Active use and perceptions of parks as urban assets for physical activity: A mixed-methods study

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ARTICLE INFO

ABSTRACT

Parks are potential key urban assets for improved population health; however, their use is not equal among all social groups. Individual and contextual factors could influence residents' perceptions of parks and how they interact with and, eventually, benefit from them. The use of complementary methodologies provides a deeper understanding of the relationship between park use, physical activity (PA), and residents' perceptions. Thus, we designed a mixed-methods study to analyze differences in park use and PA, and the perceptions of parks as urban assets for PA. We selected six parks from three neighborhoods in Madrid (Spain) with different neighborhood socioeconomic status (NSES) for systematic social observation. We registered park users by age, PA level (low, medium, and high), gender, and NSES using the System for Observing Play and Recreation in Communities (SOPARC) audit tool adapted for iOS software (iSOPARC). We also conducted 37 semi-structured interviews and 29 focus groups to analyze residents' perceptions of parks as urban assets for PA in the same neighborhoods. We adopted a convergent-parallel design to analyze both quantitative and qualitative data, and to describe the convergence and divergence areas between them. Parks within the high-NSES were more visited, showing a higher proportion of people performing high PA (11.9%) as compared to residents of the middle (9.3%) and low-NSES (3.2%). Female visitors showed lower PA levels compared to men, especially for parks within high-NSES. The following issues were reported as influence urban park use and perceptions: park maintenance and area perception, works constraints, insecurity and crime, differential perceptions by age, and the availability of organized activities in the parks. Residents from high-NSES reported fewer barriers to park use compared to residents from the other areas, who reported limitations such as less leisure time due to job constrains or perceived insecurity in parks. Senior participants reported that having parks with organized activities and a design oriented towards different age-groups are valuable. Our study shows consistency between the fewer and less intense use of parks registered in the middle and low-NSES neighborhoods, and the more barriers for PA reported in this areas during the qualitative analysis. Mixed-methods provided an insight of the potential causes leading to the differences in park use and PA within cities, which is essential in terms of environmental justice and health equity. Thus, a mixed-methods comprehensive approach to public health problems can help designing public policies addressing relevant factors related to urban health inequities.

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1. Introduction

While cities have the potential to improve population's well-being through a health-focused design, 23% of worldwide deaths that occurred during 2012 were due to unhealthy environmental conditions, such as a poorly built environment (Prüss-Ustün et al., 2016). An extensive body of research acknowledges the role of neighborhood-level physical and social environments for health outcomes (Acevedo-Garcia et al., 2014; Diez Roux and Mair, 2010; Duncan and Kawachi, 2018; Fullilove and Wallace, 2011; Hill et al., 2005; Sampson and Laub, 2003; Stevenson et al., 2016). For instance, a closer residential proximity to green spaces has been associated with better cardiovascular and immunity-related outcomes (Cavaleiro Rufo et al., 2020; Dalton and Jones, 2020), and self-perceived and mental health (Klompmaker et al., 2019; Triguero-Mas et al., 2015).

Green spaces might improve health through different pathways, such as reducing harm (mitigating exposures to heat, noise, and air pollution), relieving mental and physiologic stress, and promoting healthy activities such as physical activity (PA) (Nieuwenhuijsen et al., 2017).

However, some of the evidence related to green spaces is contradictory, and not all types of them improve health through the same pathway. For example, the association between PA and green spaces depends on the setting or the study methodological design (Bancroft et al., 2015). Green spaces have been defined using different categories in urban research on greening and health. For instance, "green spaces" is usually used as a broad term that involves all types of green areas and elements that are available in the cities such as regular vegetation (e.g., flower beds, trees), community gardens, or urban forests; meanwhile, "urban parks" is a more specific concept that refers to those green areas with a minimum size (0.5 ha), vegetation, and walking paths around and through their area (WHO Regional Office for Europe, 2016), and that could count with other features such as sport courts, which could increase PA. In fact, different studies have shown a relationship between residential park proximity or density with an increase in PA (Akpinar, 2016; Bancroft et al., 2015; Cohen et al., 2006; Durand et al., 2011; Papas et al., 2007; Young et al., 2014).

Regarding the distribution of green spaces and parks, some neighborhoods tend to be more deprived than others in terms of access to green spaces and face acute environmental injustices (Anguelovski et al., 2020b; Langemeyer and Connolly, 2020). For instance, some areas with low socioeconomic status have fewer and smaller parks, urban parks with worse quality, and less accessible and safe in comparison with wealthier neighborhoods (Cohen et al., 2012; Engelberg et al., 2016; Jones et al., 2009; Schüle et al., 2019).

However, the mere presence of green spaces is not always sufficient to create healthy environments. How populations interact with different features of the urban environment relies on a complex system where the economic and social structure of a certain area influence the social dynamics that shape inhabitants' behaviors and how they perceive these features (Franco et al., 2015; Markevych et al., 2017;). For example, several analyses have pointed out the discrepancy between objective measures of urban characteristics (e.g., accessibility or availability) and how individuals perceive them (Brownson et al., 2009; Hinckson et al., 2017; Knobel et al., 2021; Kothencz and Blaschke, 2017; Ma et al., 2014; Orstad et al., 2017), and related those discrepancies to environmental and health justice issues (Anguelovski et al., 2020a). Furthermore, social groups with different sociodemographic characteristics, such as gender, age, or ethnicity, experience the impact of exposure to green space differently, even when comparing them to more privileged groups living in the same neighborhood (Kabisch et al., 2017; Pearce et al., 2018). However, while some studies have started to offer a more contextualized understanding of how the presence of urban parks combines with complex socioeconomic and political environments, there is still much space to further explore these dynamics. Our paper aims to fill this gap with a novel focus on park perceptions, use, and physical activity.

