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ORIGINAL ARTICLE

Does being an Olympic city help improve recreational resources? Examining the quality of physical activity resources in a low-income neighborhood of Rio de Janeiro

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Abstract
Objectives To assess the quality of public physical activity resources (PARs) in a low socio-economic community in the Olympic city of Rio de Janeiro.
Methods The Physical Activity Resource Assessment (PARA) instrument was used to assess all 29 public PARs located in this community. A quality indicator (QI) was developed based on PARA results.
Results The average QI of the areas assessed was 1.3 ± 6.40 and the median 1 point, a considerably low score if compared to scores of public PARs across the city (13.6 ± 4.91 and 13 points).
Conclusions The urban regeneration necessary for hosting mega-sport events is frequently promoted as an opportunity to enhance PARs and therefore to improve health through physical activity (PA) participation. Findings indicate that the high number of elements that can discourage the use of these spaces may help explain the low level of PA during leisure time that has been previously reported of residents of the same neighborhood. Whether using the Olympic Games as catalyst or not, policies designed to encourage PA should focus also on the built environment.

Keywords Built environment · Physical activity resources · Rio 2016 Olympic Games · Low socio-economic status community

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Introduction

Despite widespread knowledge of the health benefits of physical activity (PA), high rates of sedentary behaviors, particularly during leisure time, still predominate worldwide (WHO 2010). In Brazil, just 33.8 % of the adult population achieves the recommended levels of leisure-time physical activity (LTPA) required to attain health benefits (Ministério da Saúde 2014).

In the context of high rates of physical inactivity during leisure time (WHO 2011), many authors suggest that not only personal choices are responsible for the low rates of PA, but also that environmental and policy contexts can play an important role in the adoption of healthy behaviors, including regular and sustainable PA participation (Abraham et al. 2010; Ball et al. 2006; Sallis et al. 2008). Accordingly, many scholars have tried to assess the

influence of the built environment on levels of PA (Foster and Giles-Corti 2008; Humpel et al. 2002; Sallis and Glanz 2006), with results indicating that the built environment is indeed an important predictor for PA engagement (Gordon-Larsen et al. 2006; Rodríguez et al. 2012; Troped et al. 2010).

A particular focus of research in this field has been the characteristics of the neighborhood of residence and their impact on PA behavior of the local population (Adamus et al. 2012; Gidlow and Ellis 2011). Results indicate that living in a more walkable neighborhood increases the adoption of the habit of walking for exercise (Berker et al. 2007); physical activity resources (PARs) are less available in poor/minorities neighborhoods (Moore et al. 2008); and the quality and maintenance of existent PARs is an economical strategy to increase PA participation (Adamus et al. 2012).

An important issue regarding PARs and LTPA practice in the context of this study refers to the sport mega-events being hosted in Brazil in this decade, particularly in the city of Rio de Janeiro (i.e., 2014 FIFA World Cup and 2016 Summer Olympic Games). The environmental urban regeneration necessary for hosting large scale sport events has been considered by government agencies and event organizing committees as a great opportunity for enhancing the number of PARs and improving health quality through sport participation (Department for Culture, Media and Sport 2012; London 2004, 2012; Rio de Janeiro 2016, 2009), particularly in low socio-economic status (SES) communities (Rio de Janeiro 2009, 2016). However, there is still lack of empirical evidence to support this claim (House of Lords 2013; Minnaert 2012; Weed et al. 2009).

In this context, the main objective of the present study is to evaluate and discuss the quality of public PARs available in a low SES community in Rio de Janeiro.

Methods

Data collection

Data were collected in Cidade de Deus, a low SES neighborhood in the western region of Rio de Janeiro, and focused on the assessment of public PARs available within this community. Cidade de Deus occupies an area of 1.2 km^2, has a population of 36,515 inhabitants and a population density of 32,523 inhabitants per km^2. This neighborhood presents social indicators among the most deprived in the city, ranking 135th in the Social Development Index (SDI), among 158 neighborhoods in Rio de Janeiro (Cavallieri and Lopes 2008). Significantly, this low SES community is the most populated in the vicinity of the future Olympic Park (circa 6 km). Data were collected between April and July 2012 by two trained researchers in the application of the data collection instrument.

