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Describing physical activity in public open spaces in Brazil: Active City, Healthy City Program

Descrevendo a atividade física em espaços públicos abertos no Brasil: Programa Cidade Ativa, Cidade Saudável

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ABSTRACT

This study aimed to describe the physical activity (PA) in public open spaces (POS) in a medium-sized city in Brazil. The System for Observing Play and Recreation in Communities (SOPARC) was applied to evaluate a representative sample of users in 10 POS which received actions from the Active City, Healthy City Program. The places were evaluated four days a week (Tuesday, Wednesday, Saturday, and Sunday) at four times (8 am, 10 am, 2 pm, and 4 pm). The proportion of users by gender, age group, skin color, and PA level was compared between the POS using the chi-square test for heterogeneity in the STATA software ($p<0.05$). As main results, 32,768 scans were performed in 64 target areas and identified 8,634 individuals. The highest proportion of people were males (58%), adults (38%), with white skin color (97%), and in light or moderate PA (76%). Except for skin color, there was a significant difference in the proportion of all other variables between the POS ($p < 0.05$). In conclusion, the POS was more commonly used by men, adults, and people of white skin color for light and moderate PA. Based on the results, program managers could reallocate resources to increase utilization and PA at each place.

Keywords: Motor activity; Green areas; Parks, Recreational; Behavior observation techniques; Health promotion.

RESUMO

O objetivo deste estudo foi descrever a atividade física (AF) em espaços públicos abertos (EPA) em uma cidade de médio porte do Brasil. O System for Observing Play and Recreation in Communities (SOPARC) foi utilizado para avaliar uma amostra representativa de frequentadores de 10 EPA que receberam ações do programa Cidade Ativa, Cidade Saudável. Os locais foram avaliados quatro dias da semana (terça-feira, quarta-feira, sábado, domingo) em quatro horários (8h, 10h, 14h, 16h). A proporção de frequentadores por sexo, faixa etária, cor de pele e nível de AF foi comparada entre os EPA pelo teste do qui-quadrado para heterogeneidade no software STATA ($p < 0,05$). Como resultados principais, foram realizados 32.768 scans em 64 áreas-alvo e 8.634 frequentadores foram identificados. Foi observada maior proporção de pessoas do sexo masculino (58%), adultos (38%), de cor de pele branca (97%) e em AF de intensidade leve ou moderada (76%). Com exceção da cor da pele, houve diferença significante na proporção das demais variáveis entre os EPA ($p < 0,05$). Em conclusão, os EPA são mais comumente utilizados por homens, pessoas adultas, de cor de pele branca e para a prática de AF de intensidade leve e moderada. Com base nos resultados, os gestores do programa poderiam realocar recursos para aumentar a utilização e a AF em cada local.

Palavras-chave: *Atividade motora; Áreas verdes; Parques recreativos; Técnicas de observação do comportamento; Promoção da saúde.*

Introduction

Despite efforts to increase the physical activity (PA) level worldwide, physical inactivity remains high, affecting 81% of adolescents and 28% of adults[1]. The problem is even more significant among women, the elderly, and the population of low-income countries[1,2]. Estimate that 7% of global deaths can be attributed to physical inactivity, and 500 million new cases of preventable diseases could occur by 2030. The annual impact on health systems will cost US$ 300 billion, significantly affecting middle-income countries[1,2].

Investing one dollar per person per year to reduce risk factors for chronic diseases, including physical inactivity, could save seven million lives in low- and lower-middle-income countries, where 85% of premature deaths are from this cause[3]. The World Health Organization's Global Action Plan on PA highlights 20 evidence-based policy recommendations for increasing PA[4]. The aim is to reduce physical inactivity by 15% by 2030, and the recommendations are related to the Sustainable Development Goals agenda[4]. Actions for constructing, revitalizing, and using public open spaces (POS) to equal access to suitable places are highlighted, in addition to implementing community programs to involve the entire community in regular PA[4].

In Latin America, community programs that combine political and environmental approaches targeting POS show promising results for promoting PA[5–7]. To our knowledge, three studies used systematic observation to evaluate the effectiveness of these programs on POS usage[8–10]. In Bogota (Colombia), the proportion of women and older adults was higher in the parks with PA classes[10], and in Recife (Brazil), the PA level was higher in POS with activities[9]. In Curitiba (Brazil), the proportion of moderate to vigorous PA (MVPA) was higher in larger POS[8]. In this context, the *Cidade Ativa, Cidade Saudável* Program (Active City, Healthy City Program) is an initiative for the optimization of resources by the Department of Sport and Leisure of São José dos Pinhais (Paraná), which was implemented in 2017 as a multisectoral action with the Departments of Health, Education and Social assistance[11]. The program's aim is audacious and foresees the involvement of 40% of the population. In the first year, 511 thousand customer service offered leisure activities for the community (which included PA and sports), and most of the actions took place in POS, in addition to schools, Health Units, among other places[11]. A pilot study showed that women were 57% more likely to realize MVPA in these places[12].

