Degree or had undergone Junior college. A significant 58% earned a monthly income of less than 6000RMB.

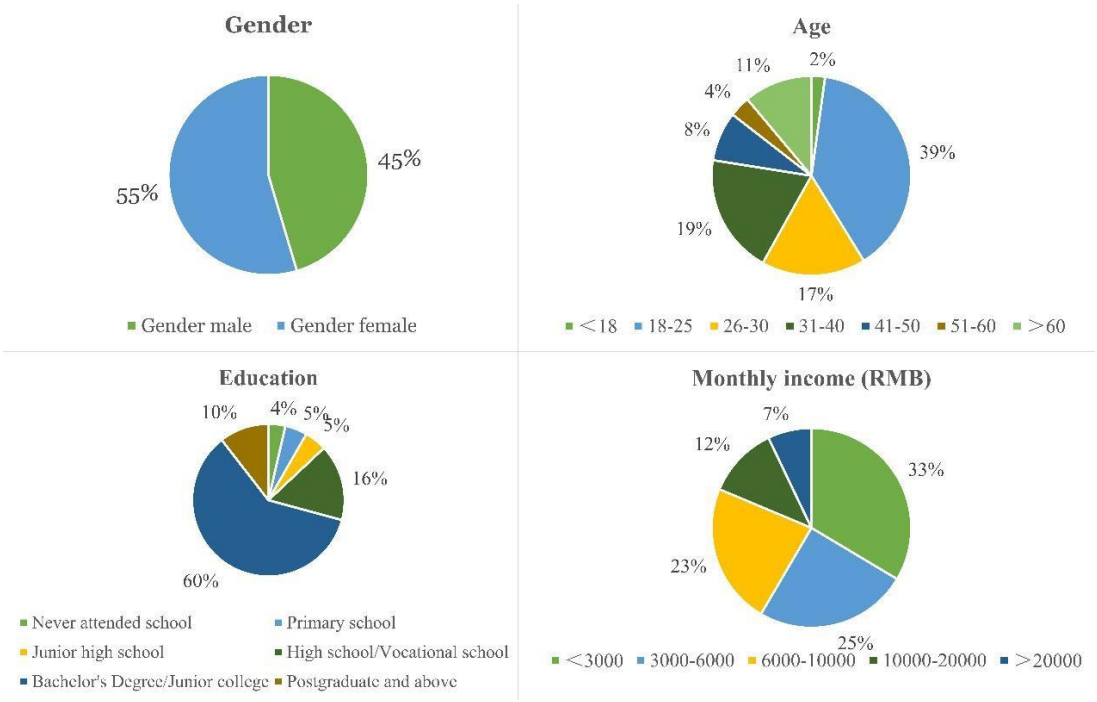

Figure 3. Respondents' demographic characteristics.

3.2 Data quality assessment

The reliability and validity of the questionnaire data are presented in Table 3. All items exhibit Loading and α values exceeding 0.7. Average variance extracted (AVE) values surpass 0.5, and Composite reliability (CR) values are beyond 0.7, demonstrating robust reliability and composite reliability of the data (Bacon et al., 1995; Lam, 2012; Nunally and Bernstein, 1978). The discriminant validity is confirmed through the Fornell-Larcker criterion, where the square root of each AVE is greater than its correlation with any other latent variable (Fornell and Larcker, 1981). However, an issue of multicollinearity was identified with PC1 and PC2. Consequently, these components were removed from the analysis. Subsequently, the Variance Inflation Factor (VIF) of all remaining variables was found to be below 3.3, indicating the absence of multicollinearity concerns (Armutcu et al., 2023; Khan, 2019; Kock and Lynn, 2012).

Table 3. Results of reliability and validity analysis.

