

Original article (short paper)

Outdoor gyms in Santiago: urban distribution and effects on physical activity

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Abstract — Aims: To put together a registry of the location of all existing outdoor gyms (OGs) in Santiago, Chile, and establish a profile of the users of these gyms. **Methods:** All OGs in Santiago located in public spaces were identified and geo-referenced, and an accessibility analysis of them was carried out. A total of 1,023 users of OGs were surveyed (71% men, average age 31.5 years old, SD =16.6), about the frequency of use of OGs, amount of time spent using them, transportation habits, motivation for usage, and their perceptions regarding their own health, among other questions. In addition, each person's neck circumference was measured. **Results:** There are 1,981 OGs in the city squares, sidewalks and parks, mostly located in poorest areas of the city. Most OG users live less than one kilometer away from an OG. **Discussion:** In line with international studies, this research demonstrates that OGs have positive collateral effects, as they not only contribute to users to increase their physical activity, but also because they attract people with sedentary lifestyles to make physical activity. This, in turn, might contribute to make urban areas more livable and safer, for they bring new “eyes to the street” and permit to use cities' under-occupied public spaces. **Conclusion:** The proliferation of outdoor gyms should be regarded as an opportunity for public health policies aimed at tackling the obesity problem and increasing the physical activity of people.

Keywords: outdoor gyms, Santiago, physical activity

Introduction

As many developing countries, Chile has shown a sustained growth in its overweight and obesity rates in the last twenty years. The last ENS, or National Health Survey, conducted in 2009, showed that 39% of Chileans were overweight and 25% were obese¹. Initially, the obesity problem was confronted with programs promoting healthier dietary habits directed at the adult and schoolchildren populations². This situation, however, began to change at the beginning of the last decade with the introduction of programs that, together with educating the population with regard to modifying their eating habits³, also emphasized the importance of physical activity (PA). Examples of this are the programs *Vida Chile*, launched in 2003⁴, and *Elige Vivir Sano*, launched in 2007⁵.

The inclusion of physical activity in the agenda to combat the obesity epidemic was far from being novel. Indeed, since the early nineties, the United States, the United Kingdom and Canada have confronted the obesity epidemic by paying attention to environmental factors that act as barriers or facilitators to the adoption of healthy lifestyles^{6,7,8,9}. In 2004, these ideas were ratified by the World Health Organization (WHO) using the slogan: “a healthy city is an active city”¹⁰, which gave origin to the recommendations of physical activity, namely, 150

minutes of moderate activity per week, in order to maintain an appropriate health condition.

In the case of Chile, the National Health Surveys of 2006 and 2009-10 showed that nine out of ten Chileans do not engage in PA regularly¹. These results prompted the authorities to adopt a more energetic strategy regarding the promotion of healthier lifestyles. Consequently, they started analyzing whether the urban environment was acting as a facilitator or as a barrier for adoption of a more active lifestyle. In this context, many OGs were installed in the last decade in Chile's capital, Santiago (6.5 m).

The first OG was installed in 2006, in the central district of Quinta Normal. Having one or more exercise machines, OGs allow users to carry out physical activities of different types (cardiovascular, strength and elongation) free of charge, and in an outdoor environment (Figure 1). In 2007, a series of OGs were inaugurated in the coastal city of Viña del Mar (100 km East of Santiago), with a significant amount of press coverage, which contributed to the growth of outdoor gyms in the following years. Financed by the municipalities, or by several governmental agencies¹¹, in less than ten years this type of infrastructure has expanded to metropolitan areas, intermediate-sized cities, and towns, becoming part of the urban scenery of squares, streets and sidewalks of Chile nowadays.

A study carried out in 2012 showed that two out of five users of OGs installed along the streets of Pucuro, in the Eastern side of Santiago¹², did not carry out any physical activity prior to their construction. Studies carried out after the installation of outdoor gyms have shown that OGs are positively evaluated by the public, as these installations facilitate spontaneous

meetings of residents, promoting social cohesion, especially in vulnerable areas¹³.

