Effects of physical and psychological factors on users' attitudes, use patterns, and perceived benefits toward urban parks

Abstract

This paper studied perceived physical and psychological factors that influence relations between people and urban parks. Current literature showed that these factors influence attitudes, behavior, and perceived benefits toward urban parks. While most of the research focused on either physical factors or psychological determinants, much less grouping them and simultaneously examining their effects on people-environment relations. To study the issue, we collected data by interviewing five hundred park visitors from ten urban parks in Hong Kong. Results showed that both categories of influence are significantly associated with relations between people and urban parks; facilities and management in physical dimension and perceived accessibility in psychological factors are variables most strongly associated with these relations. Besides, psychological factors added explanatory power of regression models. Nevertheless, the inclusion of psychological factors crowded out physical factors as significant variables, and the mediation test suggested that psychological factors play a potential mediating role in the associations between physical factors and the people-environment relations. The findings highlighted the salient factors of urban parks and the effects on health-related benefits.

Keywords: urban parks; attitudes; park utilization; perceived benefits

1. Introduction

Urban parks are a source of improving physical, psychological, and social health of people (Hartig, Mitchell, de Vries, & Frumkin, 2014). For example, the urban green spaces promote physical activity and thus improve individuals' physical health (Kaczynski, Potwarka, & Saelens, 2008). The green spaces help people relieve from stressful urban routine (Ulrich et al., 1991) and restore the capacity to direct attention (Kaplan, 1995). Furthermore, urban parks improve social relationship by providing venues for people to participate in social activities (Coley, Kuo, & Sullivan, 1997; Maas, van Dillen, Verheij, & Groenewegen, 2009).

Despite the beneficial effects of urban parks brought to people, Hong Kong has been facing the challenge of encouraging city dwellers to make frequent park visit to realize these benefits. According to a survey conducted by the Leisure and Cultural Services Department of Hong Kong in 2008, over half of the respondents had not used park facilities (Leisure and Cultural Service Department, 2009). Since the city is one of the most densely populated urban living environments in the world, the low usage rate of urban parks is likely to have adverse effect to public health, well-being, and quality of life. Moreover, even if people had intention of park visit, quantity and quality of park elements may limit the use and thus hinder the realization of well-being and benefits. In this connection, a key priority for urban planners is turning urban parks into green spaces that would effectively improve people's attitudes toward urban parks, encourage park visitation, and promote physical health and well-being of city dwellers.

The purpose of this study is to examine effects of physical and psychological factors on various people-environment relations in urban parks by analysing data collected from a highly populated city. The study seeks to achieve the following objectives. First, to understand the direct effects of physical and psychological factors on attitudes, use patterns,

and perceived benefits toward urban parks. Second, to examine the joint effects of physical and psychological factors on the people-environment relations. Third, to investigate which factors are strongly associated with these relations. This study extends current literature in three respects. First, the investigation increases our understanding of salient factors that contribute to attitudes, usage, and perceived benefits toward urban parks. Second, it addresses the research gap that current literature examine either physical or psychological factors, but not both; the investigation would shed light on effects of different categories of influence regarding people-environment interactions in urban parks. Third, findings are expected to help craft tools for promoting a more balanced view on sustainable development while proceeding with urbanization processes (Kabisch, Qureshi, & Haase, 2015).

2. Literature review

2.1. Understanding attitudes, usage patterns, and perceived benefits toward urban parks

Attitudes influence and predict our behavior toward urban green spaces (Balram & Dragićević, 2005). Park users also gain positive experiences and value urban parks that are responsive to their needs (Baur, Tynon, & Gómez, 2013). Meanwhile, people not only benefit from urban nature by making frequent visit to it (e.g., Wang, Brown, & Liu, 2015), being aware of the existence of green landscapes also improve well-being. For example, window views of the green environments promote attention restoration and alleviate stress (Li & Sullivan, 2016). A sense of satisfaction resulted from the quality of neighbourhood green environments improves mental well-being (Hadavi, 2017). Both physical features of urban parks and psychological factors play a critical role in determining visitation. People seek out green spaces that have vegetated cover (Coley et al., 1997) or multiple diverse facilities (Van Herzele & Wiedemann, 2003). In the meantime, people avoid green spaces that may evoke insecure feeling (Sreetheran & van den Bosch, 2014). Moreover, people subscribing to positive views of urban parks is important. Perceived benefits of visiting urban parks may elevate parks' prominence in public and this in turn gives momentum to people to continue their current behavior toward urban green spaces. Yet, the ability of urban parks to promote certain benefits is determined by the presence of a variety of park features (Bedimo-Rung, Mowen, & Cohen, 2005) and the ways people perceived urban parks (e.g., Ode Sang, Knez, Gunnarsson, & Hedblom, 2016). In view of the above, the emphasis on achieving more successful natural resource management has resulted in a need to understand factors that contribute to attitudes, use patterns, and perceived benefits towards urban parks.

2.2. Factors affecting relations between people and urban green environments

Over the decades, scholars have been seeking to understand factors influencing the relations between people and urban green environments (e.g., Bedimo-Rung et al., 2005; Giles-Corti et al., 2005; McCormack, Rock, Toohey, & Hignell, 2010; Rung, Mowen, Broyles, & Gustat, 2011). A variety of physical park features, including trees (e.g., Coley et al., 1997; Ode Sang et al., 2016), sports facilities (e.g., Kaczynski et al., 2008; Rung et al., 2011), playgrounds (Baran et al., 2014), and water features (White et al., 2010) have demonstrated associations with public attitudes, park use and park-based physical activity and mental health. Another strand of research studied the role of psychological factors in determining the relations between users and urban parks. For example, high quality of green spaces contributes to positive attitudes toward urban nature (Sanesi, Lafortezza, Bonnes, & Carrus, 2006) while perceived safety influences the use of public green spaces (Giles-Corti et al., 2005). Haq

(2011) considered that quality of urban parks is important to meet citizens' social and psychological needs. van Dillen, de Vries, Groenewegen, and Spreeuwenberg (2012) interpreted the quality by elaborating that green spaces which contribute to physical, psychological, and social health benefits should be attractive, pleasurable and safe to experience and suitable for use. Therefore, it is suggested that relations between people and urban green environments are determined by two categories of influence: (1) physical factors of urban parks, such as trees and facilities; (2) psychological factors such as perception of aesthetic appearance of urban parks.

2.2.1. Physical factors

Many studies recognized that relations between people and urban green environments are influenced by physical features. Greenery positively associates with mental health (Sugiyama, Leslie, Giles-Corti, & Owen, 2008), decreases level of stress (Lottrup, Grahn, & Stigsdotter, 2013), evokes positive emotions (Korpela, Klemettilä, & Hietanen, 2002), and promotes restorative benefits (Hipp, Gulwadi, Alves, & Sequeira, 2016). Perceived amount of vegetation also encourages visitation of common areas and in turn fosters social interactions (Kuo, Sullivan, Coley, & Brunson, 1998). Prins, Oenema, van der Horst, and Brug (2009) and Scott, Evenson, Cohen, and Cox (2007) suggested that it is subjective availability of sports facilities but not objective indicators significantly predicting physical activity among adolescents. Mitchell (2012) found a strong association between sports facilities and mental health. Perceived availability of facilities also shapes positive attitudes toward urban parks, resulting in a higher level of intention for park visitation (Wan & Shen, 2015a). Elicited from focus group interviews, Kaźmierczak (2013) also found that the availability of recreational facilities promotes park use and social interactions.