Thus, to understand the interaction between those factors related to park use and population's perceptions, an approach that considers the role of subjectivity is warranted. A contextual and comprehensive analysis is necessary to fully understand how structural and individual determinants are interrelated, and how they are influencing the use of urban parks for PA. We thus ask: What is the relationship between different socioeconomic contexts, and the use and perceptions of parks? We draw on a mixed-methods approach, which, by combining quantitative and qualitative data, allows for a better understanding of complex phenomena such as the relationship between social and urban dynamics and health outcomes (Cunningham-Myrie et al., 2019; Uijtdewilligen et al., 2019); .

In this study, we aimed to analyze differences in the use of parks for physical activity and the extent to which individuals from different socioeconomic backgrounds perceived these spaces as an urban asset for physical activity in the city of Madrid, Spain.

2. Methods

2.1. Study design

We designed a convergent-parallel mixed-methods study where we collected and analyzed quantitative (systematic social observation in six parks) and qualitative (residents' perceptions) data separately, and then compared and contrasted the different results during the interpretation (Bryman, 2006; Creswell and Plano Clark, 2011). Thereby, we gave equal weight to both data types. All the data collection, analyses, and interpretation processes were conducted between 2018 and 2019. We conducted this study following the Declaration of Helsinki and received ethics approval from the University of Alcalá (CEI/HU/2017/18). All participants provided written informed consent.

2.2. Study setting

Our study area was the city of Madrid, Spain's 3.2 million-resident capital, divided into 21 districts and 128 neighborhoods and with one of the highest increases in socioeconomic segregation in Europe (Leal and Sorando, 2015). We selected three neighborhoods with different socioeconomic status to bring in an environmental equity lens. Briefly, we followed a two-step process: first, we divided, ranked, and divide-classified into tertiles all neighborhoods by their neighborhood-level socioeconomic status (NSES) (Rivera Navarro et al., 2019) and selected nine neighborhoods (three per tertile). The NSES index was built using neighborhood-level variables related to available data on the demographic and socioeconomic structure of the neighborhood such as the level of unemployment, people with a part-time or temporary job, people with low educational level, people born in a foreign country, and households with a single parent and one or more children. Second, we selected one neighborhood per tertile using non-participant observation, leaving a final sample of one low-NSES (San Diego), one middle-NSES (El Pilar), and one high-NSES (Nueva España) neighborhoods. More details about the neighborhood selection process can be found elsewhere (Rivera Navarro et al., 2019).

At first, we sampled one park per neighborhood with similar size and facilities (e.g., children's playground or sports facilities). As the qualitative strand was being conducted in parallel, three more parks (one per neighborhood) that complied with the previous criteria (similar size and facilities) were added to the sample as they were identified as an asset for PA by the participants.

Parks selected had similar size (around 50000 square meters), counted with walking trails, and offered the same facilities like children's playgrounds, wide-open spaces for informal games, or sports courts, and also had ornamental features like water fountains. Fig. 1 shows the context of the city of Madrid and depicts pictures of some of the parks included for the systematic social observation.

Fig. 1. Neighborhoods of the city of Madrid according to their socioeconomic status (SES), the final neighborhoods sample (A, B and C), and pictures of some of the parks selected for the systematic social observation within each neighborhood.

2.3. Quantitative strand: systematic social observation

2.3.1. Audit tool

We obtained quantitative data on PA using the *System for Observing Play and Recreation in Communities* (SOPARC) (Mckenzie and Cohen, 2006), a widely previously-used systematic social observation tool for assessing park and recreation areas (Ward et al., 2014). The Sport Faculty of the University of Oporto adapted the SOPARC methodology for an iPad application systematizing the data collection procedure (Santos et al., 2016).

2.3.2. Registration procedure

Within each park, we selected three target areas that represented standard locations likely to provide opportunities to be physically active, defined as areas with enough space that allow activities involving different levels of PA (e.g., walking, running, or riding a bike). At least one of these target areas had to have a children's playground to capture potential patterns associated with childhood and with care. These target areas were selected after the consensus of two researchers following the same criteria defined by the SOPARC protocol.

Each park was visited twice by a researcher: once on a working day and once during the weekend. Each visiting day we set up a protocol with the same four registration shifts, through which every 1-h shift was divided into 20 min periods to register PA levels within each target area. In the end, each target area within each park was visited four times throughout the day, on two different days (eight times in total). The member of the team who carried out the systematic social observation registered the following variables about every person who crossed the target area:

- PA: low/medium/high. SOPARC protocol defines "high PA" as any kind of activity that could increase the heart rate causing sweating.
- Gender perceived by the observer: male or female.
- Age-group perceived by the observer: children (0–12 years), adolescents (13–20 years), adults (21–59 years), or seniors (60 years and older).
- Moment of the day: morning, noon, afternoon, and evening.
- Day of the week: weekday or weekend.

All parks included were visited on sunny days during May and June to avoid weather variations that could discourage residents from visiting these spaces, such as rainy or extremely warm summer days.