Sampling and measures

The Physical Activity Resource Assessment (PARA) instrument (UNDO 2011), a direct-observational tool, was used to assess the features (presence of PA infrastructure, e.g., football field, basketball court, exercise stations), amenities (supporting structures such as drinking fountains, bathrooms and lighting) and incivilities (elements that can discourage the use of the space, e.g., graffiti, litter) of all 29 'praças' (i.e., PARs) in Cidade de Deus. In Brazil, praças are traditional open built areas that provide a space for passive and active leisure, usually presenting some basic PA infrastructure and frequently hosting public sport and PA programs (Santos 2009).

The scores for all variables measured were achieved by applying PARA's guidelines for measurement: 13 features and 12 amenities are assessed on a scale from 0 to 3, where 0 = not present, 1 = poor, 2 = mediocre, 3 = good; while 12 incivilities are scaled from 0 to 3, where 0 = not present, 1 = little/few, 2 = some, 3 = a lot (UNDO 2011).

The PARA instrument has been used internationally and previous studies have shown that this check-list instrument has a good inter-rater reliability (ks > 0.77) (Adamus et al. 2012; Heinrich et al. 2007; Lee et al. 2005).

Analysis

In order to determine the quality of the public PARs investigated, a quality indicator (QI) was calculated by summing the scores assigned to the features and amenities categories and subtracting the score generated by the incivilities category (Vieira et al. 2013). The possible minimum and maximum values for QI were −36 and 75, respectively.

A *k*-means cluster analysis technique was used to investigate the praças' quality based on the three components assessed: features, amenities, and incivilities. The number of clusters to be used was determined by the between-clusters inertia-increase criteria. In cluster analysis, between-clusters inertia indicates the degree of separation between clusters; the higher the between-clusters inertia, the higher the cluster separation.

Results

The QIs of the PARs ranged from −8 to 18 points. The average QI of the areas assessed was 1.3 ± 6.40 and the median was equal to 1 point.

Figure 1 presents the increases in the between-clusters inertia. The highest increase is observed from two to three clusters. Three clusters were therefore used for the analysis as the increase in inertia after this point was too low to justify the increment in the number of clusters.

Figure 2 shows the three groups obtained by the combination of features, amenities and incivilities after the cluster analysis.

Both groups 1 ($n = 14$) and 2 ($n = 8$) had negative QIs (-2.1 ± 4.02 and -0.4 ± 2.83, respectively), presenting a combination of low scores for amenities and features and a high score for incivilities. Group 3 ($n = 7$) had the highest QI among the three groups (10.3 ± 4.61), presenting the highest scores in the features and amenities categories and the lowest score in the incivilities category (Table 1).

Discussion

In general, the quality of Cidade de Deus' PARs is very low, with QIs ranging from -8 to 18 points, an average of 1.3 ± 6.40, and the median equal to 1 point. With the exception of group 3, which comprises praças with the highest QI, groups 1 and 2 had negative mean scores. Incivilities were shown to be the most important variable for the low quality of PARs in Cidade de Deus. Low scores were also found, however, in the features and amenities of PARs in groups 1 and 2, which indicates that PA infrastructure is frequently either not available or not in good condition to be used.

As a point of comparison, Vieira et al. (2013) analyzed 38 PARs located in different neighborhoods across Rio de Janeiro and found considerably higher QI scores (ranging from 7 to 20 points, average of 13.6 ± 4.91 and median

Fig. 1 Between-clusters inertia according to the number of clusters (Cidade de Deus, Rio de Janeiro, Brazil, April–July, 2012)

equal to 13 points). In their study, the public spaces located in neighborhoods with lower SDI levels were more likely to have a lower QI. However, even the PARs that presented the lowest quality scores in that study presented an average QI considerably higher (9.3 ± 2.16) than the average QI of PARs in Cidade de Deus. The fact that Cidade de Deus' SDI is lower than the lowest SDI neighborhood included in Vieira et al.'s (2013) study might be a potential explanation for such a difference. Studies outside Brazil have constantly indicated that low SES communities tend to have less availability of PARs and/or PARs of lower quality than those found in higher income neighborhoods (Crawford et al. 2008). Importantly, in the Vieira et al.'s (2013) study the averages found for features were similar in both high and low QI groups, with significant differences being found only for amenities and incivilities; in Cidade de Deus both features and amenities were of low quality and incivilities were also still largely prevalent. Similarly, Suminski et al.'s study (2012) showed that parks located in neighborhoods with higher percentages of racial/ethnic minorities, which is also the case of Cidade de Deus, present poorer quality features and amenities.