Aside from typical physical features, research has singled out other structural infrastructures that are relevant to the perceptions toward urban parks and health benefits. The presence of water features supports recreational walking (Sugiyama et al., 2015) and affords relaxed feelings and alleviates stress (Nordh, Alalouch, & Hartig, 2011); man-made attractions related to water, such as fountains, activate similar effect to park visitors (Schroeder, 1991) and promote visitation (Voigt, Kabisch, Wurster, Haase, & Breuste, 2014). Besides, positive evaluation of culturally specific components like education galleries, historical buildings, and sculptures were found to be associated with attitudes towards urban parks and frequency of visit (Wan & Shen, 2015b).

2.2.2. Psychological factors

The ways of how we perceive the environment determine our relations with green spaces and behavioral outcomes. Literature has reported associations between perceived naturalness and self-reported psychological benefits of using urban parks (Akpinar, 2016; Dallimer et al., 2012; Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007; Liu et al., 2018; Van den Berg, Jorgensen, & Wilson, 2014) and multiple physical activities (Ode Sang et al., 2016). Aesthetic qualities such as attractive environment and beautiful scenery promote greater engagement in park-based physical activity (Ball, Bauman, Leslie, & Owen, 2001; Giles-Corti et al., 2005). Positive affective qualities of the green environments encourage visitation and offer psychological benefits. For example, relaxing quality is a common reason of park

visitation (Irvine, Warber, Devine-Wright, & Gaston, 2013; Jim & Chen, 2006). Scenes eliciting feelings of calmness and pleasantness help people recover from stress (Ulrich et al., 1991); pleasant scenes tightly link to outdoor physical activity (Schipperijn, Bentsen, Troelsen, Toftager, & Stigsdotter, 2013) and psychological benefits (Milligan, Gatrell, & Bingley, 2004; Pretty, Peacock, Sellens, & Griffin, 2005).

Exciting content offered by the urban green environments may influence likeability of park scenes (Wong & Domroes, 2005). Playful features have been suggested to bring cosy and pleasant feeling to visitors, especially for children (Bengtsson & Grahn, 2014). Fascination in nature help people feel better on days and lead to improved well-being (Sato & Conner, 2015). Perceived lack of safety has emerged as a barrier to park visitation (Brownlow, 2006; Lapham et al., 2015). Insecure feeling constrains park-based physical activities across different age groups of people (Gómez, Johnson, Selva, & Sallis, 2004; Li, Fisher, Brownson, & Bosworth, 2005; Miles, 2008) and fear from crime has negative impact on both physical and mental health (Stafford, Chandola, & Marmot, 2007). Perceived accessibility is more powerful than spatial distance in determining attitudes and park use (Wang, Brown, Zhong, Liu, & Mateo-Babiano, 2015), which in turn may influence perceived health benefits of urban parks. Places containing markers of the past, via the possess of reflection, were found potentially beneficial to restoration and stress recovery (Beil & Hanes, 2013; Korpela, 1989; Lewicka, 2014; Ratcliffe & Korpela, 2018) and negative mood alleviation (Main, 2013).

3. Method

3.1. Study context

This study was conducted in Hong Kong. Situated on the eastern side of Pearl River estuary in southern China, the city covers 1,106 km^2 (110,600 hectares) land area with around 7.4 million inhabitants (Census and Statistics Department, 2019). Geographically, Hong Kong comprises three main regions, namely, Hong Kong Island, Kowloon, and the New Territories (Figure 1). Percentage of population by region is unevenly distributed. Over 50% of population resides in the New Territories while Kowloon and Hong Kong Island has around 30% and 17% of the total population, respectively (Census and Statistics Department, 2016).

The Leisure and Cultural Services Department (LCSD) is the government agency in charge of most public open spaces in Hong Kong. LCSD maintains and operates over 1,500 parks, gardens, and sitting-out areas dispersed in three regions of the city (Leisure and Cultural Services Department, 2019). These public open spaces can be classified as regional open space, district open space, and local open space by size. *Regional open space* is at least 5 hectares and *district open space* is over 1 hectare but less than 5 hectares; small sites with at least 500 m^2 are considered as *local open space* (Planning Department, 2005). The design characteristics and spatial configurations of urban parks in Hong Kong share a high level of similarity (Rossini, 2018). Both regional and district open space usually contain naturalistic and ornamental landscape. Most of the parks provide indoor and outdoor recreational facilities, such as jogging tracks, sports venues, and children's play areas. Urban parks managed by LCSD are free of charge in Hong Kong; however, hiring charges may apply to certain sports and leisure facilities in urban parks.

3.2. Data collection

An on-site questionnaire survey was administered in December 2018. Ten urban parks were selected from the pool of public open spaces across three regions for data collection (Figure 1). To ensure representativeness of park users, each region had at least one district open space and one regional open space being selected. The number of selected parks was based on population ratio of each region. Consequently, two urban parks were chosen from Hong Kong Island; Kowloon and the New Territories had three and five parks being selected, respectively.

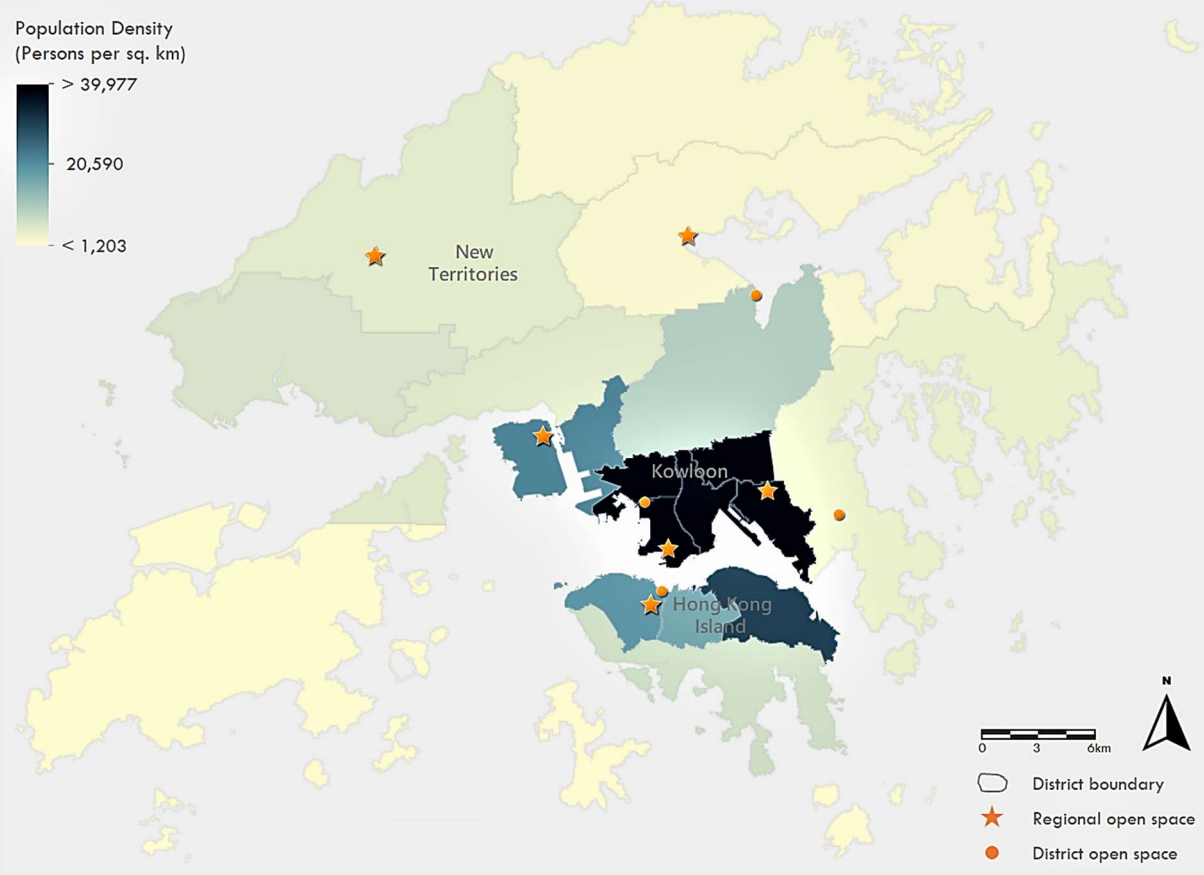

Figure 1. Map showing Hong Kong population density (Persons per sq. km) in 2018 (*Source:* Esri China (Hong Kong) Ltd., DATA.GOV.HK) and location of selected urban parks

Prior to the main study, a pilot test was run with a small group of ten park users who were not included in the final sample. The pilot work aimed at testing measurements, wordings, response formats, and implementation procedures. Participants of pilot testing reported no difficulties or problems in answering the questionnaire. Apart from pilot testing, field inspections were conducted before the formal interviews to decide a densely populated fixed point of the parks to do the fieldwork.