2.3.3. Data analysis

We exported quantitative data into two different datasets: number of visitors by age-group, gender, and number of people performing different PA levels. Then, we performed a descriptive analysis of park use by different age-group, gender, NSES, and the iSOPARC variables. We also analyzed differences in physical activity levels by NSES and gender. For these analyses, we used R software, version 4.0.3.

2.4. Qualitative strand: perceptions of parks and physical activity

2.4.1. Semi-structured interviews (SSIs) and focus groups (FGs)

To conduct the SSIs (*n = 37*) and FGs (*n = 29*), we identified and selected participants based on the following criteria: sex, age, educational level, number of children, employment status, income, family responsibilities related to children or grandchildren, years of residence in the neighborhood, and country of origin. A professional market research agency recruited participants, who were contacted via telephone. The response rate was high; 92% of contacted residents enrolled in the study. Participants received financial compensation of 25€ and a bottle of extra virgin olive oil. Using a professional agency made it impossible to include children users in our analysis. Participants lived in the three neighborhoods of the study area and were, at least, 40 years old. The age criterion was established for the larger urban health project in which the qualitative strand of the study was embedded (Bilal et al., 2016).

In the SSIs, researchers interviewed (JRN, PCE, MGS, MSV, and MFT) 31 residents and 6 key informants. Key informants were school principals and directors of healthcare centers who helped to explain the dynamics related to our study dimensions in each neighborhood. Table 1 shows the sociodemographic characteristics of participants.

For the focus groups, we conducted 14 in the low-SES, 11 in the middle-SES, and 4 in the high-NSES. In total, 182 residents participated in the 29 focus groups (Table 2).

2.4.2. Data collection

The SSIs and the FGs were conducted between 2016 and 2019. The SSIs lasted approximately 60 min and were conducted by six researchers. FGs took place between 2018 and 2019 and lasted approximately 90 min each. The number of participants within each FG ranged from five to eight. We designed the SSIs and FGs guides (JRN, MFT, MGS, PCE, and MSV) including the following topics related to the neighborhood and parks: 1) general perception about their accessibility; 2) perception of their situation and condition); 3) perception of facilities

Table 1
Sociodemographic characteristics of semi-structured interviews participants (n = 31) and key informants (n = 6) participating in the semi-structured interviews according to neighborhood socioeconmic status.

	Neighborhood		
	Low SES (n = 12)	Medium SES (n = 12)	High SES (n = 13)
Gender (n, %)			
Female	5 (41.7)	7 (58.3)	6 (46.2)
Male	7 (58.3)	5 (41.7)	7 (53.8)
Age (n, %)			
40-49	4 (33.3)	5 (41.7)	5 (38.4)
50-59	2 (16.7)	2 (16.7)	3 (23.1)
60-69	1 (8.3)	4 (33.3)	4 (30.8)
≥70	5 (41.7)	1 (8.3)	1 (7.7)
Educational level (n, %)			
≤ Primary school or less	9 (75.0)	2 (16.7)	–
Secondary school	1 (8.3)	6 (50.0)	2 (15.4)
Tertiariy achool	2 (16.7)	4 (33.3)	11 (84.6)
Employment status (n, %)			
Working (full-time or part-time)	5 (41.7)	7 (58.4)	9 (69.2)
Unemployed	1 (8.3)	–	–
Retired	6 (50.0)	4 (33.3)	4 (30.8)
Housewives	–	1 (8.3)	–
Country of origin (n, %)			
Spain	8 (66.7)	12 (100.0)	13 (100.0)
Other	4 (33.3)	–	–
Living arrangement (n, %)			
Living alone	1 (8.3)	4 (33.3)	2 (15.4)
Cohabiting	11 (91.7)	8 (66.7)	11 (84.6)

SES: socioeconomic status

Table 2
Sociodemographic characteristics of focus group participants (n = 182) according to neighborhood socioeconomic status.

	Neighborhood		
	Low SES (n = 90)	Medium SES (n = 65)	High SES (n = 27)
Gender (n, %)			
Female	52 (57.8)	44 (35.4)	15 (55.6)
Male	38 (42.2)	21 (64.6)	12 (44.4)
Age (n, %)			
40-49	23 (25.5)	18 (27.7)	2 (7.4)
50-59	36 (40.0)	24 (36.9)	11 (40.7)
60-69	25 (27.7)	12 (18.5)	5 (18.5)
≥70	6 (6.8)	11 (16.9)	9 (33.4)
Educational level (n, %)			
≤ Primary school or less	20 (22.2)	7 (10.7)	2 (7.4)
Secondary school	33 (36.7)	27 (41.6)	2 (7.4)
Tertiariy achool	37 (41.1)	31 (47.7)	23 (85.2)
Employment status (n, %)			
Working (full-time or part-time)	60 (66.7)	39 (60.0)	18 (66.7)
Unemployed	9 (10.0)	7 (10.7)	–
Retired	17 (18.9)	18 (27.7)	9 (29.7)
Housewives	4 (4.4)	1 (1.6)	1 (3.6)
Country of origin (n, %)			
Spain	62 (68.9)	49 (75.4)	27 (100.0)
Other	28 (31.1)	16 (24.6)	–
Living arrangement (n, %)			
Living alone	25 (27.7)	12 (18.5)	5 (18.5)
Cohabiting	65 (72.3)	53 (81.5)	22 (81.5)

and resources related to parks and physical activity that take place in each neighborhood. We completed SSIs and FGs after reaching saturation point when perceptions shared started to be repetitive, and no new core themes and issues in participants' answers or discussions emerged (Axelsson et al., 2015). The saturation point was reached earlier in the SSIs and FGs conducted in the high-SES neighborhood because of their more homogeneous resident profile (i.e., mostly high-skilled workers and high-income residents), which explains the fewer number of FGs

conducted in the high SES neighborhood. The number of FGs conducted in the low-SES neighborhood was higher due to the higher proportion (30%) of people born in a foreign country in this area, to better show their different and diverse perceptions as sub-groups.