Studies using systematic observation to assess POS in Latin America were conducted in large, dense, and populous cities, which may not represent the contextual reality of smaller cities regarding access to POS and public investment in actions to promote PA[7–10,12]. Also, these studies evaluated the pattern of usage of large and green or natural areas (parks, pocket parks, beaches), which limits the extrapolation of results to smaller community spaces or other structures without those features[12,13]. It is necessary to expand the evidence and describe actions and strategies for promoting PA in smaller cities with different cultural features[7,13]. This study aimed to describe the PA in POS in a medium-sized city in Brazil.

Methods

The data used in this study were from the project "Effectiveness of community programs for PA promoting and reducing sedentary behavior in a medium-sized city in Latin America"[11]. The description of information followed the requirements suggested by Strengthening the Reporting of Observational Studies in Epidemiology.

Rationale, design, city contextualization, and ethical aspects

A quantitative, observational, cross-sectional study was conducted with descriptive and exploratory analyses in a representative sample of users at 10 POS. The research was conducted in São José dos Pinhais (southern Brazil), a medium-sized developed city that comprises 334,620 inhabitants, the Human Development and Gini Index were 0.758 and 0.459, respectively[14]. The geographical area is 946 km^2 (79% rural), and 90% of the residents live in an urban area comprising 42 neighborhoods, 271 census tracts, and the population density is 354 inhab./km^2. The city is 906 m above sea level, has a subtropical climate, and has an average temperature of 20°C. The study was approved by the Research Ethics Committee of the Federal University of Technology – Parana (#2.700.058).

Active City, Healthy City Program

São José dos Pinhais has 142 POS for PA unequally distributed in the city (93% in the urban area)[15]. The program's actions included maintaining, revitalizing, and constructing POS and offering PA classes and sports activities at the Sports and Leisure Centers[11,12]. Approximately USD 1.5 million is invested per year in all program activities. The logical model is available

in the literature[11]. However, managers did not conduct baseline studies and decided to evaluate the "effectiveness" of the actions after the beginning of the implementation. The POS evaluated in this study are the Sports and Leisure Centers, which have free access, operate daily, offer PA classes or sports activities, and allow the usage of structures, such as covered and outdoor courts, sand fields, playgrounds, fitness zones, and walking paths, among others[12,15].

Selection of Sports and Leisure Centers

At the beginning of project planning, the city had 14 Sports and Leisure Centers (POS). The 11 POS available in the urban area were considered eligible for being accessible to 90% of the population[11]. However, one place was excluded on the first day of data collection due to the unsafe and criminality. Thus, 10 POS were evaluated (Figure 1).