With reference to urban park studies conducted in Hong Kong context (e.g., Mak & Jim, 2018), respondents were randomly identified from people visiting urban parks at the time of the fieldwork. Specifically, the first potential respondent was selected randomly and then at the end of each interview the next fifth passer-by park visitor was invited to take the survey. The procedure was repeated if the invited visitor refused to take the interview. The fieldwork was distributed equally on weekdays and weekends at different time slots (i.e., morning,

afternoon, evening). Ethical review was conducted by the institutional committee and an approval had been granted for this study.

3.3. Measures

The questionnaire was designed to capture attitudes, use patterns and perceived benefits (i.e., physical activity, psychological benefits, social cohesion) with respect to both perceived physical and psychological factors of urban parks. Demographic information was included as covariate. Otherwise specified, items were assessed by a 7-point response scale, where 1 = strongly disagree to 7 = strongly agree.

3.3.1. Dependent variables

Attitudes toward urban parks. The construct consists of six items. The items were developed based partly on urban park research (Baur et al., 2013; Wan & Shen, 2015a). Four items assessing how respondents evaluate the contributions of urban parks *("Urban parks improve my quality of life"*; *"Urban parks offer opportunities to the public for nature contact"*; *"Urban parks provide the public with venues for recreational activities"*; *"The natural environment in urban parks helps city dwellers reduce stress"*). Two items measured respondents' preference for urban parks by asking them to rate the statement *"I like urban parks"* and *"I prefer urban parks over all other places I have ever been"*. The Cronbach's alpha of the construct is .87.

Use patterns. Park usage was operationalized as frequency, average duration, and regularity of park visit. Measurements items were modified based on a study examining reliability and validity of park use questionnaire (Evenson, Wen, Golinelli, Rodríguez, & Cohen, 2012). Frequency of visit was measured by asking *"How many times did you visit urban parks in the last 12 months?"* A 6-point scale ranging from 1 to 6 was used (1 = *1-2 times*, 2 = *3-4 times*, 3 = *5-6 times*, 4 = *7-8 times*, 5 = *9-10 times*, 6 = *11 times or above*). Response options for average duration of park visit were *"30 minutes or below"*, *"31-60 minutes"* and *"over 60 minutes"*. To test the regularity of visit to urban parks, respondents were asked *"How often you usually visit urban parks?"* Response options for the measurement were on a 7-point scale (1 = *daily*, 2 = *weekly*, 3 = *monthly*, 4 = *quarterly*, 5 = *bi-annually*, 6 = *annually*, 7 = *irregular use*). The Cronbach's alpha of the construct is .60.

Physical activity. The construct assessed perceived impact of urban parks in promoting physical activity. Respondents were asked to rate their agreement on whether the presence of urban parks could encourage them to undertake physical activity, including vigorous (e.g., jogging) and sedentary (e.g., walking) activities as well as keeping a habit of doing physical exercise. The Cronbach's alpha of the construct is .94.

Psychological benefits. Psychological benefits was operationalized as restorative experiences, positive emotions and stress reduction. Measurement items were adopted and/or developed from Restorative Outcome Scale (Korpela, Ylén, Tyrväinen, & Silvennoinen, 2008), items of emotional well-being (Pasanen, Neuvonen, & Korpela, 2017), and a subscale of Perceived Restorativeness Scale (Being Away) (Hartig, Korpela, Evans, & Gärling, 1997). Three items reflected restorative experiences (*"I feel restored after visiting urban parks"*, *"I forget*

everyday worries after visiting urban parks", and *"Spending time in urban parks gives me a break from day-to-day routine"*). Positive emotions was evaluated by four items including *"I feel happy after visiting urban parks"*, *"I feel joy after visiting urban parks"*, *"I feel happiness after visiting urban parks"* and *"I feel energized after visiting urban parks"*. Another three items measured stress reduction. They were *"I feel relaxed after visiting urban parks"*, *"I feel calm after visiting urban parks"*, and *"It is an escape experience"*. We replaced the last item with *"Visiting urban parks helps me reduce stress"* in order to make it more comprehensible to facilitate understanding by Hong Kong respondents. The Cronbach's alpha of the construct is .96.

Social cohesion. Social cohesion measurement items were selected from Neighborhood Quality of Life Study (NQLS) (Sallis et al., 2009), a scale developed by Sampson, Raudenbush, and Earls (1997), and Neighborhood Social Ties scale by Kuo et al. (1998). Wording of original items were changed to suit the study context. Items from NQLS were *"It is easy to make friends in urban parks"* and *"Urban parks give me a sense of community"*. Another two items from Sampson et al. (1997) were *"Visitors in urban parks are willing to help others"* and *"Visitors in urban parks generally get along with each other"*. An additional item *"I will socialize with other visitors in urban parks"* was adapted from Neighborhood Social Ties scale. The scale was originally designed to assess respondents' degree of socialization with their neighborhood. The Cronbach's alpha of the construct is .82.

3.3.2. Independent variables

Physical factors. Respondents rated the sufficiency of a range of physical features. Selection of features was draw reference to context of urban parks in Hong Kong and previous studies (Lo, Yiu, & Lo, 2003; Van Herzele & Wiedemann, 2003; Wan & Shen, 2015a, 2015b; Zhang, Chen, Sun, & Bao, 2013) which have discussed similar physical environments with those in Hong Kong context. Factor analysis was performed on the initial set of 21 items. Five items ("biodiversity", "fresh air", "natural scenes", "catering services", "facilities for pets") were removed on the consideration that their meanings clearly deviated from the component that they have loaded on to. Thus, 16 items were left for re-analysis and yielded a 4-factor solution explaining over 72% of variance. The KMO was .871 with a significant Bartlett's Test of Sphericity ($p < .000$). The factors were labeled as greenery, facilities and management, cultural elements, and artificial elements (Table 1a).

Psychological factors. The measurement instrument contains a set of 22 items gauging perception of urban parks. Items were self-developed and were inspired by research literature discussed in previous section and specific to Hong Kong context (e.g., Ode Sang et al., 2016; Van Herzele & Wiedemann, 2003; Wan & Shen, 2015a, 2015b; Zhang et al., 2013). Six subscales explaining 75.24% of total variance with eigenvalues larger than one were established after performing factor analysis. The KMO was .913 with a significant Bartlett's Test of Sphericity ($p < .000$). The factors were labeled as aesthetic and natural qualities, restorative effect, memories, accessibility, safety, and excitement (Table 1b).