The SSIs and FGs topic guides are included in the supplementary material (S1).

2.4.3. Data analysis

All SSI and FG were professionally transcribed and then checked by four researchers (JRN, MGS, PCE, and MSV). Direct quotes were translated from Spanish to English following a widely-used three-step procedure (Biering-Sørensen et al., 2011). We used the principles of constructivist grounded theory (Charmaz, 2006; Glaser, 2003) and included the complete dataset in this analysis (e.g., entire transcripts of all 37 SSIs and 29 FGs). The research team coded the transcribed text line-by-line using open coding. Constant comparison (Glaser, 2003) of emerging codes allowed us to consolidate several categories and sub-categories, which sometimes, although not always, matched the core topics about the research question previously determined by the researchers. Then, categories were refined into broader themes to detect conceptual similarities, refine differences between categories, and discover discourse patterns. We used ATLAS.ti-8 software to manage the analytical process by four team members with different backgrounds (social sciences and public health). These four team members compared codes as well as the resultant categories, ensuring the criteria of credibility (reliability/validity) (Dahlgren et al., 2004). Differences between resultant categories were resolved by a discussion and further clarification among the team members.

2.5. Mixed-methods analysis

We followed a convergent-parallel approach to collect and analyze both the quantitative and the qualitative data (Bryman, 2006; Creswell and Plano Clark, 2011; Edmonds and Kennedy, 2017). Both quantitative and qualitative strands of the study were conducted in parallel, therefore two separate analysis were performed: the quantitative one after the collection of data on park use, and the qualitative one after conducting the SSI and FG, and codifying the perceptions and discourses of the participants. As the data of both strands were available, the analysis were conducted separately, and the results are presented separately. Afterwards, we combined the evidence of each strand of the study (quantitative and qualitative) to compare them and detect areas of convergence or divergence in the findings. Following this approach, we did not give more relevance to either strand of the study, but we focused on whether there was consistency between both quantitative and qualitative data, and we tried to understand the consistency or discrepancy based on the information gathered in each strand of the study, also by comparing them with the available evidence in the research literature.

We organized the results section as follows: first, we summarize the results from the quantitative analysis drawn from our systematic social observation; and, second, we present the qualitative results by the most relevant topics related to park use and physical activity detected during the analysis. In the discussion section, we explain the convergence and divergence areas of both strands and the potential explanations of the observed phenomena.

3. Results

In this section we first present park use trends building on our quantitative analyses, and then report on the five most salient factors, for park use, and especially for physical activity, according to our qualitative analysis: a) Park maintenance and area perception; b) Work constraints; c) Insecurity and crime; d) Differential perceptions by age; e) Availability of organized activities in the parks.

3.1. Quantitative results: park use and physical activity by neighborhood socioeconomic status and sociodemographic characteristics

We registered 10,810 individual observations throughout the quantitative data collection period. Table 3 presents the quantitative data related to park use and PA according to NSES, gender, day of the week, and moment of the day.

In general terms, the number of observations was similar in a regular workday and weekend, although some differences were registered. More people performed medium PA in working days as compared to those during the weekend (68.2% vs 62.8%), but more people performing high PA were registered during the weekend (6.0% vs 11.7%). According to the moment of the day, more people visited these spaces in the afternoon and the evening (32.7% and 39.3%, respectively).

According to the NSES, we registered more visits in parks located in the high-NSES areas (4956) compared to low-NSES areas (2992); in fact, 45.8% of all visits happened in the high-NSES parks. Regarding levels of PA, most of the people performed medium PA (7084, 65.5%). Some differences in PA according to the NSES were observed. For example, the proportion of visitors performing high PA followed a social gradient: That proportion was higher in the high-NSES (11.9%) compared to the medium and low-NSES (9.3% and 3.2%).

According to gender, the proportion of male and females visitants was similar (50.6% and 49.4%, respectively). More females performed low PA compared to men (26.9% vs 24.4%), meanwhile, a higher proportion of men performed high PA (7.1% vs 10.5%). Table 4 shows differences in PA performed according to both the NSES and gender.

Differences in the proportion by gender performing high PA differed by NSES: these were higher in the high-NSES (15.1% males vs 8.9% females) compared to the low-NSES where proportions were more comparable (3.6% males vs 2.8% females). Fig. 2 shows how differences in PA performed by NSES varied by gender: within males, differences by NSES were wider for high PA, while in females the relation was the opposite, differences were wider for the low PA.

Table 5 shows the distribution by age group. Adults were the group that more frequently visited parks (52.6%). The highest proportion of

Table 3
Differences in physical activity level performance by park visitors according to neighborhood socioeconomic status, gender, day of the week, and the moment of the day (N = 10,810).