In regard to the different characteristics of PARs and how they affect the overall quality and use of these spaces, Adamus et al. (2012) found that although the features and amenities of PARs that were free of charge were better than chargeable PARs, those free access PARs had a higher number of incivilities. Significantly, Heinrich et al.'s (2007) study, which investigated PARs located in public housing neighborhoods in Kansas City, USA, observed that accessibility to free-of-charge PARs was positively associated with the number of days per week in which local residents engaged in vigorous PA. However, the authors found that there is a negative association between the average number of incivilities present in the neighborhood's PARs and the number of days local residents walk for leisure per week. In Cidade de Deus, where all PARs analyzed were free of charge, incivilities were extremely frequent. Considering the findings of previous studies and the characteristics of the built environment for PA practice in Cidade de Deus, it is possible to suggest that the low engagement with PA during leisure time found among women residents of this neighborhood (Sousa-Mast et al. 2015) might be related to the low quality of PARs encountered in this community.

The strategic location of Cidade de Deus, in close proximity to the 2016 Olympic Games Olympic Park, suggests that this low SES community could greatly benefit from the public investments in urban regeneration being made across Rio de Janeiro. Importantly, the delivery of opportunities for PA practices well before and after the games, particularly for low SES communities, was a stated commitment of the Rio 2016 Organizing Committee as part