Table 1a. Factor analysis of physical factors

	Factor 1	Factor 2	Factor 3	Factor 4
Item	**GRE**	**FAC**	**CUL**	**ART**
Trees	.915	–	–	–
Plants	.898	–	–	–
Flowering plants	.846	–	–	–
Lawns	.790	–	–	–
Recreational facilities	–	.806	–	–
Playgrounds	–	.749	–	–
Sports facilities	–	.746	–	–
Ancillary facilities	–	.727	–	–
Good management practices	–	.585	–	–
Artistic features (e.g., public art display, sculpture)	–	–	.889	–
Historical and cultural features	–	–	.867	–
Characteristic architectural style (e.g., themed design)	–	–	.808	–
Educational elements (e.g., greenhouse, exhibition gallery)	–	–	.769	–
Man-made sights constructed with different kinds of rocks	–	–	–	.860
Water amenities (e.g., fountains, artificial cascades)	–	–	–	.816
Man-made sights	–	–	–	.802
Eigenvalues	6.266	2.373	1.567	1.441
% of Variance	39.163	14.828	9.796	9.007
Cumulative %	39.163	53.992	63.787	72.794
Cronbach's alpha	.911	.828	.894	.853

Note. GRE = Greenery. FAC = Facilities and management. CUL = Cultural elements. ART = Artificial elements.

Table 1b. Factor analysis of psychological factors

Item	Factor 1 ANQ	Factor 2 RE	Factor 3 MEM	Factor 4 ACC	Factor 5 SFTY	Factor 6 EXCIT
Urban parks are attractive	.852	–	–	–	–	–
Urban parks are beautiful	.821	–	–	–	–	–
Urban parks are embraced by lush greenery	.592	–	–	–	–	–
The environment in urban parks is nature-like	.557	–	–	–	–	–
There is enough space in urban parks where I can freely move around	.496	–	–	–	–	–
The environment in urban parks is different from those in urban settings	.475	–	–	–	–	–
The environment in urban parks is comfortable	–	.849	–	–	–	–
The environment in urban parks is tranquil	–	.845	–	–	–	–
The environment in urban parks is relaxing	–	.824	–	–	–	–
For me, urban parks are full of memory	–	–	.871	–	–	–
Urban parks make me feel all nostalgic	–	–	.856	–	–	–
For me, urban parks are full of unforgettable moments	–	–	.839	–	–	–
Urban parks are located close to my home	–	–	–	.750	–	–
Urban parks can be easily reached	–	–	–	.746	–	–
The open hour of urban parks meets the needs of the community	–	–	–	.677	–	–
Facilities in urban parks are user-friendly	–	–	–	.605	–	–
There is enough lighting system in urban parks	–	–	–	–	.852	–
There is good security management in urban parks	–	–	–	–	.833	–
The overall environment of urban parks is safe	–	–	–	–	.788	–
Urban parks are full of amazing and exciting content	–	–	–	–	–	.821
Urban parks are full of playful content	–	–	–	–	–	.817
Urban parks are places to have fun	–	–	–	–	–	.791
Eigenvalues	9.553	2.019	1.686	1.232	1.052	1.010
% of Variance	43.424	9.179	7.663	5.601	4.783	4.592
Cumulative %	43.424	52.603	60.266	65.867	70.650	75.242
Cronbach's alpha	.874	.930	.943	.772	.883	.887

Note. ANQ = Aesthetic and natural qualities. RE = Restorative effect. MEM = Memories. ACC = Accessibility. SFTY = Safety. EXCIT = Excitement.

3.3.3. Demographic variables

Respondents were asked to indicate their gender, age group, education level, marital status, personal monthly income, and the number of children who are fifteen or below at the end of the questionnaire.

3.4. Data analysis

SPSS version 25 was used for all statistical analysis of this study. Descriptive statistics were examined. Multicollinearity issue was checked by examining collinearity statistics. All predictor variables fell within acceptable level of tolerance (> .30) and VIF ratio (< 4.0), implying that multicollinearity is unlikely to be a problem in this study (O'Brien, 2007). Correlations among dependent variables, independent variables, and demographic variables were examined. Next, we conducted hierarchical linear regression analyses. In each model, demographic data were entered as control variables, physical factors in step 2, and psychological factors in step 3. At each stage, we assessed the amount of explained variance and the standardized regression weights for significance. Since the aim of this study is examining effects of perceived physical and psychological factors, results of demographic variables will not be reported in detail for brevity.

4. Results

4.1. Sample size, response rate, and demographic profile of respondents

500 park visitors were interviewed. By using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007), the minimum sample size required for this study is 204 (significant level = .05, effect size = .15, number of independent variables = 16). Response rate for each urban park is ranging from 65% to 68%.

The sample included approximately half males (49.8%) and females (50.2%). More than half of the respondents are young adults between 20-39 years old (59.2%). A small proportion of participants (7.2%) had attained education at primary level or below, 27.2% secondary level, and 65.6% having attained tertiary education or above. 22.4% had a monthly personal income of less than HK$10,000, 30.8% HK$10,000 to HK$19,999, 29.3% HK$20,000 to HK$29,999, and 17.6% HK$30,000 or above. 66.6% respondents have been married while 62.2% respondents do not have children with age 15 or below.

4.2. Correlations between variables

Table 2 summarizes correlations between variables of this study. All physical factors and psychological factors had a positive and significant linear relationship (*rs* = .23–.66, *ps* < .01). Psychological factors correlated positively and significantly with dependent variables (*rs* = .14–.62, *ps* < .01). All physical factors appeared to have had a small to moderate effect on dependent variables (*rs* = .20–.46, *ps* < .01). Demographic variables were only significantly associated with a few specific physical and psychological factors. However, the demographic background had a greater association with dependent variables. Except for gender difference, the rest of demographic variables had either positive or negative significant correlation with most outcome variables.

Table 2. Correlation analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. GEN	-																				
2. AGE	.011	-																			
3. EDU	.068	–.567**	-																		
4. MARSTA	–.075	.389**	–.269**	-																	
5. INC	.123**	–.229**	.426**	.075	-																
6. CHILD	–.162**	.072	–.077	.460**	.088*	-															
7. GRE	.011	.036	–.075	.078	–.080	.074	-														
8. FAC	.136**	.057	–.010	.067	–.054	.079	.419**	-													
9. CUL	–.023	.120**	–.087	.157**	–.105*	.064	.259**	.442**	-												
10. ART	.033	.060	–.003	.092*	.011	.017	.378**	.432**	.404**	-											
11. ANQ	.045	.140**	–.104*	.129**	–.115**	.085	.599**	.660**	.412**	.416**	-										
12. RE	.055	.163**	–.106*	.054	–.093*	.029	.367**	.543**	.263**	.273**	.657**	-									
13. MEM	.051	.085	–.067	.087	–.087	.070	.229**	.471**	.370**	.292**	.520**	.410**	-								
14. ACC	.048	.105*	–.017	.092*	–.063	.110*	.411**	.524**	.258**	.317**	.579**	.475**	.388**	-							
15. SFTY	.106*	.116**	–.057	.054	–.010	.069	.228**	.548**	.254**	.301**	.459**	.437**	.438**	.505**	-						
16. EXCIT	.013	.128**	–.145**	.110*	–.122**	.085	.357**	.443**	.343**	.340**	.539**	.431**	.596**	.382**	.397**	-					
17. ATTD	–.017	.200**	–.093*	.072	–.076	.075	.334**	.460**	.245**	.232**	.616**	.480**	.500**	.585**	.468**	.471**	-				
18. USE	–.049	.172**	–.118**	.211**	–.099*	.153**	.197**	.178**	.212**	.202**	.216**	.169**	.142**	.303**	.187**	.127**	.172**	-			
19. PA	.016	.176**	–.101*	.110*	–.034	.065	.272**	.367**	.290**	.256**	.417**	.289**	.400**	.454**	.377**	.395**	.602**	.251**	-		
20. PB	.006	.159**	–.078	.108*	–.034	.076	.240**	.396**	.281**	.247**	.488**	.435**	.436**	.458**	.436**	.446**	.709**	.251**	.656**	-	
21. SC	–.019	.192**	–.161**	.148**	–.119**	.161**	.297**	.317**	.323**	.229**	.406**	.360**	.428**	.439**	.384**	.435**	.531**	.299**	.491**	.532**	-