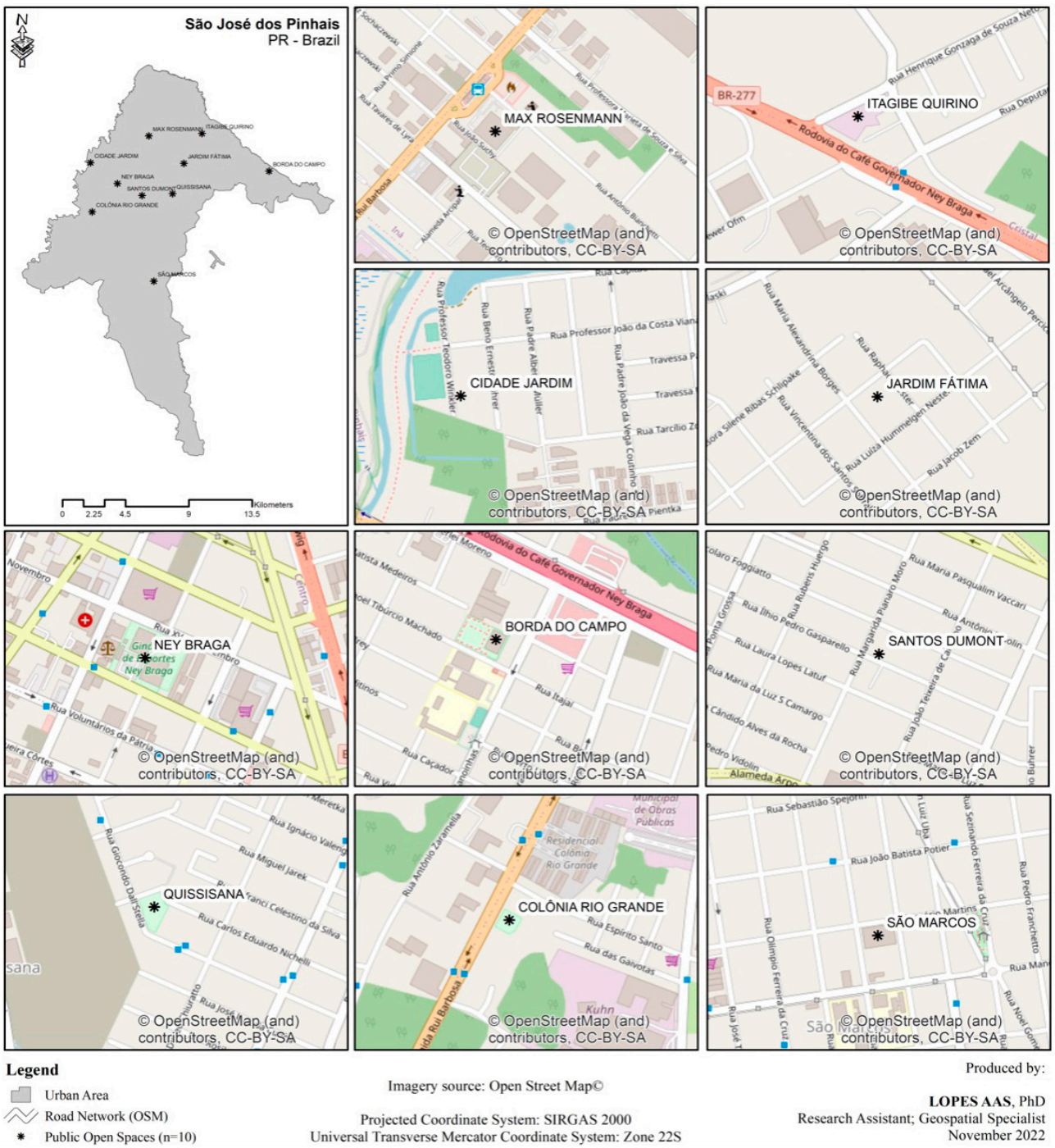

Figure 1 – Location and design of public open spaces evaluated. São José dos Pinhais, Paraná, Brazil, 2018 (n = 10).

Observation of public open spaces usage

It was applied the System for Observing Play and Recreation in Communities (SOPARC)[16], a method based on the momentary sampling of target areas, with systematic scans to obtain information on the user's characteristics[16,17]. The SOPARC is valid, has psychometric attributes ≥94% (internal validity, agreement), and is widely used[16,18,19].

The manual was reviewed[17,20], expanded, adapted for this study, and established standardizations to minimize random errors among observers[15,21,22]. Exploratory visits were conducted at POS on different days and times to identify the potential target areas for PA (N = 64) and the respective observation points. During the observations, the age group was estimated based on the apparent age in children (0-12 yrs), adolescents (13-20 yrs), adults (21-59 yrs), and older adults (≥60 years), and the skin color was coded into two categories as black/brown and white/yellow[23]. Based on the literature review, the activities were classified into four intensities (sedentary, light, moderate, and vigorous)[18]. Sedentary activity or behavior was regarded with anybody's posture observed sitting, lying, or reclining. Light PA was regarded as the activities observed in the pose standing still (≈1.3 METS) or walking slowly (≈2.5-2.9 METS). Moderate PA was classified in behavior like brisk walking (≈3.3-5.5 METS). Vigorous PA was considered activities like fast walking, running, gymnastics, and sports (≥6.3 METS)[21,22,24].

Observer training

Ten observers' physical education practitioners received a 10-hour training from one of the experts in the method (RCF). The theoretical component (4 h) was delivered in two days and included the introduction and familiarization with the technique; conceptual and operational definitions; encoding convention; identification and categorization of gender, age group, skin color, and PA levels; use of the mechanical counter, registration of information in the form and simulation of scans with videos[16,17]. The practical training was delivered in two days (6 h), which included information on mapping target areas, observation points, identification of primary activities, performing scans to observe the characteristics of users, use of the mechanical counter, and recording the information on the form. After the scans, the results were compared among the observers, who received feedback and instructions on standardizing.

Agreement between observers

Seven target areas of a similar POS were selected to simulate natural conditions and obtain acceptable agreement (≥80%)[16]. The 10 observers realized simultaneously and paired scans "side by side" to record information from POS users (9 h in three days)[8,25]. The percentual of agreement and the intraclass correlation coefficient (ICC) were calculated based on the total number of observations of people in the target areas by PA level, skin color, age group, and gender, comparing the observers with one being considered as the reference[16,25]. The average agreement at the PA level for women was 95% (ICC: 0.956; 95%CI: 0.935 - 0.971; $p < 0.001$). For men, the agreement was 93% (ICC: 0.964; 95%CI: 0.912 - 0.960; $p < 0.001$). For skin color, the agreement for women and men was 99% (ICC women: 0.887; 95%CI: 0.632 - 0.924; $p < 0.001$ | ICC men: 0.806; 95%CI: 0.712 - 0.869; $p < 0.001$). Five evaluators completed the training of agreement, the percent agreement was ≥91%, and the observers were considered fit for data collection.