In spite of the above, little research has been done on how OGs are being used by people. The current study tries to complement existing studies, learn the location of the OGs in Santiago, their usage patterns, as well as the profile of their users.



Figure 1: Outdoor gym in Santiago. Source: own elaboration

Methods

This study was conducted in two stages. The first stage sought to create a record of all existing OGs in Santiago: the record was required because OGs were built by each municipality of the city in an autonomous, organic way. The record was conducted by requesting the 37 municipalities to provide information regarding this type of equipment in their jurisdictions. This information was verified on site and later transferred to a geographical information system (software ArGis 10.3).

Once all OGs were mapped, an accessibility analysis was carried out. To do so, we employed the *Network Analyst* tool of Arc Gis, which allowed determination of the “service area” (in this case an outdoor gym), within the city’s urban grid, considering a specific radius. In this case, a radius of 500 meters was set, equal to a ten-minute walk, a typical threshold used in urban studies^{14,15}. Figure 2 illustrates this procedure.

The accessibility of OGs was first studied at a district level, that is, assessing how much of a district’s total urban grid had an OG at 500m or less, and later at a city level, that is, the percentage of the urban grid of Santiago with an OG at the same distance. In addition to metric-based accessibility of OGs, a socioeconomic accessibility analysis was performed. The procedure consisted of selecting all blocks within the 500m radius of OGs, and then analyzing the socioeconomic characteristics of all households living in these blocks, based on data from the 2002 National Census¹⁶. Socioeconomic groups were divided into five categories: ABC1, C2, C3, D and E, according to the stratification defined by Adimark¹⁷, the traditional survey used in Chile to classify socioeconomic strata¹.

The second stage surveyed a large pool of users of OGs. The survey collected basic characteristics of users, such as age, gender and educational level, as well as specific information regarding

how OGs were perceived and used. Participants were asked if they considered themselves users of the OGs, and how many blocks they lived from an OG they were using. They were also asked how long they spent at these facilities and three questions of the GPAQ questionnaire: 1) if they walked or used a bicycle for more than 10 minutes to get to work, or school/university, and how frequently they did this; 2) evaluation of their general health level compared to one year ago; and 3) whether prior to using the OGs these users had carried out any physical activity and what was their main motivation to use the OGs.

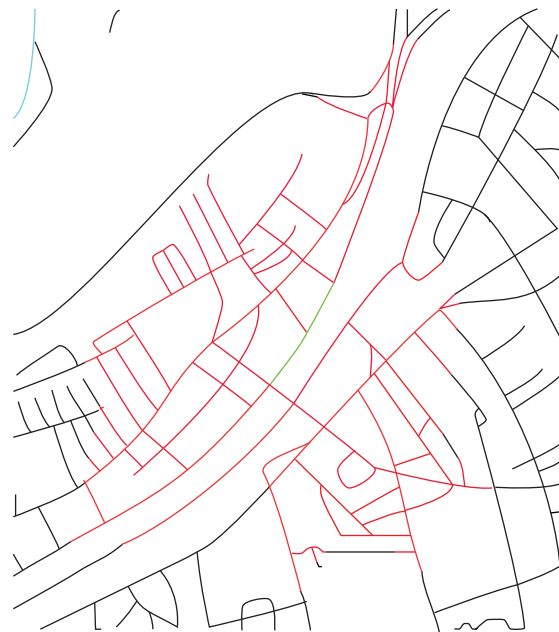


Figure 2: Example of a 500 m accessibility analysis. The green line corresponds to the “origin”, while all red lines show the area covered by a 500 m walk from it. Source: own elaboration

With the purpose of estimating the cardiovascular risk of OG users, their neck circumference were registered with a

1 “The five strata order has been the traditional way to classify socioeconomic groups in Chile. The ABC1 is the wealthiest group and corresponds to about 11.3% of the population. The C2 corresponds to 15.4% of Chileans. The C3 group accommodates 22.4% of the population, while the D and E, the poorest socioeconomic groups, represent 34.8% and 20.3% of the population, respectively”

flexible metric tape (Seca pediatric 5-5) at the level of most prominence of the cricoid cartilage (Adam's apple)^{18,19,20,21}. In order to define a large neck perimeter, the following measurements were considered as references for this study: ≥ 35 cm for women, and ≥ 41 for men¹⁹. This measurement was conducted by the same surveyors who distributed the written survey, who had been trained before on this type of measurement at the National Institute of Food Technology, a well-known institute for the study of obesity at the University of Chile.