Note. GEN = Gender. AGE = Age. EDU = Education. MARSTA = Marital status. INC = Income. Child = No. of children (aged ≤ 15). GRE = Greenery. FAC = Facilities and management. CUL = Cultural elements; ART= Artificial elements; ANQ = Aesthetic and natural qualities; RE= Restorative effect; MEM = Memories; ACC = Accessibility; SFTY = Safety; EXCIT = Excitement; ATTD = Attitudes toward urban parks; USE = Use patterns; PA = Physical activity; PB = Psychological benefits; SC = Social cohesion

*Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

4.3. Multiple regression models

4.3.1. Attitudes toward urban parks

Results of attitudes toward urban parks are presented in Table 3. The inclusion of physical factors in Model 2 explained 26% of variance. Greenery and facilities and management were significant at $p < .001$, together contributing to an additional 22.4% of variance compared to Model 1. Physical and psychological factors together in Model 3 explained 51.3% of variance. Aesthetic and natural qualities, memories, accessibility, safety, and excitement indicated a significant association with attitudes toward urban parks. Greenery and facilities and management dropped out as significant predictors in the full model while artificial elements showed significant but unexpected negative impact on attitudes.

Table 3. Regression results with attitudes toward urban parks as the dependent variable

	Model 1	Model 2	Model 3
Demographic variables			
Gender	−.006	−.075	−.075*
Age	.228***	.216***	.146***
Education	.055	.035	.025
Marital status	−.037	−.066	−.072
Income	−.051	.006	.039
No. of children (aged ≤ 15)	.083	.036	.005
Physical factors			
Greenery		.170***	−.032
Facilities and management		.385***	−.024
Cultural elements		.019	−.046
Artificial elements		−.011	−.074*
Psychological factors			
Aesthetic and natural qualities			.339***
Restorative effect			.015
Memories			.165***
Accessibility			.288***
Safety			.101*
Excitement			.095*
R^2	.048	.275	.529
Adj. R^2	.036	.260	.513
F	4.142***	18.519***	33.907***

Note. Standardized coefficients are reported.
*$p < .05$. ***$p < .001$.

4.3.2. Use patterns

Table 4 shows the regression models of use patterns. Model 2 possessed 10.6% of explanatory power. Greenery was the only physical factor that indicates a significant association with use patterns, explaining an additional 4.8% of variance. Model 3 accounted for 13.9% of variance. Accessibility remained significant; greenery lost its significance while cultural elements turning to be significant with the presence of psychological factors in the full model.

Table 4. Regression results with use patterns as the dependent variable

	Model 1	Model 2	Model 3
Demographic variables			
Gender	−.014	−.026	−.028
Age	.103	.095	.067
Education	.033	.027	.002
Marital status	.147**	.115*	.121*
Income	−.107*	−.083	−.080
No. of children (aged ≤ 15)	.088	.081	.066
Physical factors			
Greenery		.100*	.074
Facilities and management		.033	−.060
Cultural elements		.090	.105*
Artificial elements		.098	.090
Psychological factors			
Aesthetic and natural qualities			−.046
Restorative effect			.023
Memories			.007
Accessibility			.235***
Safety			.052
Excitement			−.076
R^2	.070	.124	.167
Adj. R^2	.058	.106	.139
F	6.141***	6.924***	6.044***

Note. Standardized coefficients are reported.
*p < .05. **p < .01. ***p < .001.

4.3.3. Perceived benefits

Table 5 presents the results of physical activity, psychological benefits, and social cohesion.

Regarding physical activity, Model 2 accounted for 17.6% of variance. Greenery, facilities and management, and cultural elements were significantly associated with physical activity, and together increased 15.3% of explanatory power. Model 3 accounted for 29.4% of variance with memories, accessibility, safety, and excitement indicating statistical significance. Physical factors dropped out as significant variables in the full model.

In regard to psychological benefits, Model 2 explained 17.9% of variance. Facilities and management and cultural elements indicated a significant association with psychological benefits. The full model accounted for 35.1% of variance with all psychological factors showing a significant effect on self-reported psychological benefits. Physical factors became non-significant after adding psychological factors in the full model.

Turning to social cohesion, Model 2 explained 19.4% of variance with all physical factors except artificial elements indicating statistical significance. The full model possessed 33.7% explanatory power. Memories, accessibility, safety, and excitement were positively correlated to social relationships of respondents. Those physical factors remined significant but had

reduction in standardized coefficients weight for greenery and cultural elements as well as negative coefficients in facilities and management.

Table 5. Regression results with perceived benefits (i.e., physical activity, psychological benefits, social cohesion) as the dependent variable

	Physical activity			Psychological benefits			Social cohesion		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Demographic variables									
Gender	.025	–.020	–.024	.017	–.037	–.038	.019	–.011	–.015
Age	.161**	.146**	.110*	.154**	.135*	.072	.133*	.121*	.071
Education	.004	–.014	–.023	.030	.006	.012	–.027	–.038	–.036
Marital status	.031	–.010	–.013	.033	–.003	.002	.031	–.016	–.007
Income	–.009	.041	.062	–.021	.029	.049	–.095	–.044	–.028
No. of children (aged ≤ 15)	.045	.015	–.015	.057	.024	–.001	.146**	.123**	.095*
Physical factors									
Greenery		.119*	.031		.067	–.072		.163***	.097*
Facilities and management		.238***	.008		.303***	–.045		.141**	–.135*
Cultural elements		.118*	.078		.097*	.050		.180***	.142**
Artificial elements		.053	.003		.044	–.011		.026	–.025
Psychological factors									
Aesthetic and natural qualities			.077			.167*			–.041
Restorative effect			–.086			.104*			.081
Memories			.136**			.105*			.164**
Accessibility			.259***			.181***			.220***
Safety			.099*			.143**			.134**
Excitement			.122*			.154**			.145**
R^2	.035	.193	.317	.031	.196	.372	.069	.210	.358
Adj. R^2	.023	.176	.294	.019	.179	.351	.058	.194	.337
F	2.982**	11.682***	13.982***	2.618*	11.913***	17.875***	6.081***	12.977***	16.838***

Note. Standardized coefficients are reported.
*p < .05; **p < .01; ***p < .001.

5. Discussion

5.1. The effects of physical and psychological factors on the interactions with urban parks

This study examined the effects of perceived park features and psychological factors on attitudes, use patterns and perceived benefits toward urban parks. The effects of perceived physical factors were less influential across users' interactions with urban parks; by contrast, psychological factors indicated greater influence on most outcome variables.

Perceived greenery indicated a significant association with attitudes, use patterns, physical activity, and social cohesion in the absence of psychological factors. The presence of greenery such as trees was considered to have a positive effect on public attitudes (Lo & Jim, 2012), park visitation (Schipperijn et al., 2013), outdoor physical activity (Cohen et al., 2007; Kaczynski et al., 2008), and social relationship among people (Kuo et al., 1998; Sullivan, Kuo, & DePooter, 2004). However, it is unexpected that perceived greenery did not associate with psychological benefits, a result that is contradictory to previous studies (e.g., Carrus et al., 2013; Hipp et al., 2016; Kaplan, 2001; Sugiyama et al., 2008). One reason may be that previous studies focused on specific study group (e.g., Hipp et al. (2016) investigated university students) while the current study examined general park users. The contradictory finding may also be the result of correlations between independent variables; correlated variables may cancel out each other's effects when multiple independent variables were simultaneously included in a model.