Data collect

The PA classes and services are similar on Monday and Wednesday. As well as on Tuesday and Thursday. Then, Tuesday and Wednesday were intentionally selected to capture possible differences in usage patterns. Also, Saturday and Sunday were chosen because they have different usage patterns than POS. The times were selected to represent the use of the POS at the beginning and end of the morning and afternoon and to enable the data collection logistics.

Each POS was observed for one week, four days, four times per day (8-9 am, 10-11 am, 2-3 pm, 4-5 pm)[19], and four moments per time. One observation was performed by the target area every 15 minutes, sequentially between the areas (8 am, 8:15 am, 8:30 am, 8:45 am, 10 am, 10:15 am, 10:30 am, 10:45 am, 2 pm, 2:15 pm, 2:30 pm, 2:45 pm, 4 pm, 4:15 pm, 4:30 pm, 4:45 pm). Each observation comprised eight scans to identify the PA level by gender and age group (1: child women, 2: adolescent women, 3: adult women, 4: older adult women, 5: child men, 6: adolescent men, 7: adult men, 8: older adult men). Scans were conducted clockwise with speed enough to identify the characteristics of users in the target areas (±1 second per person). The following equation computes the total scans: number of target areas * number of days per week * number of times per day * number of moments per time * number

of scans performed (total of scans: 64 target areas * 4 days per week * 4 times per day * 4 moments per time * 8 scans performed = 32,768 scans). Data were collected between July and August 2018 (Winter, 16.4 ± 5.1ºC).

Contextual and descriptive characteristics of the neighborhood and the POS

A street network buffer of 500 meters around POS was used to compute the population indicators based on secondary data from the Brazilian Institute of Geography and Statistics (IBGE - gender, age, and income). More information is available in the literature[12,15]. The distance from downtown was calculated, and analyses were performed on ESRI® ArcGIS 10.1. We used the places' addresses on the Walk Score® website to estimate the region's walkability[26]. The POS managers informed the number and diversity of PA classes and services.

Statistical analysis

Data were analyzed with descriptive statistics by average, standard deviation, and relative frequency distribution. The chi-square test for heterogeneity was used to compare the proportion of users by gender, age, skin color, and PA level by POS. The analyses were performed in STATA software ($p<0.05$), and the figures were elaborate in Microsoft Excel®.

Results

About 15 thousand people lived around 500 m buffer from the POS, and the income was BRL R$ 8,079, with 51% of women and 62% of adults (Table 1). The POS close to downtown was Ney Braga (NB: 1.4 km), which was in a region of high walkability (Walk Score®: 91, Walker's Paradise). The POS furthest from the downtown was Borda do Campo (BC: 15.1 km) in an area of low walkability (Walk Score®: 61, Somewhat Walkable) (Table 2).

Sixty-four target areas were observed, with an average size of 249±94 m² (37% courts and 79% usable) (Table 2). In 32,768 scans, 8,634 individuals were observed (216 per day) (Table 2). Considering the number of target areas, the POS with the highest volume of individuals per day was Borda do Campo (BC: 46), and the lowest was São Marcos (SM: 21) (Table 2).

The POS with the highest number and variety of activities was Max Rosenmann (MR: 66 and 15, respectively), and the lowest was Cidade Jardim (CJ: 26 and 7, respectively) (Figure 2 and Appendix).

Regarding individual characteristics, it was observed highest proportion of people were males (58%),

Table 1 – Description of neighborhoods, census tracts, and neighbors of public open spaces (POS). São José dos Pinhais, Paraná, Brazil, 2018 (n = 10).

	Name and abbreviation of POS										
	All POS	Borda do Campo (BC)	Cidade Jardim (CJ)	Colônia Rio Grande (CRG)	Itagibe Quirino (IQ)	Jardim Fátima (JF)	Max Rosenmann (MR)	Ney Braga (NB)	Quissisana (QS)	Santos Dumont (SD)	São Marcos (SM)
Neighborhood characteristics											
Territorial extension (km²)	51	12	3	3	6	6	3	3	3	2	11
Households (n)	32,762	5,450	3,452	834	4,935	2,372	3,268	2,772	3,458	3,532	2,689
Inhabitants (n)	57,430	6,486	3,893	6,059	3,817	3,325	5,060	4,802	5,535	8,868	9,585
Census tracts characteristics*											
Streets segments (n)	903	110	77	64	30	84	71	113	91	121	142
Households (n)	4,663	626	202	515	77	168	185	425	604	930	931
Inhabitants (n)	14,964	2,137	671	1,536	264	557	594	1,226	2,026	2,952	3,001
Income (BRL R$)**	8,079	5,208	5,007	6,805	2,673	3,216	7,126	26,593	5,921	10,710	7,532
Neighbors characteristics*											
Gender											
Men	49%	49%	44%	47%	51%	50%	51%	46%	49%	49%	50%
Women	51%	51%	56%	53%	49%	50%	49%	54%	51%	51%	50%
Age group											
Children (0-12 yrs)	7%	8%	8%	8%	8%	9%	7%	5%	8%	6%	8%
Adolescents (13-20 yrs)	13%	14%	15%	13%	15%	15%	13%	8%	14%	12%	14%
Adults (21-59 yrs)	62%	64%	58%	65%	63%	63%	64%	56%	64%	60%	63%
Older adults (≥ 60 yrs)	18%	14%	20%	14%	14%	13%	16%	31%	15%	22%	15%