	Low PA (n, %)	Medium PA (n, %)	High PA (n, %)	Total (n, %)
Neighborhood SES				
High-NSES	1379 (27.8)	2988 (60.3)	589 (11.9)	4956 (45.8)
Medium-NSES	640 (22.4)	1954 (68.3)	268 (9.3)	2862 (26.5)
Low-NSES	753 (25.2)	2142 (71.6)	97 (3.2)	2992 (27.7)
Gender				
Female	1437 (27.0)	3519 (65.9)	381 (7.1)	5337 (49.4)
Male	1335 (24.4)	3565 (65.1)	573 (10.5)	5473 (50.6)
Day of the week				
Working day	1400 (25.8)	3707 (68.2)	326 (6.0)	5433 (50.3)
Weekend	1372 (25.5)	3377 (62.8)	628 (11.7)	5377 (49.7)
Moment of the day				
Morning	63 (6.5)	816 (84.6)	86 (8.9)	965 (8.9)
Noon	916 (25.9)	2363 (66.9)	255 (7.2)	3534 (32.7)
Afternoon	556 (27.0)	1395 (67.7)	109 (5.3)	2060 (19.1)
Evening	1237 (29.1)	2510 (59.0)	504 (11.9)	4251 (39.3)

SES: socioeconomic status; PA: physical activity.

Table 4
Differences on physical activity performance according to the interaction between neighborhood socioeconomic status and gender (N = 10810).

	Low PA (n, %)	Medium PA (n, %)	High PA (n, %)	Total (n, %)
High-NSES				
Female	779 (30.0)	1588 (61.1)	232 (8.9)	2599 (52.4)
Male	600 (25.5)	1400 (59.4)	357 (15.1)	2357 (47.6)
Medium-NSES				
Female	326 (23.8)	935 (68.2)	110 (8.0)	1371 (47.9)
Male	314 (21.1)	1019 (68.3)	158 (10.6)	1491 (52.1)
Low-NSES				
Female	332 (24.3)	996 (72.9)	39 (2.8)	1367 (45.7)
Male	421 (25.9)	1146 (70.5)	58 (3.6)	1625 (54.3)

NSES: neighborhood socioeconomic status; PA: physical activity.

children was found within the medium-NSES (14.4%). Adolescents were the group with the lowest proportion registered across the three NSES, but this was more remarkable in the high-NSES (4.8%). The proportion of seniors was higher in the medium-NSES area (31.2%).

The proportion of males and females was similar in the children and adolescents groups, but some differences were registered in the two other groups: more proportion of females compared to males were found in adults (54.9% vs 50.4%); while the opposite was observed in the senior group (23.8% vs 27.3%).

Across all groups except for the children, a higher use of parks was registered in the working days. However, there were higher differences in the observed proportion of children between a working day and a weekend (9.8% vs 17.7%) compared to the other age-groups.

3.2. Qualitative results: reported factors for park use and physical activity

During the SSIs and FGs, participants spoke about their neighborhoods, specifically about the facilities located within them, such as parks, and related to physical activity (e.g., sports, walking, etc.). The following issues were reported as influencing park use for physical activity:

3.2.1. Park maintenance and NSES area perception

People from the high-NSES area argued that both the facilities (including parks) and clean air were ideal for walking and sports. They mentioned also how parks were integrated with the rest of the built environment, as a broader perception of the public space, was important to encourage park use for walking or PA:

The neighborhood attracts [users] because there are green spaces. Yes, the neighborhood attracts, yes, yes. I think the air is a little cleaner than El Retiro (one of the biggest parks of the city), because El Retiro is in the center of Madrid (FG. Male and female, 45–55 years old. High income. High-NSES)

Specifically, I would tell you this whole neighborhood and this whole area, including its parks, is ideal to walk around and do any type of physical activity, go out to walk. You can walk and do any type of physical activity in neighborhood parks and nearby parks in other neighborhoods (SSI. Active male. 53 years old. Without children. High income. High-NSES).

However, people from the middle and low-NSES neighborhoods reported that their parks were very dirty because of incivilities and also because they felt abandoned by the public administration:

… The same thing happens in the parks. There are very dirty parks, very dirty … most of them, 99% … and no … rubbish bins are broken and they aren't replaced …. and they aren't emptied. But I think the problem is not so much that they do not do it, but rather that there is little civic responsibility (FG. Male and female, 45–55 years old. Stable workers. Medium-NSES)
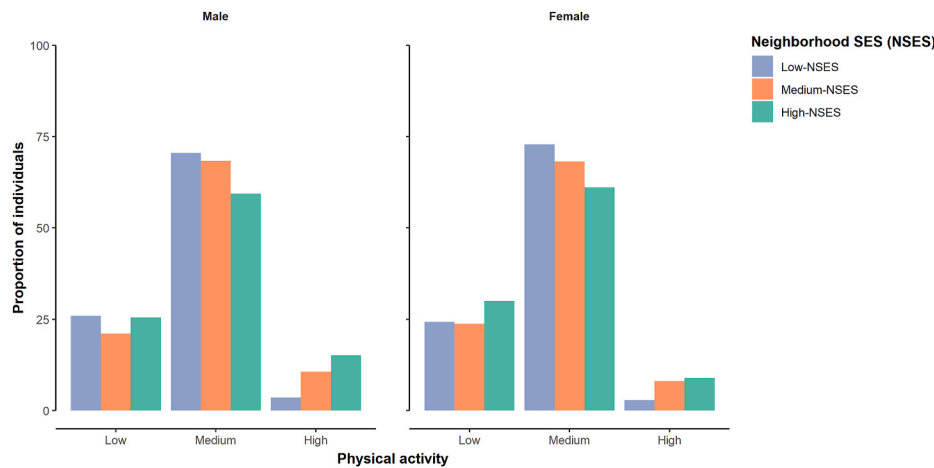
Fig. 2. Differences in the number of observations by PA and gender within each neighborhood according to its socioeconomic status (SES) (N = 10810).