Constructs	**Indicators**	**Loading**	**α**	**CR**	**AVE**	$\sqrt{AVE}$
Perceived crowding	PC1	0.892	0.92	0.921	0.746	0.864
	PC2	0.885				
	PC3	0.869				
	PC4	0.806				
Revisit intention	RI1	0.855	0.881	0.886	0.722	0.85
	RI2	0.827				
	RI3	0.867				
Satisfaction	SA1	0.804	0.761	0.769	0.625	0.791
	SA2	0.777				

3.3 SEM analysis outcomes

Table 4 presents the path model's goodness-of-fit metrics, which align with the established standards (Hair, 2009; Jiang and Yan, 2022), indicating an acceptable fit for the model. Table 5 and Figure 4 detail the path analysis findings: park attractiveness positively influences perceived crowding (0.302, $P < 0.001$). Perceived crowding negatively impacts both revisit intention (-0.096, $P < 0.001$) and satisfaction (-0.540, $P < 0.001$). In contrast, satisfaction positively correlates with revisit intention (0.839, $P < 0.001$). Thus, hypotheses H1 to H4 received support.

Table 4. The goodness-of-fit for the model.

Fit index	X2/df	RMSEA	RMR	CFI	NFI	IFI
Threshold	<3	<0.08	<0.08	>0.9	>0.9	>0.9
Value	2.642	0.055	0.014	0.989	0.982	0.989

Table 5. Standardized effect sizes (β), together with standard errors (SE), and *P* -values (*P*) for the structural equation model depicted.

H	**Path**	**β**	**SE**	***P***	**Results**
H1	Parks attractiveness → Perceived crowding	0.302	0.004	***	Supported
H2	Perceived crowding → Revisit intentions	-0.096	0.03	*	Supported
H3	Perceived crowding → Satisfaction	-0.540	0.03	***	Supported
H4	Satisfaction → Revisit intentions	0.839	0.07	***	Supported

Note: * $P < 0.05$, *** $P < 0.001$.

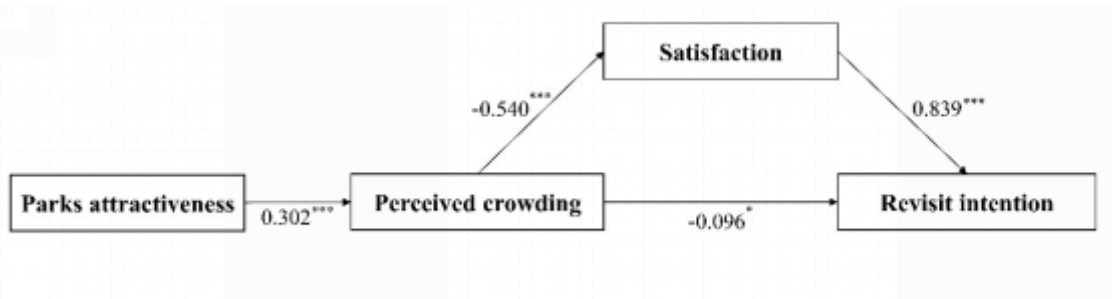

Figure 4. Standardized coefficients of the structural equation model.

3.4 Mediating role of satisfaction

Employing a bootstrap methodology (2000 iterations with a 95% confidence interval), the study assessed satisfaction's mediating effect, as recommended by previous research (Preacher and Hayes, 2004). Table 6 provides these results. The confidence intervals for the indirect (-0.382 to - 0.263), direct (-0.165 to -0.078), and total effects (-0.432 to 0.318) all exclude 0, with $P < 0.001$.

This implies that satisfaction partially mediates between perceived crowding and revisit intention. The effect of perceived crowding on revisit intention is direct and, to some extent, channeled through satisfaction, validating hypothesis H5.

Table 6. Results of Media :ing Effect.

H	Point Estimate	β	95% CI		T	P	Results
			Lower	Upper			
H5	Indirect effect	-0.253	-0.382	-0.263	-8.446	***	Supported
	Direct effect	-0.122	-0.165	-0.078	-5.503	***	
	Total effect	-0.375	-0.432	-0.318	-12.869	***	

Note: ***$P < 0.001$.

3.5 Moderating impact of accessibility

Accessibility, represented by the number of bus and subway POIs within a 500-meter buffer zone around the park, was examined as a potential moderator between perceived crowding and revisit intention. Table 7 displays these findings. The data suggests that accessibility amplifies the negative association between perceived crowding and revisit intention (-0.003, $P < 0.01$). A subsequent simple slope analysis, visualized in Figure 5, confirms that heightened accessibility intensifies the adverse effect of perceived crowding on revisit intentions, thereby supporting hypothesis H6.