*Contained within 500 meters of each POS, **Average gross monthly income of those responsible for the household

Table 2 – Description of characteristics, target areas, and observations of public open spaces (POS). São José dos Pinhais, Paraná, Brazil, 2018 (n = 10).

	All POS	Abbreviation of POS name									
		BC	CJ	CRG	IQ_	JF	MR	NB	QS	SD	SM
Characteristics of POS											
Distance from downtown (km)	–	15.1	2.2	4.4	9.9	8.0	4.8	1.4	6.2	3.7	10.2
Walk Score®	–	61	51	37	28	19	78	91	50	66	44
Walk Score® classification	–	SW	SW	CD	CD	CD	VW	WP	SW	SW	CD
Average size ± s.d. (m^2)	4,613 ± 4,871	5,343	251	1,924	2,423	1,141	13,499	13,399	3,260	4,230	3,567
Target areas											
Quantity (n)	64	7	3	4	4	3	12	12	7	6	6
Average size ± s.d. (m^2)*	249 ± 94	520 ± 502	222 ± 87	234 ± 93	307 ± 188	221 ± 116	254 ± 354	235 ± 146	246 ± 132	321 ± 150	234 ± 224
Minimum – maximum (m^2)*	5 – 800	89 – 1,446	122 – 272	127 – 288	90 – 416	88 – 288	5 – 800	18 – 400	105 – 401	157 – 547	60 – 480
Total size (m^2)*	15,707	3,120	666	703	922	664	2,795	2,583	1,478	1,604	1,172
Average walking path length ± s.d. (m)	241 ± 100	262	–	166	212	–	100	440	223	294	228
Average walking path width ± s.d. (m)	2 ± 1	1.5	–	1.0	1.0	–	5.0	1.5	1.1	1.1	1.0
Type of target areas											
Court	37%	29%	67%	50%	50%	67%	26%	33%	29%	50%	33%
Fitness zone	15%	14%	0%	25%	25%	33%	8%	17%	14%	17%	17%
Walking path	12%	14%	0%	25%	25%	0%	8%	8%	14%	17%	17%
Playground	8%	14%	0%	0%	0%	0%	8%	8%	14%	16%	0%
Lawn or green area	8%	29%	33%	0%	0%	0%	0%	0%	29%	0%	0%
Physical activity/ exercise room	6%	0%	0%	0%	0%	0%	18%	0%	0%	0%	33%
Sand court	5%	0%	0%	0%	0%	0%	0%	26%	0%	0%	0%
Strength exercise station (outdoor)	3%	0%	0%	0%	0%	0%	8%	8%	0%	0%	0%
Strength training room	2%	0%	0%	0%	0%	0%	8%	0%	0%	0%	0%
Capoeira area	2%	0%	0%	0%	0%	0%	8%	0%	0%	0%	0%
Bleacher	2%	0%	0%	0%	0%	0%	8%	0%	0%	0%	0%
Characteristics of target areas											
Usable	79%	89%	83%	72%	56%	75%	69%	92%	87%	95%	59%
Accessible	78%	89%	83%	53%	54%	75%	70%	90%	87%	97%	61%
Empty	64%	53%	69%	74%	73%	60%	70%	65%	64%	44%	73%
Equipped	18%	14%	30%	20%	25%	29%	17%	18%	8%	23%	13%
Organized	16%	12%	27%	18%	22%	27%	15%	19%	5%	16%	16%
Supervisioned	11%	5%	19%	18%	15%	8%	16%	16%	3%	10%	3%
Dark	7%	0%	0%	0%	0%	1%	31%	6%	0%	0%	0%
Observations											
Scans (n)	32,768	3,584	1,536	2,048	2,048	1,536	6,144	6,144	3,584	3,072	3,072
Total of individuals (n)	8,634	1,286	321	416	399	451	1,511	2,043	674	1,019	514
Proportion of individuals (%)	100%	15%	4%	5%	5%	5%	18%	24%	8%	12%	6%
Average of individuals per day (n)	216	322	80	104	100	113	378	511	169	255	129
Average of individuals per day, and target area (n)	32	46	27	26	25	38	31	43	24	42	21
Average of individuals per day, target area, and period (n)	8	11	7	7	6	9	8	11	6	11	5

s.d. = standard deviation, *except for walking path, N.A. = Not available, SW: Somewhat Walkable, CD = Car-Dependent, VW = Very Walkable, WP = Walker's Paradise