The survey was conducted among 1,023 people (71% men, average age 31.5 years, standard deviation = 16.6) between June 2015 and January 2016. The sample allowed an estimation error level of 3% with a confidence interval of 95%, assuming that this encompasses a large population (over 100,000 cases), maximum variance and a random selection. It is worth noting that it was not possible to know the real population of OG users prior to the elaboration of this research, as no registry of this kind of equipment existed before this research.

Most surveys were carried out in three districts of Santiago, each representing different socioeconomic groups: Maipú (39%, middle-to-low income level), Providencia (31%, middle-to-high income level), and Santiago (18%, middle income district). The other surveys were conducted at OGs located in the South and West of Santiago. People surveyed signed an informed consent (previously approved by the Ethics Committee of the Universidad Diego Portales and approved by Conicyt), before responding to the questionnaire.

The third stage consisted of an initial descriptive analysis of the OG location (number and type of outdoor gyms in Santiago by district), the number of fitness equipment, and their urban accessibility. Data analysis of surveys began with a description of each variable to establish a consistency of the registered information (range of values, lost responses, registration errors, etc.), in addition to identifying typical values and dispersion. In the next stage of analysis, association patterns between key variables were examined. Given the level of measurement of the variables, this was carried out with the aid of contingency table adjustments and the application of the statistical test of Chi-square (χ^2) or observed distribution versus expected distribution.

Results

We surveyed 1,981 OGs in Santiago, as shown in Figure 3. As it can be observed, outdoor gyms were not evenly distributed in the city, for districts such as Puente Alto or La Florida, in the South of Santiago, have 295 and 215 outdoor gyms, respectively, while districts such as Quinta Normal or Lo Barnechea, in the Central-East of Santiago, have only 10 and 17 outdoor gyms, respectively. Figure 4 shows these differences. It is worth noting that the greatest concentration of OGs is in the South and West part of the city, the poorest areas, while districts in the Eastern part of the city, the most affluent, have fewer gyms.

The average number of fitness equipment per OG was 4.6 (SD=2.5), although 70% of the registered installations had 3 to 6 (see Table 1). There were important differences in this aspect: while some districts tended to favor smaller installations (one

or two fitness equipment) to spread them over the district, others favored OGs with more fitness equipment in fewer places.

Accessibility analysis – with a radius of 500 meters – showed that most residents live near OGs near. Indeed, 64% of the households of the city have an OG (regardless of the number of fitness equipment in it) within 500m. If only outdoor gyms with four or more fitness equipment are considered (which allows many people exercise simultaneously), 53% of the street layout of the city has an OG within 500 m or less, and 27% if only outdoor gyms with six or more fitness equipment are considered. Figure 5 shows these results.

Figure 6 shows that outdoor gyms are more likely to be found in poor areas than in rich areas. Indeed, while 45% of all households belonging to the highest socioeconomic group (ABC1) have an outdoor gym at a walking distance, 60% of the poorest households have an outdoor gym within 500 m radius.

Table 2 shows the main results of the survey. First, the most participants surveyed consider themselves users of OGs (89.1%). Some interesting differences were found between males and females. The first significantly statistical difference refers to the habits of physical activity prior to the installation of the OGs: men expressed a greater inclination towards carrying out physical activity than women (80.3% vs. 61.3%, $\chi^2(1) = 42.3, p < .001$). Secondly, although women and men were highly inclined to walk or use a bicycle to travel from home to a place of work and/or study (82.7% and 85.3%, respectively), men were more likely to do this on a daily basis (82.3% of men vs. 74.2% of women make their journeys in an active manner more than five times a week, $\chi^2(1) = 42.6, p < .01$). Thirdly, men and women had different motivations to use the OGs: while men primarily sought to improve their health (56.5% of men preferred this alternative vs. 47.9% of women), women used the OGs to lose weight (26.2% of women chose this alternative vs. 10% of men, $\chi^2(4) = 42.2, p < .001$). Other factors of interest are detailed below, which resulted from the survey, but they did not show significant differences between men and women.