Table 5
Differences on visits to parks of different age-groups according to neighborhood SES, gender, day of the week or the moment of the day (N = 10810).

	Children (n, %)	Adolescents (n, %)	Adults (n, %)	Senior (n, %)	Total (n, %)
Neighborhood SES					
High SES	692 (14.0)	237 (4.8)	2865 (57.8)	1162 (23.4)	4956 (45.8)
Medium SES	411 (14.4)	312 (10.9)	1245 (43.5)	894 (31.2)	2862 (26.5)
Low SES	380 (12.7)	326 (10.9)	1576 (52.7)	710 (23.7)	2992 (27.7)
Gender					
Female	734 (13.7)	404 (7.6)	2928 (54.9)	1271 (23.8)	5337 (49.4)
Male	749 (13.7)	471 (8.6)	2758 (50.4)	1495 (27.3)	5473 (50.6)
Day of the week					
Working day	531 (9.8)	509 (9.3)	2932 (54.0)	1461 (26.9)	5433 (50.3)
Weekend	952 (17.7)	366 (6.8)	2754 (51.2)	1305 (24.3)	5377 (49.7)
Moment of the day					
Morning	34 (3.5)	135 (14.0)	580 (60.1)	216 (22.4)	965 (8.9)
Noon	441 (12.5)	198 (5.6)	1691 (47.8)	1204 (34.1)	3534 (32.7)
Afternoon	210 (10.2)	216 (10.5)	1265 (61.4)	369 (17.9)	2060 (19.1)
Evening	798 (18.8)	326 (7.7)	2150 (50.6)	977 (22.9)	4251 (39.3)

SES: Socioeconomic status; PA: physical activity levels.

> *Our parks are not cleaned. We are also to blame, there is no civic responsibility. People throw bags on the ground instead of in the bins. The parks are not cleaned.* (SSI. Widow female. 83 years old. She lives alone. Low-NSES).

3.2.2. Work constraints

Residents reported as a relevant factor the nature of the job and the availability of leisure-time. People from the low-NSES highlighted feeling physically exhausted after work, which discouraged them from using parks for PA. Additionally, they reported that long-lasted shifts left them without enough leisure-time to visit parks:

> *An example, you wake up at 6 a.m. to go to work and you get to work and you leave at 8 p.m. and you say am I going to a park to do exercise? Because tomorrow you wake up at 6 a.m. again … Then, when you have Sunday off, you say I'm going to rest* (FG. Male, 45–55 years old.

Unemployed and precarious workers. Some immigrant residents. Low-NSES).

3.2.3. Insecurity and crime

People from the low-NSES neighborhood reported feelings of insecurity within the neighborhood as an important barrier for park use. This was associated by the participants with certain social groups who used parks inappropriately. Specifically, three factors were highlighted by respondents: 1) loose dogs; 2) people drinking on the streets (young people and drug users in particular), and 3) young LatinX residents (mainly gangs linked to episodes of violence).

Although there were public parks in the low-SES neighborhood, the above-mentioned factors caused many neighbors to perceive that they could not use them and to use other parks located in other neighborhoods:

> *There is a lot of crime, there are a lot of bad people in the neighborhood who weren't there before. In other words, you can't walk in the park after certain hours. And you always have to be accompanied.* (FG. Seniors older than 65 years old. Retired. Low-NSES).

> *"… But usually we have to get the dogs into the car and take them to another park … in our neighborhood, it's impossible because there is a group of kids who are 20 years old and who usually bring loose pit bulls"* (FG. Females from 45 to 55 years old, with different family situations -with or without children, married, divorced, single-, some immigrants; low-NSES neighborhood)

3.2.4. Differential perceptions by age

In the medium-NSES neighborhood, older adults reported that people across all age-groups used parks for walking, but this was more characteristic of the senior group:

> *People go out to walk. A lot of people go for a walk in the park, at any time of the day. Cold or hot, rain or snow, they are there walking every day. There are people of all ages, but mostly seniors* (FG. Housewives, older than 65 years old. Medium-NSES).

One relevant reason to use these areas reported by seniors from the medium-NSES neighborhood was its role as a place where their grandchildren could socially interact with their friends:

> *Since I have grandchildren, I usually go down to the park. You have to go down to a park, you no longer go for a walk, you go to the park where there are children who interact with children* (FG. Housewives, older than 65 years old. Medium-NSES).

3.2.5. Availability of organized activities in the parks

The variety of organized activities to perform PA in groups or the social cohesion within a neighborhood that leads to the spontaneous organization of these activities were valued as important characteristics that make parks more attractive for visits and PA, especially in the medium-NSES neighborhood:

People do the cholesterol route, which is a path around the neighborhood that also passes through several parks. There are a lot of seniors, women walking around the neighborhood everywhere (SSI. Key informant. Health Center. Medium-NSES).