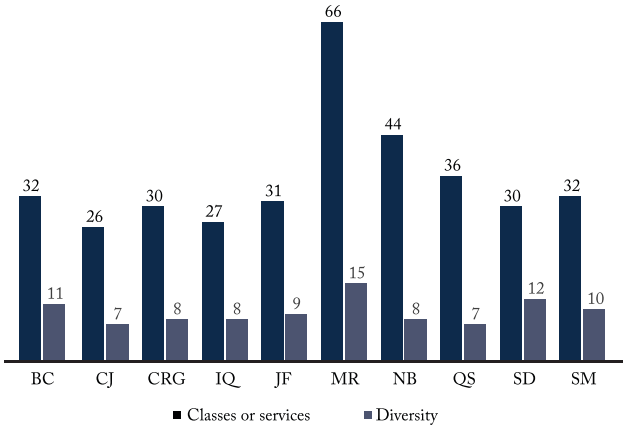

Figure 2 – Number of physical activity classes or services available in each public open space*. São José dos Pinhais, Paraná, Brazil, 2018 (n = 10) (*available on days and times of data collection: Tuesday, Wednesday, Saturday, Sunday; 8-9 am, 10-11 am, 2-3 pm, 4-5 pm).

adults (38%), with white skin color (97%), and in light or moderate PA (76%) (Figures 3 A, B, C, and D, respectively). The highest proportion of males was observed in the POS Cidade Jardim (CJ: 93%), and the lowest was in Max Rosenmann (MR: 45%) (Figure 3 A). The highest proportion of adults was in Cidade Jardim (CJ: 61%), and the lowest was in Colônia Rio Grande (CRG: 19%) (Figure 3 B). All users of the POS Itagibe Quirino (IQ) were white, and the proportion in the others varied between 91-99% (Figure 3 C). All Cidade Jardim (CJ) users were observed practicing some PA (light: 27%, moderate: 57%, vigorous: 16%). The highest proportions of vigorous PA were observed at Colônia Rio Grande (CRG: 26%) (Figure 3 D).

Except for skin color, there was a significant difference in the proportion of the other variables between the POS ($p < 0.05$).

Discussion

This study aimed to describe the PA in 10 POS that received the actions of a community program in a medium-sized city in Brazil. This study shows strengths and fills essential gaps in the Latin American context, such as exploring different POS (besides parks), understanding how different population subgroups use POS, and identifying contextual characteristics of the places and neighborhoods[7,13]. Based on the literature review, this is the fourth study conducted in Latin

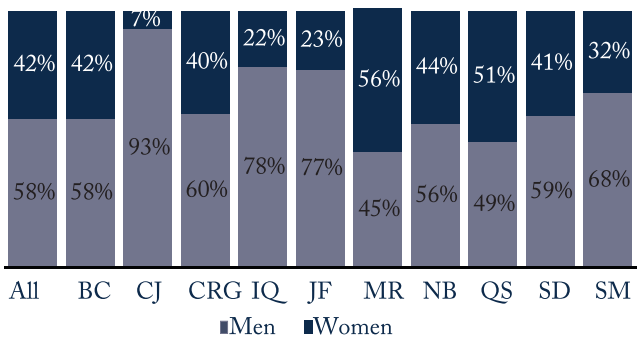

Figure 3-A: Usage of POS by sex ($p = 0.003$).

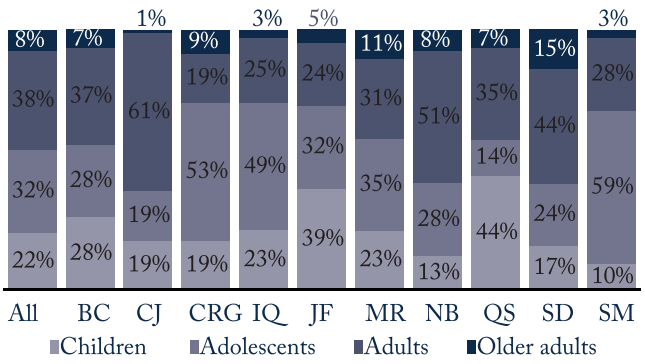

Figure 3-B: Usage of POS by age group ($p = 0.008$).

Figure 3-C: Usage of POS by skin color ($p = 0.972$).

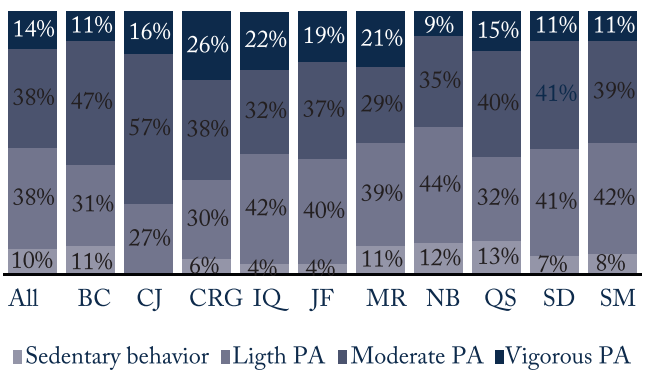

Figure 3-D: Usage of POS by physical activity (PA) level ($p = 0.021$).