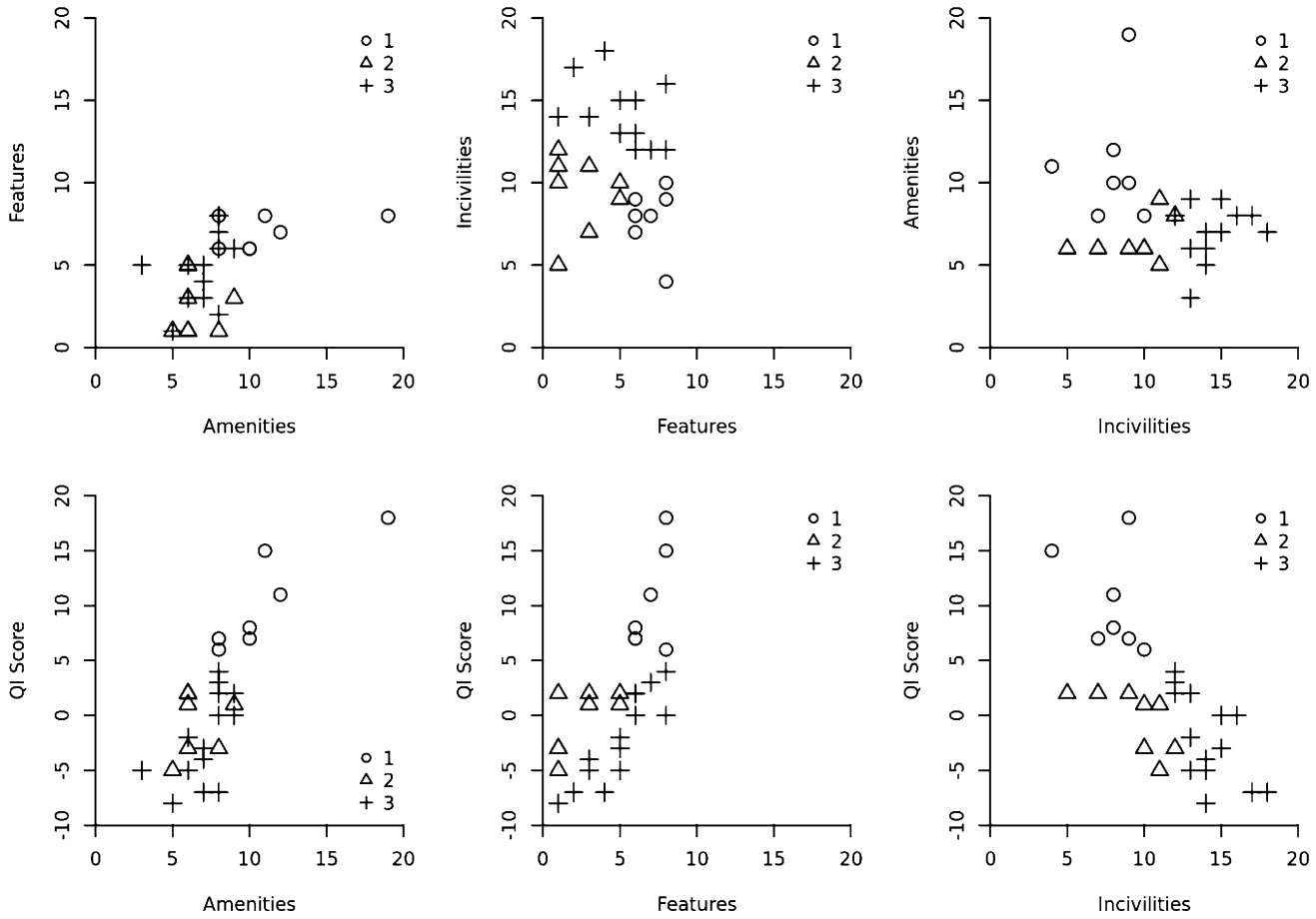

Fig. 2 Distribution of praças according to the cluster, features, amenities, incivilities, and quality indicator (Cidade de Deus, Rio de Janeiro, Brazil, April–July, 2012)

Table 1 Results of assessment of the physical activity resources visited in Cidade de Deus, Rio de Janeiro, Brazil, April–July, 2012

	n	Quality indicator			
		Total (mean ± SD)	Features	Amenities	Incivilities
Group 1	14	−2.1 ± 4.02	4.9 ± 2.13	7.1 ± 1.64	14.1 ± 1.88
Group 2	8	−0.4 ± 2.83	2.5 ± 1.77	6.5 ± 1.31	9.4 ± 2.33
Group 3	7	10.3 ± 4.61	7.0 ± 1.00	11.1 ± 3.76	7.9 ± 1.95
Total	29				

of their Olympic legacies program (Rio de Janeiro 2009, 2016). The results of this study indicate that efforts in this direction are overdue. Unfortunately, however, there is a lack of evidence to suggest that being an Olympic city contributes to increasing PA and sport participation at a local population level (Demarzo et al. 2014; Mahtani et al. 2013; McCartney et al. 2010). It is suggested that for such benefit to occur, clear investment in PA and sport infrastructure as well as positive changes in policy and practice must to be implemented as part of the hosting plans (Coalter 2004; Homma and Masumoto 2013; Veal et al. 2012). In this sense, the present study highlights the need for such investments to be appropriately made in Rio de Janeiro in general, and in low-income communities such as Cidade de Deus specifically, as the 2016 Olympic Games fast approaches.

Conclusions

This study focused on analyzing the quality of public PARs available in a very densely populated low SES community in the Olympic city of Rio de Janeiro. International studies

have constantly indicated that low SES communities tend to have less availability of PARs and/or PARs of lower quality than those found in higher income neighborhoods. Our study reinforces such findings with results indicating that despite having a reasonable number of PARs, the quality of the facilities located in Cidade de Deus is very low. Importantly in the context of this study is the potential impact low-quality PARs are having on PA levels of the local population.

It is important to note that the study presented here is a cross-sectional study that did not attempt to analyze further improvements of the Cidade de Deus' PARs since data collection in 2012. A longitudinal study is required to show more accurately the relationship between hosting the Olympic Games and its impact on public PARs in low-income communities. Findings reinforce, however, that policies to encourage PA, whether using the Olympic Games as a trigger or not, need to focus on the built environment, particularly in socially vulnerable areas, if we are to reach the PA levels necessary to achieve the desired health indicators.

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Compliance with ethical standards

Conflict of interest None of the authors declared any conflicts of interest.

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Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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