There is an esplanade next to the pond where we do calisthenics. I already said that I have been doing it for 8 years and there are people who have been there for longer and we do calisthenics there. What has happened is that our group has acquired a life of its own (FG. Housewives, older than 65 years old. Medium-NSES).

As one participant from the medium-NSES reported, these types of activities were so important that the neighbors opposed to their modification or cancellation:

A support staff from the City Council wanted us to modify the schedule and I told him. "We already have a life of our own and we do calisthenics at 9:30 and 10:30 and then if there are volunteers who want to do another schedule, they can do it, but we are here" (FG. Retired male over 65 years old. Medium-NSES).

4. Discussion

Our mixed-methods study showed consistency between the quantitative (systematic social observation) and the qualitative strand (residents' perceptions). Parks within the high-NSES neighborhood were more frequently used by a higher proportion of visitants performing high PA levels, and residents from this high-NSES perceived fewer barriers to use parks. We found more males perform high PA compared to females, and differences were more pronounced in the high-NSES. Fewer seniors and children visited parks in the low-NSES compared to the other neighborhoods, where seniors and female participants reported an unsafe park environment. Adolescents were the group with fewer visits to parks across all NSES.

Extensive research shows that physical activity relates to better health outcomes and that this relationship appears to be not dose-dependent: any physical activity provides some health benefit (Warburton and Bredin, 2017). Nevertheless, physical activity levels are not equally distributed across different social groups (Aleksovska et al., 2019; O'Donoghue et al., 2018; Willey et al., 2010). Considering these inequalities is key in public health research and the design of environments that mitigate health inequities (Anguelovski et al., 2020a,b).

Our study provides data that could explain differences in park use and physical activity across different socioeconomic contexts. The reasons reported by the participants allow for developing an integrated framework for better understanding the relationship between parks, use, and physical activity at different levels: park-level (aesthetics or organized activities), individual-level (gender roles or job characteristics), and contextual-level (neighborhood perceptions of safety concerns). Here, we discuss the main issues reported in the qualitative strand, and weather their convergence or divergence with the quantitative data:

4.1. Less park use in low-NSES and barriers reported by their inhabitants

We found that parks located in high-NSES were more used compared to those located in more disadvantaged areas, similar to previous studies (Cohen et al., 2016; Leslie et al., 2010). Previous studies also found a negative association between neighborhood deprivation and green space accessibility, quality, or other characteristics (Cohen et al., 2012; Hoffimann et al., 2017; Vaughan et al., 2018; Wen et al., 2013).

During the interviews and focus groups, residents from the low-NSES reported the presence of incivilities and insecurity as barriers to visit these spaces. These barriers have been already reported in previous studies (Lapham et al., 2016; Leslie et al., 2010; McCormack et al., 2010). Moreover, these barriers have been shown to have a particularly strong impact on female and working-class residents' use of parks (Cronan et al., 2008; Wilbur et al., 2002; Wilson et al., 2004). Understanding the roots of insecurity and crime is thus important to changing neighbors' perceptions about safety. One potential explanation is that perceptions about neighborhood insecurity are also driven by the social construction of stereotypes about racial and ethnic minorities, specially within those areas with a higher percentage of these social groups (Quillian and Pager, 2001). These stereotypes might have more influence in these neighborhoods, which could be related to the less park use observed in low-NSES and the perceptions reported by their residents. Other studies describe that gentrification has an impact on social stability and cohesion, which could increase conflict and sense of being excluded from space (Osciłowicz et al., 2020; Van Welsem et al., 2006). Another aspect that limited the use of the parks in Madrid as reported by residents was dirtiness and litter, especially in the low and middle-NSES, in line with other studies on the role of poor aesthetic or maintenance on urban park use (McCormack et al., 2010), and on the lower public resources dedicated to park clean up or upgrading in lower-income neighborhoods (Rigolon, 2016).

Residents of the low-NSES reported how their job characteristics and schedule constraints affect their leisure-time availability or tiredness, leading to less motivation or ability for physical activity. Other studies have pointed out the relevant role of occupational determinants on sedentarism (Beenackers et al., 2012; Seiluri et al., 2011). Upgrading or increasing the availability of green spaces could not be a sufficient factor to increase physical activity, and requires more comprehensive policies to improve socioeconomic opportunities and job conditions among the most disadvantaged groups. Furthermore, a more intense PA were registered in weekend days, so policies aim to increase population leisure-time could lead both to increase regular PA, benefiting the more deprived.

4.2. Differences in park use by gender in the different NSES

Generally, female residents visit less these spaces and perform lower levels of physical activity compared to men (Cunningham-Myrie et al., 2019; Derose et al., 2017; Knapp et al., 2019; Vaughan et al., 2018). Our results are consistent with this existing evidence: more females were observed performing low physical activity and performing less high physical activity compared to males. Female residents suffer more often from different types of violence in the streets, so they experience more frequently insecurity, as the analysis of the perceptions showed in low and middle-NSES, and are thus more discouraged from using green public spaces (Osciłowicz et al., 2020). Another explanation could be that female and male residents use parks for different purposes due to gender roles: men usually attend these spaces to perform higher physical activity levels, while women are caring for their children or grandchildren (Cohen et al., 2019; Derose et al., 2017). Furthermore, our analysis showed that differences between males and females, and within both groups, were influenced by the NSES, especially in the female group; more females were performing low physical activity in the high-NSES neighborhoods. Some of these females were caring for their children during the systematic observation, so the more presence of them performing low physical activity in privileged areas could be related to having less economic constraints, and thus more possibilities to take parental leave, compared to females in more underprivileged areas with more unstable economic conditions.