Figure 3 – Usage of public open space (POS) by sex (A), age group (B), skin color (C), and physical activity level (D). São José dos Pinhais, Paraná, Brazil, 2018 (n = 8,634)

America that used systematic observations to analyze the effectiveness of community programs for PA actions on the pattern of POS usage. However, it is the first study conducted in a medium-sized city and other POS than a park. The quantitative approach, the geoprocessing data, and the systematic observation of a representative sample of 10 POS allowed us to verify important contextual characteristics to promote the place's usage at the community level[7,13].

It was observed that the highest proportion of male people (58%), adults (38%), white skin color (97%), and providing light or moderate PA (76%). Our results for the general profile of POS usage are like other research conducted in Latin America that used the SOPARC method[8–10,12,27]. Economic, social, and cultural inequalities lead to inequities in access to health services and programs for the most vulnerable groups, such as blacks and browns[28,29]. The low proportion of individuals with this characteristic should not be interpreted only from a biological aspect, but mainly by the social variables with a high load in the historical and cultural construction that determine the health of racial groups[30].

The above-mentioned descriptive approach that presents differences in POS utilization by gender, age, and skin color is relevant to provide equity lenses for analyzing the public policy being implemented and the advocacy needed[7,13]. Brazil is one of the worldwide leaders in social inequalities and, consequently, presents huge health-related inequalities[7,30]. In leisure-time PA (LTPA), the most recent survey conducted at the national level showed that there is a gap of 31 percentage points (p.p.) between the wealthiest 20% compared to the 20% poorest of the population (also showing an increasing wealth inequality compared to the previous surveys conducted in 2013)[28]. Gender PA inequalities show a persistent and pro-men pattern from 2013 to 2019[28]. Multiple levels of influence determine these inequalities but are also closely related to access to PA places. Based on the National Health Surveys, the prevalence of perceived access to POS is 42 p.p. higher among the wealthiest group compared to the poorest population[28].

Our results showed that the primary POS users are those with individual characteristics associated with a higher LTPA level (men, adults, and white skin color). Observing the scenario of persistent and remarkable inequalities and considering the possibility of increasing such differences, equity-oriented public policies are necessary[7,13,29]. Characteristics of activities in terms of time, type, and distribution in poor neighborhoods might be strategies to be implemented, and future studies should be conducted to assess potential changes in the patterns of use in the POS and their activities [7,13].

The integrated interpretation of POS characteristics can generate insights for future studies[13]. For example, the POS Cidade Jardim (CJ) was one of the small places (251 m^2), with few (n=3) and small target areas (222±87 m^2) (Table 2), and few classes and diversity of activities (26 and 7, respectively – Figure 2). However, the number of individuals per day, target area, and period (n=7) were higher than more extensive POS with more structures [e.g., São Marcos (SM), n= 5]. The target areas of Cidade Jardim seem "to be attractive" to males (97%) and adults (61%), and all were observed in some PA (73% in MVPA, higher than all others POS) (Figure 3).

Seven limitations must be considered for the adequate interpretation and extrapolation of the results. First, the POS was observed for one week; and the usage pattern may change in other months weeks. Second, the observations took place in winter; and although the temperature of the city shows significant daily variation in different climatic seasons, the usage may be different in spring, summer, or autumn. Third, for logistical and security reasons for the project team, the data was not collected at night, a period in which they offer many PA classes, such as dance, with the presence of women (±100 per class). Fourth, it was not possible to assess one POS of a neighborhood with high social vulnerability and a high occurrence of drug trafficking and crime, which would be important to analyze the impact of these characteristics on the pattern of usage of the place. Fifth, the city has different types of POS, but without an offer of PA or sports classes, which may affect the usage pattern of these locations, and the results cannot be extrapolated to them. Six, the absence of observation of POS without activities could provide information about the effectiveness of these actions in the pattern of usage, something that is not possible with the present study's data. Finally, it was not possible to evaluate the usage of POS before the implementation of the actions of the community program, which limits the establishment of the causal relationship between the exposure factors and the analyzed outcomes.

In conclusion, the POS was more commonly used by men (58%), adults (38%), and people of white skin color (97%) for light and moderate PA (76%). Based

on these results, managers can reallocate resources and actions more effectively in each POS, aiming to increase the usage and PA level. Future studies could 1) evaluate other POS or schedules without PA classes to analyze the impact of these actions on the usage pattern, 2) assess the impact of revitalizing areas or offering different activities on the POS usage, 3) explore how each target area and the quality of the places can impact the PA level in different age groups and genders, 4) analyze the association between the characteristics of the built environment surrounding and pattern of POS usage, 5) research using a representative sample to analyze the associated factors with the usage of the POS, and finally, 6) to evaluate the users to identify the demands, needs, and satisfaction with the place and the activities offered[13].