Table 7. Results of moderating effects

H	Path	β	T	*P*	Results
H6	Perceived crowding → Revisit intentions	-0.369	-12.976	***	Supported
	Accessibility → Revisit intentions	-0.006	-4.565	***	
	Interaction effect (Perceived crowding × Accessibility) → Revisit intentions	-0.003	-2.732	**	

Note: $^{**}P < 0.01$, $^{***}P < 0.001$.

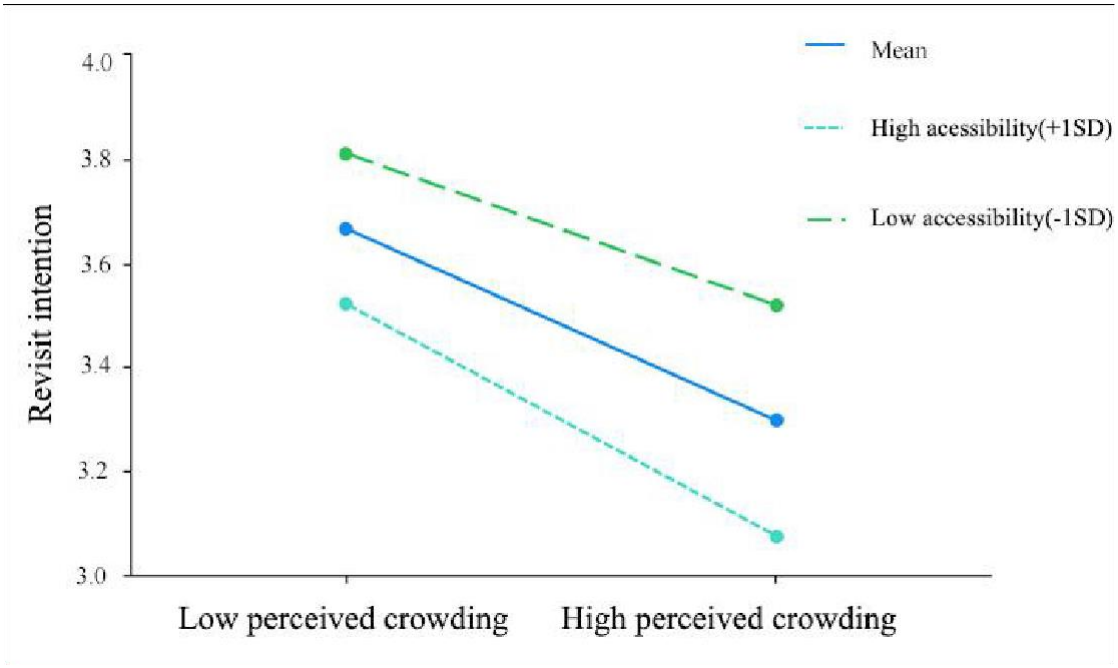

Figure 5. Moderating effect of accessibility on perceived crowding and revisit intention.

5. Discussion

5.1 The relationship between attractiveness and crowding in parks

Crowding in parks arises at the nexus of demand and attractiveness. The push and pull theory illuminates this dynamic: on one end, an escalating demand to visit parks is observed, which may be a byproduct of rising urban populations or an amplified individual desire (Delen et al., 2020).

On the flip side, disparities in park attractiveness can create variances in visitor numbers. The precise role of attractiveness in fostering park crowding, however, has remained underexplored until now.

A key finding of this study is the positive correlation between park attractiveness and perceived crowding among visitors (as shown in Table 5 and Figure 4). This observation aligns with findings in tourism and outdoor recreation research, where highly popular and renowned destinations often experience crowding due to their appeal (Riganti and Nijkamp, 2008; Shi et al., 2017). Thus, tourist crowding is a common phenomenon in well-known locations(Popp, 2012).

This study provides fresh insights into the relationship between park attributes and crowding by analyzing how park attractiveness contributes to perceived crowding. The construction of the park attractiveness index using three indicators – natural environment, artificial elements, and recreation – helps explain this phenomenon. Parks, as key urban green spaces, offer lush landscapes, diverse flora and fauna, and a natural respite, attracting those seeking a break from urban life. Man-made amenities like walking trails, sports fields, and playgrounds enhance park functionality, drawing a broader visitor spectrum. Furthermore, a park's reputation, often bolstered by word-of-mouth and social media, ensures a steady influx of visitors, subsequently increasing visitor numbers and the perception of crowding.