Although accessibility analysis showed that 64% of the households of Santiago had an OG at a distance of 500 m or less, only 44.7% of those surveyed said that they lived five blocks or less from the OG they were using. The study showed that women were less inclined to use OGs that were farther than five blocks from their home (53.3% of women said they lived five blocks or less from the gym they were using vs. 42.4% of men). This could mean that OG users do not necessarily go to the closest facility to their residence, but rather to the one that provides them with a more complete exercise routine, or that have a more convenient location in the city, either for esthetical or for security reasons. More detailed studies are needed to answer these questions.

Regarding the amount of physical activity performed at OGs, the survey detected that 32.1% of users say that they attended these installations four or more times per week, 37.9% said their frequency was three times a week, and 30% said they exercised between one or two times per week. Additionally, most attendees declared they used OGs for extended periods: about 76.8% said they spent 30 minutes or more exercising.

It was also found that OG users have active lifestyles: about 84.4% said that they normally ride a bicycle or walk

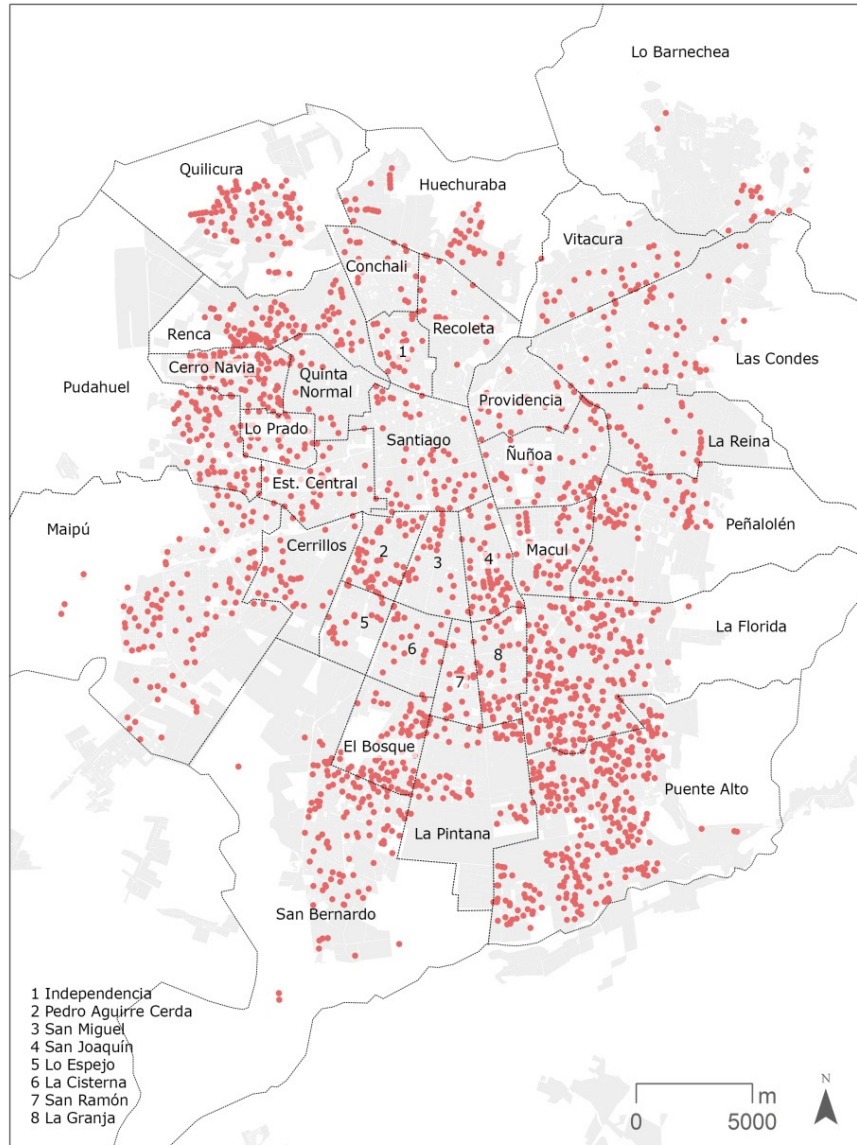


Figure 3: The 1,981 outdoor gyms in public spaces currently in operation in Santiago. Source: own elaboration