4.3. Park use and perceptions by age group

How individuals interact with green spaces, and their perceptions

about them, change during their life course (O'Donoghue et al., 2018). Participants in our study reported that older adults organized activities within the medium-NSES parks to perform physical activity. Other studies have found that these organized activities are correlated with higher use of these urban assets (Cohen et al., 2012), and might ingrease social cohesion (Jennings and Bamkole, 2019). A lower proportion of older adults was observed in the low-NSES parks, which could be associated with the insecurity as well as the lower quality and maintenance that they reported during the qualitative data collection.

Adolescents were the age-group that was less likely to visit parks. Other studies have shown similar results (Babey et al., 2015). Some of the facilities that adolescents value such as skate parks or courts were present only in the high-NSES parks, as has been reported in other studies on the quality differences of green spaces within the cities (Edwards et al., 2015; Floyd et al., 2011). Besides the facilities, another important barrier described in the literature, and reported during the qualitative research, is park safety (Akpınar, 2020; Babey et al., 2015), although our qualitative groups did not include adolescents.

4.4. Strengths and limitations

The main strength of the study is the use of a mixed-methods approach, which allowed us to have a more comprehensive understanding of park use and their role in promoting physical activity in the city of Madrid, and how individual and neighborhood characteristics have an influence on their use and the perceptions about these spaces. This methodology combines different sources of information that provide potential explanations to the observed phenomena and deepens into the links between park, use, physical activity, and social behavior within cities. The evidence generated through this process could be useful to follow a more population approach framework as Geoffrey Rose proposed (Rose, 1985), focusing on those factors that condition park use and physical activity at the population level. In this regard, studies on the relationship between neighborhoods and health have pointed out the importance of contextual variables on the individual level (Franco et al., 2015). Although the study was conducted in the city of Madrid, the variety of participants and the richness of their discourses and perceptions provided information about the potential pathways and barriers for active park use that could be generalized to other cities with similar urban dynamics. Thus, collecting both individual and contextual variables could lead to a better understanding of urban health and a better design of public policies aimed to increase park use and physical activity within cities. Madrid is also a large, dense, global city where public and green space use is no different from any other place with similar characteristics.

Visiting each park twice and across different moments of the day helped to reduce the confusion related to the variability on park use according to the moment of the week or day. Another strength was our ability to include parks and individuals from neighborhoods of different socioeconomic status to detect the potential effect of contextual variables.

The study also presents several limitations. Not all park users might live in the park area; however, the convergence with the discourses of neighbors in the qualitative analysis reduces the risk of this potential bias. Data obtained from the systematic social observation tool was aggregated and not analyzed at the individual level, which would allow a more accurate analysis of park active use. However, our aggregated data showed differences observed in other studies. Another limitation was the exclusion of some age groups from the qualitative interviews (e. g., kids or adolescents). Thus, further studies are needed to understand which park characteristics are valued by these age-groups. Potential differences in the quality of parks could lead to differences in the use pattern. However, this was minimized by selecting parks with similar characteristics (e.g.: size or facilities provision) in each neighborhood. Furthermore, we considered that by selecting parks with similar characteristics in terms of size and facilities, the differences in park use

registered could be explained by the other elements analyzed throughout the manuscript. The systematic observation was performed following a specific schedule which could not be the most suitable for some age-group according to how they use parks (e.g., adolescents). Another potential limitation is the availability of data on ethnic origin in the quantitative information. However, as the SOPARC relies on observation, a decision to include ethnicity could have led to a misclassification of park users. Last, the sample size of parks does not allow us to make inferences about park use in the entire city of Madrid. Nevertheless, several criteria to select parks and participants were followed to have a variety of green spaces which enable us to catch potential differences both on park use and perceptions about parks and physical activity.

5. Conclusions

Our study showed a differential pattern on park use and physical activity, and analyzed the different residents' perceptions about these spaces and physical activity according to neighborhood socioeconomic status (NSES). Parks were more visited in the high-NSES neighborhood, where a higher proportion of people performed high physical activity (as compared with residents in the middle- and low-NSES areas). In the latter, residents reported several barriers to park use, such as poor maintenance and unsafety. As compared to male residents, a lower proportion of female residents performed high physical activity, who also reported insecurity concerns. The convergent-parallel mixed-methods analysis provided valuable insights on the potential causes that could explain the quantitative evidence, pointing out potential pathways to understand the further implications of inequalities in park use in terms of environmental and health inequities.

A better understanding of how individual factors (e.g, gender or age) and contextual ones (e.g., neighborhood safety or socioeconomic status) influence the unequal relationship between parks, their use, and physical activity, and how those shape individual perceptions, is key to building healthier neighborhood environments for all. These results call for public action and investment in public green spaces to increase their maintenance and availability of organized activities, improving their attractiveness for all ages, and to address residents' perceptions related to security and those contextual factors that constrain their use, especially in underserved urban areas.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.healthplace.2021.102660.

Authors contribution

M.F-V, J.R-N, P.G. and M.F. conceptualized and designed the study; M.F-V and J.R-N prepared the data and wrote the first draft; P.G., M.F., I. A. and J.D., critically revised the paper for intellectual content; J.R-N, P. G. and M.F. performed project supervision and administration, and managed funding acquisition.

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