Hence, it is inferred that the influence of park attributes on perceived crowding, as discussed in this study, is likely mediated through visitor volume. The direct trigger for crowding perception in this context is the number of visitors, while park attributes, or attractiveness, indirectly influence this perception. However, park environments may also directly affect crowding perception. For instance, factors such as the presence of litter in a park have been found to positively influence perceptions of crowding (Sever et al., 2018). These findings suggest a multifaceted mechanism linking park attributes to crowding.

5.2 The impact of perceived crowding on revisit intentions

Crowding in parks has been identified as a significant predictor of revisit intentions (Assaker and Hallak, 2013; Wu et al., 2018; Yin et al., 2020). However, the relationship between park crowding and revisit intentions has been less explored. This study demonstrates a negative effect of perceived crowding on the intention to revisit parks (Table 5 and Figure 4). Common motivations for park visits include leisure with family and friends, exercise, and seeking tranquility (Halkos et al., 2021). Crowding compromises recreational quality in parks. Excessive visitor numbers often result in competition for space and amenities, thereby reducing the tranquility typically associated with parks and leading to unmet needs, which subsequently decreases the likelihood of revisits. Prior research also supports the positive impact of need fulfillment on park revisits (Gibson, 2018). The direct relationship between crowding and revisit intentions highlights a behavioral tendency to opt for alternative recreational venues that offer greater comfort and lesser crowd density.

Additionally, our study reveals that perceived crowding negatively impacts satisfaction. Crowding diminishes relaxation and pleasure and interferes with the overall visitor experience. Concurrently, recent research indicates that an increase in visitor numbers in green spaces adversely affects mood (Honey-Rosés and Zapata, 2023). The mood in parks partially mediates the relationship between perceived crowding and satisfaction (Lin et al., 2023c).

This study enriches the understanding of crowding consequences by linking the crowding-induced effects on visitors' emotions (satisfaction) and behaviors (revisit intention). We found that perceived crowding can indirectly affect revisit intentions through satisfaction (Table 6). This finding is consistent with the stimulus-organism-response (SOR) model, which suggests that environmental stimuli trigger an organism's emotional response, leading to a corresponding behavioral response (Mehrabian and Russell, 1974). Crowded experiences reduce tourist satisfaction due to decreased enjoyment and increased negative emotions, which indirectly affects decisions to revisit.

In urban park management, the relationship between park accessibility and perceived crowding presents a paradox. While higher accessibility is generally viewed positively, our findings suggest that it intensifies the negative impact of crowding on the willingness to revisit parks (Table 7 and Figure 5). Increased accessibility may inadvertently heighten crowding by making park visits more convenient, thus attracting more visitors. Furthermore, visitors to highly accessible parks might have elevated expectations of their visit experiences. When these expectations clash with overcrowded conditions, the resulting dissatisfaction may influence their

decision not to revisit. While improving public transportation is often seen as a solution to alleviate crowding (Magalhães and Rivera-Gonzalez, 2021), this study indicates that merely increasing public transport stops might inadvertently exacerbate crowding by attracting more visitors without effectively facilitating their departure.

It is important to note that while our study aligns with many that depict crowding negatively (Luque-Gil et al., 2018; Sanz-Blas et al., 2019; Yin et al., 2020), there is also a concept of "good crowding" (Popp, 2012). Some argue that spatial crowding causes negative emotions, but crowding of people can produce positive emotions (Jacobsen et al., 2019; Yin and Poon, 2016). Moderate crowding might enhance the atmosphere, uplift moods, and lead to optimal levels of arousal (Cheng et al., 2021; Whiting and Nakos, 2008). Studies have suggested that perceptions of park crowding vary widely depending on visitors' age, gender, cultural background, encounter preferences, and social context(Honey-Rosés and Zapata, 2023; Huai and Van de Voorde, 2022; Kyle and Landon, 2021; Sever et al., 2018). However, park studies in the United States (Rice et al., 2020), Serbia (Vasiljević et al., 2023), and Greece(Halkos et al., 2021) have found that the primary purpose of tourists visiting parks is to enjoy the quiet and escape the hustle and bustle. Excessive numbers of visitors may hinder tourists from fulfilling this purpose. A cross-cultural study showed that 38% of respondents in Japanese parks and 50% in Austrian parks preferred very low levels of social stimulation, with only 17% and 9%, respectively, believing that social stimulation had a positive effect on trail preference (Arnberger et al., 2010). Therefore, visitors who enjoy crowded environments might not represent a large percentage of park visitors. The

potential negative effects of crowding, as discussed in this study, remain relevant for parks across many regions.