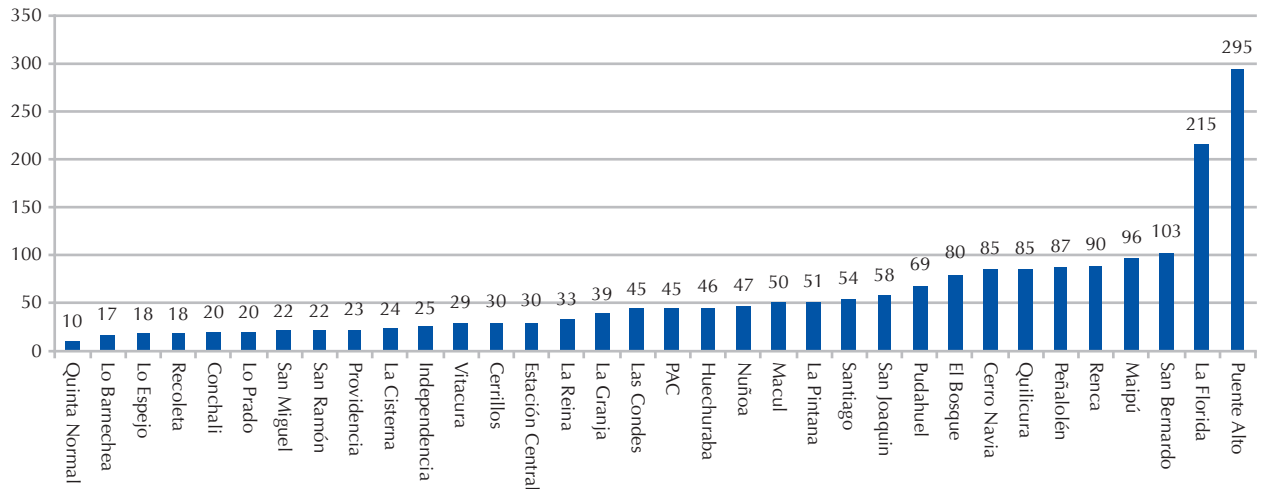


Figure 4: Number of outdoor gyms in each of the 37 districts of Santiago. Source: own elaboration.

Table 1: Number of fitness equipment per outdoor gym. Source: own elaboration

Type of Gym	Quantity	%
1 to 2 fitness equipment	276	13.9
3 to 4 fitness equipment	996	50.3
5 to 6 fitness equipment	394	19.9
7 or more fitness equipment	315	15.9
Total	1,981	100

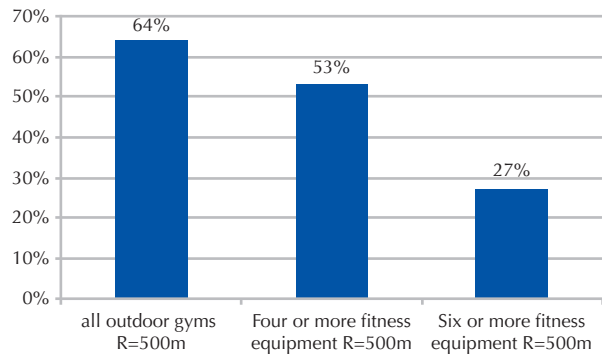


Figure 5: Percentage of urban grid of Santiago with at least one outdoor gym within a 500 m distance. Source: own elaboration.