Facilities and management positively associated with attitudes, physical activity, and social cohesion in the absence of psychological factors. The results are consistent with findings by previous studies (Kaźmierczak, 2013; Prins et al., 2009; Wan & Shen, 2015a). The regular use of sporting environments was strongly associated with greater well-being (Mitchell, 2012). It also explains why a positive correlation between facilities and management and self-reported psychological benefits was found in this study.

Respondents who were more sensitive to the provision of cultural elements have reported a higher level of physical activity, improved psychological status as well as enhanced social cohesion. Cultural elements not only keep people staying outdoor and offer people a chance to experience cultural expressions but also provide people with opportunities to meet each other (Van Herzele & Wiedemann, 2003). The findings suggest that cultural elements are a source which benefits our psychological health. Meanwhile, unlike their Chinese counterparts in the study by Zhang et al. (2013) which historical aspect of urban parks was reported as an appropriate characteristic for recreation, Hong Kong park users did not associate cultural elements with attitudes toward urban parks or took cultural elements as a driving force of park visitation. By inference, Hong Kong park users considered cultural elements such as historical sites as not the most important element for promoting visitation and preferences for urban parks.

Artificial elements were marginally and negatively associated with attitudes toward urban parks in the full model. The attitudes construct of this study evaluated urban parks' contributions such as providing opportunities for nature contact and stress reduction, and gauged respondents' preference for urban parks. Respondents may perceive the existence of

artificial elements such as man-made structures and artificial sights as a form of human interventions that is incongruent with the natural environment and associated functions. Indeed, Hong Kong people visit urban parks principally for the purpose of physical exercise, breathing fresh air and enjoying the relaxing environment (Lo & Jim, 2010); the citizens also express a strong expectation of more vegetated spaces for alleviating air pollution, improving living environment and promoting physical and mental health (Lo & Jim, 2012). It is with this background to conclude that artificial elements may not be a necessary component to improve the overall impression towards urban parks in Hong Kong.

The findings about aesthetic and natural qualities and restorative effect are informative to the relations between people and urban parks. The degree of aesthetic and natural qualities perceived by respondents was significantly associated with attitudes toward urban parks and self-reported psychological benefits. The results are similar to the conclusions reported elsewhere (Liu et al., 2018; Ode Sang et al., 2016) though measurement scales are in minor difference compared with those studies. The positive correlation between restorative effect and psychological benefits also confirmed that urban parks which afford comfortable, relaxing and tranquil feelings offer restorative experiences, evoke positive moods and serve as a refuge from stressful daily life (Ulrich et al., 1991). However, there was no indication that aesthetic and natural qualities influence park utilization, physical activity and social cohesion; in addition, restorative effect was only found to be associated with psychological benefits. The results suggest that both qualities and restorative effect become an invalid index when actual behaviors such as park utilization, park-based physical activity, and socializing with others are taken for investigation. Following this line of reasoning, it is debatable that the successfulness of behavioral mechanisms guiding health benefits may not subject to the same driving force.

Accessibility was the most robust psychological factor across most outcomes in this study. The results give support to the conclusions by previous studies (Mowen & Confer, 2003; Wang, Brown, & Liu, 2015) that subjective dimension of accessibility plays an important role in determining park utilization and health-related behaviors. It is worth to mention that the construct is the only psychological factor which is significantly associated with use patterns. On consideration of engaging in urban green environments as a prerequisite for benefits realization, we suggest the hustle and bustle of city life in Hong Kong leads respondents paying more attention to accessibility issue over other qualities of urban parks, making it more distinctive among other independent variables.

The positive results of memories in urban parks have some resonance with the suggestion by Korpela (1989) that, places associated with memories of the past can be considered as a characteristic that is important for self-regulation such as alleviating stress and building positive affect. Ratcliffe and Korpela (2018) further elaborated the relationship by that places linked with memories are a source of psychological escape from everyday stress of the present time. Accordingly, urban parks possessing memorable content could remind people the memories of the past and that may have positive contribution to mental health.

This study also confirmed findings of previous research (Bengtsson & Grahn, 2014; Sato & Conner, 2015) regarding the exciting attributes of urban parks. Followed the explanation of

Attention Restoration Theory (Kaplan & Kaplan, 1989), exciting and fascinating stimuli of urban parks require less directed attention and help people restore mental fatigue.

Safety in this study focused on crime and related issues such as patrol and security matters of urban parks perceived by users. Respondents who have endorsed a more secure urban park environment were likely to possess a higher level of perceived physical, psychological and social benefit of using urban parks, a finding that is congruous with current research literature (e.g., Stafford et al., 2007).

Beyond psychological benefits, memory, excitement, and safety played a role in turning urban parks into people's favorable place where users were more likely to undertake physical activity and socialization with others. The findings add knowledge to the literature by widening the understanding of psychological factors for that could involve personal ties and experiences related to urban parks, and how these features potentially influence our mind and health outcomes.

Despite the significant associations found between physical factors and some dependent variables, introducing psychological factors into the models has completely crowded out physical factors as significant regressors, reducing the physical factors' level of significance or flipping the sign of standardized coefficients. It could be attributed to the fact that there is a weak association between physical factors and the outcomes. For example, the weak but significant association between perceived greenery and use patterns and physical activity may not be strong enough that allows perceived greenery to retain statistical significance after the introduction of psychological factors to the full models. It is also possible that there are mediating effects of psychological factors on the relationships between physical factors such as greenery and facilities and management and the studied outcomes. In this connection, we have performed a follow-up mediation analysis to test the potential mediating role of psychological factors. We used SPSS macro MEDIATE by Hayes (http://afhayes.com/spss-sas-and-r-macros-and-code.html) to test the indirect effects of physical factors on various people-environment relations through psychological factors. MEDIATE allows us to study the full mediation model with multiple independent and mediating variables. Unstandardized indirect effects and bias-corrected 95% confidence intervals were generated using 5,000 bootstrapped samples. Mediation holds if CIs do not contain zero (Hayes, 2018), that is, the physical factors have significant indirect effects (*ab* path) on the dependent variables through psychological factors.

A multiple mediation model was shown in Appendix A (Figure A1). Tables A1-A5 in the appendix summarize results of total indirect effects for the six mediators (i.e., psychological factors) with attitudes toward urban parks, use patterns, and perceived benefits as the dependent variable. In brief, indirect effects of perceived greenery, facilities and management, and cultural elements on attitudes and psychological benefits were significantly mediated by aesthetic and natural qualities. Significant indirect effects through environmental memories were found between both facilities and management and cultural elements and dependent variables including attitudes, physical activity, and social cohesion. Accessibility significantly mediated indirect effects of both perceived greenery and facilities and management on all outcome variables. Except for use patterns, perception of safety

significantly transmitted the relationships between facilities and management and attitudes toward urban parks, physical activity, psychological benefits, and social cohesion. Excitement transmitted indirect influence of greenery and facilities and management on attitudes and physical activity; moreover, excitement mediated indirect effects of all physical factors on psychological benefits and social cohesion. None of the physical factors had a significant indirect effect mediated by restorative effect. In sum, the results suggest that there are possible indirect effects of physical factors on people-environment relations through multiple psychological variables in the urban green spaces context.