5.3 Implications for park management

The influx of visitors, while indicative of a park's success, can also lead to overcrowding and a resultant sense of congestion that detracts from the visitor experience. Addressing the challenge of balancing park attraction with crowd management is a critical aspect of park management.

Several strategies can be considered: (1) Recognizing that perceptions of crowding differ based on individual traits, park managers might benefit from tailoring strategies for specific visitor groups. (2) Parks can strategically expand and diversify their attractions to spread visitors across different areas. Developing underutilized parts of the park to create new points of interest can reduce the burden on areas that are traditionally crowded. (3) The addition of appropriate transportation and stop-able spaces within the park, such as event lawns and plazas, should be considered. This approach can enhance the park’s capacity to comfortably accommodate visitors. (4) The development of other attractive green spaces within the city can serve to divert visitors from overcrowded parks, thereby easing congestion. (5) Effective visitor management strategies are essential. These could include using technology to inform potential visitors about current crowding levels, implementing staggered visiting times, encouraging visits during off-peak hours, or establishing visitor quotas to alleviate crowding during peak periods. (6) A balanced approach to marketing the park is crucial. Avoiding over-promotion can help manage visitor expectations and prevent excessive crowding.

5.4 Limitations and future directions

This study enhances the existing body of research on park crowding by elucidating the intricate relationship between park attractiveness, perceived crowding, and revisit intentions. It contributes to a more comprehensive understanding of the antecedents and subsequent effects of crowding, particularly in linking park attributes, park crowding, visitor experience and behavior. Unlike previous studies that often explored these aspects in isolation (Lin et al., 2023c), our study integrates them, offering a holistic perspective on the interaction between these factors and strategies for managing park crowding. Additionally, by incorporating park accessibility and visitor satisfaction as moderating factors, our research deepens the understanding of the dynamics involved.

Despite its contributions, this study has limitations. Firstly, it does not account for individual characteristics in perceptions of crowding. Secondly, the data, collected from over 500 questionnaires in ten parks, might not completely cover the full spectrum of park and visitor profiles. Future research should consider a larger sample of parks and visitors to further discuss park crowding and validate our findings. Thirdly, the relationship between park attractiveness and crowding might be bidirectional. While crowding is considered a critical factor in assessing a park's attractiveness (Yin et al., 2019), it can also negatively impact the appeal of a destination(Yin et al., 2020). Thus, future research should explore this bidirectional relationship in greater depth. Fourthly, reflecting on the findings within the Chinese urban context, we recognize the global prevalence of park crowding issues, including in North America, Europe,

and Asia (Kim and Park, 2019; Krinsky and Kuehn, 2020; Sever et al., 2018). The model developed in the Chinese context offers valuable insights, but cultural and social differences must be considered. Future research should consider local nuances and variables such as socio-economic status, cultural background, and environmental quality to enhance the model's applicability.

Future research directions could also include exploring the root causes of attractiveness disparities among parks, and the effectiveness of practical measures for managing park crowding. Additionally, examining how crowded parks in some areas might lead to neglect in others could provide further insights into urban park dynamics.

Conclusions

Our study presents a groundbreaking conceptual model that clarifies the relationship between park attractiveness and perceived crowding. Additionally, it outlines the relationship of perceived crowding affecting the intention to revisit. We discovered that increased park attractiveness notably heightens perceptions of crowding. The perceived crowding, in turn, has a marked negative impact on the intention to revisit. Intriguingly, the adverse influence of crowding on revisit intentions can also be indirectly observed, as it is mediated by visitors' satisfaction levels. We further identified that better park accessibility can exacerbate the negative association between perceived crowding and the intention to revisit. In general, these results insight into a deeper understanding of the nuances of park crowding, its causes, and its implications. It is our

sincere hope that these findings equip urban planners and park managers with the knowledge needed to tackle the growing global challenge of park crowding.

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