Conflict of interest

The authors declare no conflict of interest.

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Author's contributions

Silva AT participated in the initial project design, the conceptualization of the paper, the interpretation of the data, and the initial writing of the manuscript. Santos LP participated in the writing of the manuscript. Custódio IG participated in the design and planning of the project; pilot study; collection, analysis, and interpretation of data, and writing of the manuscript. Truchym TC participated in the project's initial planning; collaborated in collecting, analyzing, and interpreting data and reviewing the manuscript. Crochemore-Silva I and Rech CR participated in data interpretation and critical review of the manuscript. Lopes AAS coordinated the collection and analysis of geoprocessing data and participated in the interpretation of data and critical review of the manuscript. Rodriguez-Añez CR participated in the project's initial design, data interpretation, and critical review of the manuscript. Fermino RC participated in the design and planning of the project at all stages, coordinated the collection; led the analysis and interpretation of data; and wrote and critically reviewed the manuscript in all its stages.

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Appendix

Table – Physical activity classes or services available in Public Open Spaces (POS)*. São José dos Pinhais, Paraná, Brazil, 2018 (n = 10).

		Abbreviation of POS name's									
		BC	CJ	CRG	IQ	JF	MR	NB	QS	SD	SM
Fights											
1	Capoeira	0	1	0	0	0	3	0	0	0	0
2	Jiu-jitsu	2	0	0	1	1	1	0	0	1	0
3	Judo	0	0	0	0	1	0	0	0	0	0
4	Karate	0	0	2	2	0	3	0	5	1	2
5	Mixed Martial Arts	1	0	0	0	0	0	0	0	0	0
6	Muai tai	0	0	1	4	0	0	0	0	0	0
7	Olympic Wrestling	1	0	0	0	0	0	0	0	0	0
8	Taekwondo	0	0	0	0	0	6	0	0	0	0
	Subtotal of classes	4	1	3	7	2	13	0	5	2	2
	Subtotal of diversity	3	1	2	3	2	4	0	1	2	1
Physical activities or exercises											
1	Aerobics and rhythms	1	0	1	1	1	1	0	0	1	0
2	Functional exercises	1	0	1	1	1	4	0	1	1	1
3	Gymnastics for older adults	1	1	0	0	1	0	0	0	1	1
4	Guided walk	1	0	0	0	0	2	0	0	0	1
5	Pilates	0	0	0	0	0	0	0	0	1	0
6	Physical, sports, and social activities for older adults	0	0	0	0	0	1	2	0	0	0
	Subtotal of classes	4	1	2	2	3	8	2	1	4	3
	Subtotal of diversity	4	1	2	2	3	4	1	1	4	3
Sports (recreacional)											
1	Athletics	0	0	0	0	0	4	1	0	1	0
2	Beach volleyball	0	0	0	0	0	0	3	0	0	0
3	Basketball	0	0	0	0	0	2	0	2	0	0
4	Futsal (indoor soccer)	5	5	6	4	6	8	0	11	6	7
5	Handball	0	0	0	0	0	1	0	0	0	0
6	Initiation to team sports on the court**	2	1	0	2	2	3	0	0	1	2
7	Table tennis	0	0	0	0	0	0	0	0	0	2
8	Volleyball	1	2	3	0	2	11	0	2	3	1
	Subtotal of classes	8	8	9	6	10	29	4	15	11	12
	Subtotal of diversity	3	3	2	2	3	6	2	3	4	4
Sports (training for performance)											
1	Basketball	0	0	0	0	0	0	2	0	0	0
2	Futsal (indoor soccer)	0	0	0	0	0	0	9	0	0	0
3	Volleyball	0	0	0	0	0	0	11	0	0	0
	Subtotal of classes	0	0	0	0	0	0	22	0	0	0
	Subtotal of diversity	0	0	0	0	0	0	4	0	0	0
Other activities and services *(hours available to…)*											
1	Free usage	16	12	12	12	16	0	0	12	10	12
2	Location of structures	0	4	4	0	0	0	0	3	3	3
3	Sports events	0	0	0	0	0	16	16	0	0	0
	Subtotal of services	16	16	16	12	16	16	16	15	13	15
	Subtotal of diversity	1	2	2	1	1	1	1	2	2	2
	Total of classes or services	32	26	30	27	31	66	44	36	30	32
	Total of diversity	11	7	8	8	9	15	8	7	12	10

*Classes and services available on days and times of data collection (Tuesday, Wednesday, Saturday, Sunday; 8-9 am, 10-11 am, 2-3 pm, 4-5 pm). **Futsal (indoor soccer), volleyball, handball, basketball.