Table 2: Main results of survey. Source: own elaboration

Q	Content of Question	All	Women	Men
1	Do you consider yourself an OG user? (% YES)	89.1	88.1	89.5
2	How many times a week do you use an OG? (%1 - 2 times / 3 times / 4 - 7 times)	30 / 37.9 / 32.1	26.9 / 41.8 / 29.1	30.3 / 36 / 33.6
3	Distance in blocks to the OG (% 5 or less/ more than five blocks)	44.7 / 50.3	53.3 / 46.7	42.4 / 57.6
4	How many minutes do you spend at an OG on each visit? (% less than 30 minutes / 30-50 minutes / 60 minutes or more)	23.2 / 33.1 / 43.7	31.5 / 47.6 / 20.8	33.9 / 41.8 / 24.3
5	Do you practice another PA when you come to this OG? (% YES)	91.2	90.8	91.4
6	Did you carry out PA regularly prior to the use of this OG? (% YES)	74.1	61.3	80.3
7	Do you walk or use a bicycle for 10 min for your transportation needs? (% YES)	84.4	82.7	85.3
8	In a typical week, how many days do you ride a bicycle or walk at least ten minutes? (% 5 or more times)	79.7	74.2	82.3
9	Health condition compared to one year ago (% much better / somewhat better / the same / somewhat worse)	63.6 / 24.7 / 11.7	64.9 / 25 / 10.1	62.9 / 24.6 / 12.5
10	Motivation to use an outdoor gym (% lose weight/ improve health / socialize / relax / other)	15.6 / 53.5 / 1.4 / 15.9 / 13.6	26.2 / 47.9 / 0.7 / 15.1 / 10.1	10 / 56.5 / 1.8 / 16.3 / 15.4

Fourthly, it was observed that OGs had a positive effect on health. Indeed, 25.9% of participants surveyed said they did not carry out any physical activity on a regular basis prior to

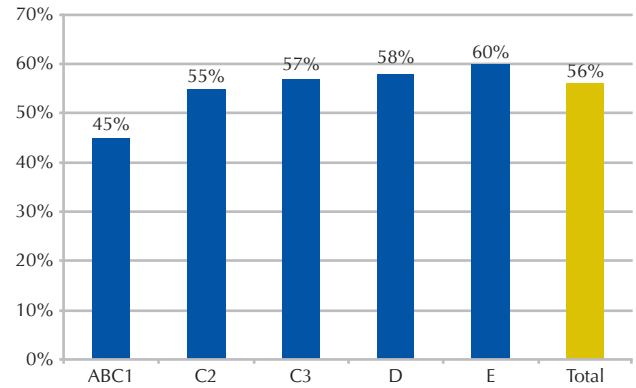


Figure 6: Percentage of all households of different socioeconomic groups with an outdoor gym at a distance up to 500 m. Source: own elaboration.

for at least ten minutes when moving through the city, and 79.7% said they do this five days a week. Moreover, about 91.2% said they combine the use of OGs with other physical activities, such as riding a bicycle or jogging. The above suggests that OGs are not only affecting the immediate urban space by motivating more neighbors to occupy squares and city parks, but also are allowing people who engage in outdoor physical activities, such as joggers and cyclists, to diversify their sports activities.

the installation of outdoor gyms, which in the case of women reached 38.7%. The above suggests that OGs might be acting as catalysts for the adoption of active lifestyles for those physically

inactive. This behavioral change might have affected how people perceived their own health, as demonstrated by the fact that almost 63.6% of participants surveyed said their general health is better than one year ago.

Measurements of the neck circumference in men and women show a consistency with the Chilean National Health Survey of 2009-10 (ENS)¹. As shown in Table 3, neck circumference in men was 39.3 cm (SD=3.1) versus 39.1 in the last ENS survey, while in women it was 35.6 cm (SD=3.4) versus 34.7 in the abovementioned survey¹. In the same manner, a progression of these values, for both women and men, was observed as their age increased.

In other words, OG users do not have a lower cardiovascular risk than the general population. However, a disaggregate analysis of the population suggests a positive effect of OGs for those with larger neck measurements. It is estimated that 31% of people surveyed with neck perimeter larger than P=0.75 percentile were more inclined to carry out physical activities after OGs had been installed than those with neck perimeter smaller than P=0.75 threshold, ($\chi^2(1) = 19.1, p < .001$). In addition, these people cited weight loss as the most important factor for using OGs (26% of them said they wanted to lose weight versus 10% of other people surveyed, ($\chi^2(4) = 40.5, p < .001$).