5.2. Joint effects of physical and psychological factors

This study found support for a significant role of all physical models (ps < .001), explaining 10.6% to 26% of the variance across dependent variables. In addition, the inclusion of psychological factors increased explanatory power of the models, ranging from 3.3% to 25.3% of increased variance. The results have twofold implications. On one hand, the findings reinforce the perspective that not only physical structures but also influence from psychological factors are indispensable in shaping people-environment relations in urban green environments. Some studies have already found that quality of greenery is more influential to mental health as it adds predictive value to the model which has already been included quantity greenery (e.g., van Dillen et al., 2012). Quality of urban green areas may even make quantity variables redundant in some cases (de Vries, Van Dillen, Groenewegen, & Spreeuwenberg, 2013). The mediation analysis of this study also provided evidence for that indirect effects of physical factors on dependent variables are transmitted by some psychological factors. On the other hand, the results informed urban planning by that merely focusing on hardware is insufficient for urban parks turning into green spaces that effectively promote health-related outcomes. To meet the needs of citizens and maximize multiple health benefits, policy strategies which account for perceptions of urban green areas and tie to personal values and experiences are highly recommended.

5.3. Specific factors strongly associated with relations between people and urban parks

Within the category of physical influence, facilities and management was most strongly associated with attitudes toward urban parks, self-reported physical activity and psychological benefits based on standardized coefficients weight. Compared to other perceived physical elements such as the presence of sculptures and fountains, respondents considering the provision of diversified sports and recreation facilities as a more important factor may reflect the public aspiration on the role and service of urban parks; the public was also concerned with park management issue such as cleanliness and maintenance for the delivery of multiple health benefits. Understanding these basic needs is important for effective park management. The findings offer a chance for policy makers to review whether future park planning should move ahead with additional diversified facilities or the management authority is doing an adequate job to ensure a sound management for both facilities and overall park environment (cf. Gobster & Westphal, 2004).

Accessibility was among the psychological factors indicating the strongest correlation to park utilization and all self-reported benefits in all final models. As mentioned above, easy access

is a prerequisite for park use and realization of multiple health benefits. The ways that people perceive how convenience of accessing to urban parks take over other qualities and dominate our behavior. Struggle with land shortage, park accessibility issue in Hong Kong becomes more critical. The empirical findings of this study and previous research (e.g., Park, 2017) suggest that shortening the geographical distance between users and urban parks by constructing new parks may not be the most effective solution of promoting urban green spaces utilization and benefit realization; instead, focusing on changing people's perception of the urban green spaces should be amplified.

5.4. Implications and applications

This study has policy and practice implications for urban park management. Although both physical factors and psychological factors influence people's interactions with urban parks, most physical features cannot retain their significance in the full models. It is suggested that psychological factors may be more proximal driving factors in the process of people-environment interactions. The qualities of urban parks guide our judgments of the environment and would take a central role in future urban planning (Van Herzele & Wiedemann, 2003). For example, perceived accessibility is vital to park visitation, and visitation is a pre-condition to actualize benefits of nature contact. It is the paramount importance to improve perceived accessibility of urban parks by setting up flexible opening hours, removing obsolete rules as well as providing more information of nearby urban parks, such as different routes of accessing to the parks. Other psychological factors, especially with respect to safety issue in urban parks, the ability of recalling memorable experiences, and the capability of stimulating exciting responses, play an influential role in shaping positive public attitudes and contributing to perceived benefits toward urban parks. Social campaigns for promoting these qualities and incorporating the qualities into programming of activities for encouraging active engagement in urban parks are recommended.

Intervention strategies which aim at improving perceptions of urban parks among citizens are suggested. People with positive perception of the environment may be more aware of it and result in active behavior in the place. Thus, manipulating perceptions of the environment could enable people to experience urban parks in a new way, that in turn encourages people to be more active in the green environments even if the settings were less ideal (Duvall, 2013). Accordingly, information disseminated by education works targeted at changing people's perceptions of urban parks is essential to get people more involved in the natural environments. In addition, extensive publicity campaigns for the urban green spaces may alter people's perceptions. For instance, urban parks may align with other scenic spots in the vicinity to form a chain of attractions, leading to increased attractiveness of the urban green environments.

6. Limitations and conclusion

This study was targeted at park users as respondents. The absence of information on other urban residents, such as non-users of urban parks, may raise concern against generalization issue. Notably, external validity of the findings for other urban residents cannot be assessed. It is possible that attitudes and perceived benefits toward urban parks vary between park users

and other urban residents; thus, the current findings may not be generalizable. The focus on park users has brought up another concern that differences between population groups cannot be compared for how particular features of urban parks will affect each group's interactions with the green environments. It would be helpful for future research to investigate different population groups and make a comparison between different types of users.

This study did not account for area-based measures such as residential and working environment closing to green landscapes, home ownership, and length of residency of respondents. It should be noticed that these factors are either not applicable or least influential if the living context of Hong Kong and research design of the current study are taken into consideration. However, future studies may include these measures for investigation if these area-level factors applied to the study context.

This study did not capture seasonal variations and associated impact. The survey was conducted in December. Although the fieldwork period can be considered as a pleasant month of the year in subtropical regions such as Hong Kong, the study cannot assess month-by-month differences if the fieldwork was restricted to a specific time of the year. As a result, it may not address influence of seasonality and weather conditions, which in turn fail to identify park features that are season-dependent in the relationships of people-environment interactions. For example, flowers and activities undertaken in urban parks vary across seasons; the variation may affect public attitudes, frequency of visit and perceived benefits toward urban parks. Future studies are suggested to include data collected from different seasons and develop interventions that have been taken both seasonal and weather conditions into account.

Urban parks provide essential access to green environments for urban dwellers. Investigating parks features that effectively improve public attitudes, usage rate and perceived benefits toward urban parks would maximize actual benefits offered by the green environments. The originality of this research lies in the work that jointly considers both physical and psychological factors and their impact on people's various interactions with urban parks. Findings increase our understanding of urban parks related factors that may effectively promote health benefits. This study also assist in the development of clear evidence-based guidelines for urban park planning.

Appendix A

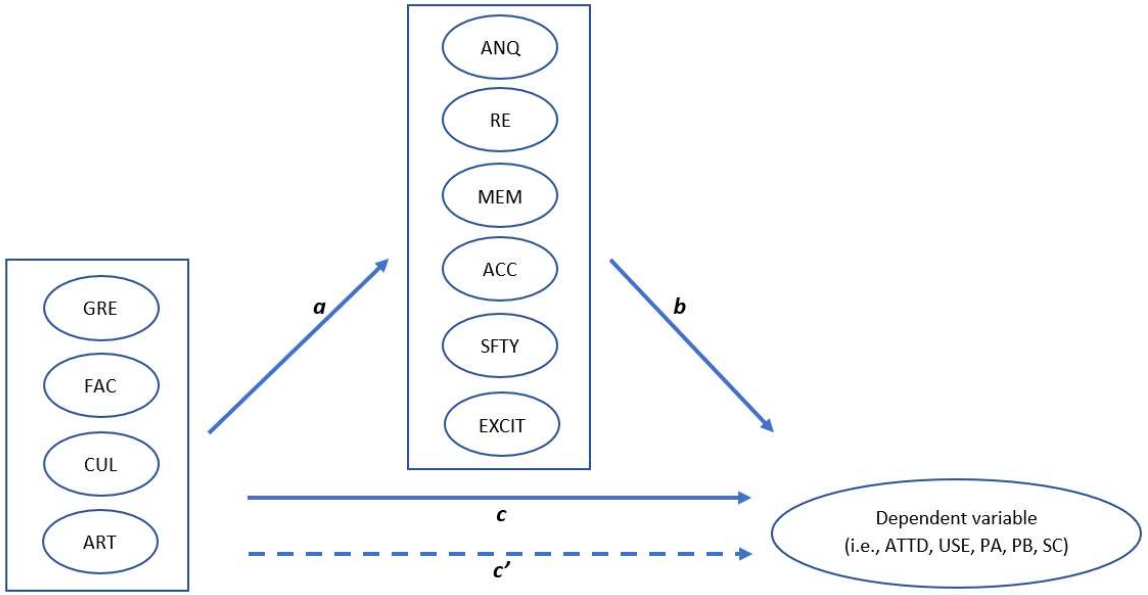

Figure A1. Multiple mediation model

Table A1. Indirect effects of the physical factors (*ab* path) on attitudes toward urban parks through six mediators (i.e., psychological variables)