	Cases (N)	15-24	25-44	45-64	65 and over	All ages
Men		38.6 (SD=2.3)	39 (SD=2.6)	41.5 (SD=4.4)	40.9 (SD= 2.0)	39.3 (SD= 2.9)
NHS 2009-10 Values	1975	37.2	39.3	40.1	39.4	39.1
Women		34 (SD=2.7)	36 (SD=3.7)	37.6 (SD=2.7)	34.6 (SD=2.8)	35.6 (SD= 3.4)
NHS 2009-10 Values	2931	33	34.7	35.7	35.5	34.7

Discussion

There are several points of interest resulting from this investigation. First, the quick expansion of outdoor gyms in Santiago reveals a growing concern from municipalities of different socioeconomic areas over urban environments that encourage people to engage in physical activity.

This interest was not part of a plan proposed by the central government, but the result of individual initiatives by each mayor of the 37 districts of Santiago. It is still debated to what extent city managers perceive that the urban environment can facilitate the adoption of active lifestyles. Urban policies in Chile, however, should attempt to export this approach to higher levels of government, such as ministries and regional governments to generate a multi-sectorial agenda to encompass different policies, such as health, urbanism, transport and sports into the design of the urban environment. This last point is especially relevant in the case of Chile, where the government's self-imposed health goals relegate physical activity in the urban environment to a secondary role in the fight against the obesity epidemic²².

In line with international studies on OGs^{23,24}, this research demonstrates that these installations have positive collateral effects, as they not only contribute to increase physical activity made by their users²³, but also because they attract people with sedentary lifestyles to make physical activity^{12,23,24,25}. This, in turn, might contribute to make urban areas more livable and safer, insofar as they bring new "eyes to the streets"²⁶, giving new "purpose" thus to under-occupied parks and green areas in the cities²³. Indeed, studies carried out in Chile show also that OGs have become places where families and neighbors of vulnerable areas can meet and interact in the public space, for they give an "excuse" to occupy the public space¹³.

In line with international studies, people will more likely use OGs close to their homes. Moreover, OG users tend to

engage in other forms of physical activity^{12,23,28}, which means that installing these facilities in places of easy access, such as bicycle lanes or lineal parks¹², could increase the use of all types of sporting infrastructure.

Previous studies on outdoor gyms in Europe, Asia and North America have shown that outdoor gyms are more likely to be used by seniors and females than men and adolescents^{24, 25, 26}. This is not the case of this study, nonetheless. Indeed, the majority of outdoor gym users were men under 30 years, with active lifestyles. This pattern, also detected in another type of research on outdoor gyms in Chile^{11, 12, 13} suggests the existence of cultural barriers for using public equipment for physical activity. Future policies should attempt to integrate other groups (seniors and women) to the use of outdoor gyms.

In contrast to green areas (parks) unequal distribution, which are concentrated in the affluent part of the city²⁷, OGs are more prevalent in the poorer and more densely populated areas of Santiago. Indeed, districts with higher indices of obesity and sedentary lifestyles (97% according to ENS 2009) have more OGs. OGs can thus play an important role in the development of preventive health policies aimed at vulnerable groups and seniors²⁸. Moreover, by attracting people to use parks and open spaces^{28,29,30} OGs could also contribute to occupy public spaces in poorer districts of Santiago, improving the perception of security in these neighborhoods by increasing the amount of people on the streets³¹, which could help prevent young people engaging in antisocial behavior.

Summarizing, the proliferation of outdoor gyms should be regarded as an opportunity for public health policies that bring together city planners, transportation engineers, health professionals, as well as those in charge of sports activities. This is also an opportunity for citizens to carry out collective physical activity free of charge and to engage with other fellow citizens to bring a new purpose to the city. Finally, this is an opportunity for the city to recover its public spaces.

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