	ANQ			RE			MEM			ACC			SFTY			EXCIT		
	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI
GRE	**.103**	.059	.151	.002	–.011	.016	.000	–.014	.016	**.052**	.027	.084	–.002	–.011	.006	**.012**	.001	.028
FAC	**.136**	.081	.195	.007	–.031	.049	**.054**	.020	.094	**.105**	.063	.152	**.047**	.011	.087	**.023**	.001	.051
CUL	**.026**	.003	.054	.000	–.006	.004	**.026**	.007	.049	–.004	–.028	.021	–.001	–.009	.009	.010	–.000	.024
ART	.012	–.008	.037	.000	–.005	.005	.009	–.006	.027	.014	–.008	.037	.007	–.001	.018	.009	–.000	.023

Note. Unstandardized coefficients are reported. Bold values denote statistical significance. A confidence interval (CI) not including zero indicates a statistically significant mediating effect. LLCI = Lower limit of the bias-corrected bootstrap 95% CI. ULCI = upper limit of the bias-corrected bootstrap 95% CI. GRE = Greenery. FAC = Facilities and management. CUL = Cultural elements. ART = Artificial elements. ANQ = Aesthetic and natural qualities. RE = Restorative effect. MEM = Memories. ACC = Accessibility. SFTY = Safety. EXCIT = Excitement.

Table A2. Indirect effects of the physical factors (*ab* path) on use patterns through six mediators (i.e., psychological variables)

	ANQ			RE			MEM			ACC			SFTY			EXCIT		
	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI
GRE	–.010	–.044	.020	.002	–.010	.016	.000	–.004	.004	**.031**	.013	.054	–.001	–.006	.003	–.007	–.020	.002
FAC	–.013	–.057	.027	.007	–.028	.045	.002	–.024	.029	**.062**	.029	.100	.018	–.017	.051	–.013	–.035	.004
CUL	–.003	–.013	.006	.000	–.005	.005	.001	–.012	.015	–.002	–.017	.013	–.000	–.005	.004	–.006	–.016	.002
ART	–.001	–.008	.004	.000	–.005	.005	.000	–.006	.007	.008	–.005	.024	.003	–.003	.010	–.005	–.016	.001

Note. Unstandardized coefficients are reported. Bold values denote statistical significance. A confidence interval (CI) not including zero indicates a statistically significant mediating effect. LLCI = Lower limit of the bias-corrected bootstrap 95% CI. ULCI = upper limit of the bias-corrected bootstrap 95% CI. GRE = Greenery. FAC = Facilities and management. CUL = Cultural elements. ART = Artificial elements. ANQ = Aesthetic and natural qualities. RE = Restorative effect. MEM = Memories. ACC = Accessibility. SFTY = Safety. EXCIT = Excitement.

Table A3. Indirect effects of the physical factors (*ab* path) on physical activity through six mediators (i.e., psychological variables)

	ANQ			RE			MEM			ACC			SFTY			EXCIT		
	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI
GRE	.031	–.026	.086	–.016	–.044	.006	.000	–.016	.017	**.061**	.027	.103	–.002	–.016	.008	**.021**	.002	.049
FAC	.041	–.034	.111	–.048	–.117	.020	**.058**	.010	.111	**.124**	.064	.189	**.061**	.002	.130	**.039**	.005	.080
CUL	.008	–.006	.028	.000	–.014	.014	**.028**	.003	.060	–.004	–.033	.023	–.001	–.012	.013	.017	–.000	.043
ART	.004	–.005	.017	–.000	–.014	.013	.009	–.007	.032	.017	–.009	.046	.009	–.002	.029	.015	–.000	.038

Note. Unstandardized coefficients are reported. Bold values denote statistical significance. A confidence interval (CI) not including zero indicates a statistically significant mediating effect. LLCI = Lower limit of the bias-corrected bootstrap 95% CI. ULCI = upper limit of the bias-corrected bootstrap 95% CI. GRE = Greenery. FAC = Facilities and management. CUL = Cultural elements. ART = Artificial elements. ANQ = Aesthetic and natural qualities. RE = Restorative effect. MEM = Memories. ACC = Accessibility. SFTY = Safety. EXCIT = Excitement.

Table A4. Indirect effects of the physical factors (*ab* path) on psychological benefits through six mediators (i.e., psychological variables)

	ANQ			**RE**			**MEM**			**ACC**			**SFTY**			**EXCIT**		
	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI
GRE	**.054**	.006	.106	.015	–.001	.037	.000	–.011	.013	**.035**	.012	.063	–.003	–.017	.010	**.021**	.005	.044
FAC	**.071**	.009	.133	.047	–.002	.099	.036	–.005	.081	**.070**	.025	.116	**.071**	.020	.125	**.040**	.011	.077
CUL	**.014**	.000[a]	.035	–.000	–.012	.013	.017	–.002	.042	–.002	–.021	.016	–.001	–.013	.014	**.017**	.001	.039
ART	.007	–.004	.022	.000	–.012	.012	.006	–.005	.023	.009	–.005	.028	.011	–.001	.029	**.015**	.001	.035

Note. Unstandardized coefficients are reported. Bold values denote statistical significance. [a]The value is .0002 before decreasing decimal. A confidence interval (CI) not including zero indicates a statistically significant mediating effect. LLCI = Lower limit of the bias-corrected bootstrap 95% CI. ULCI = upper limit of the bias-corrected bootstrap 95% CI. GRE = Greenery. FAC = Facilities and management. CUL = Cultural elements. ART = Artificial elements. ANQ = Aesthetic and natural qualities. RE = Restorative effect. MEM = Memories. ACC = Accessibility. SFTY = Safety. EXCIT = Excitement.

Table A5. Indirect effects of the physical factors (*ab* path) on social cohesion through six mediators (i.e., psychological variables)

	ANQ			**RE**			**MEM**			**ACC**			**SFTY**			**EXCIT**		
	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI	B	LLCI	ULCI
GRE	–.013	–.053	.028	.011	–.003	.028	.000	–.015	.015	**.040**	.018	.068	–.002	–.014	.008	**.019**	.005	.039
FAC	–.017	–.072	.036	.034	–.008	.087	**.054**	.019	.095	**.081**	.043	.125	**.063**	.021	.110	**.036**	.013	.067
CUL	–.003	–.017	.008	–.000	–.011	.009	**.026**	.006	.052	–.003	–.022	.016	–.001	–.011	.012	**.016**	.001	.036
ART	–.002	–.010	.005	.000	–.008	.010	.009	–.006	.027	.011	–.006	.030	.009	–.001	.024	**.014**	.000[a]	.031

Note. Unstandardized coefficients are reported. Bold values denote statistical significance. [a]The value is .0009 before decreasing decimal. A confidence interval (CI) not including zero indicates a statistically significant mediating effect. LLCI = Lower limit of the bias-corrected bootstrap 95% CI. ULCI = upper limit of the bias-corrected bootstrap 95% CI. GRE = Greenery. FAC = Facilities and management. CUL = Cultural elements. ART = Artificial elements. ANQ = Aesthetic and natural qualities. RE = Restorative effect. MEM = Memories. ACC = Accessibility. SFTY = Safety. EXCIT = Excitement.

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