

# Leisure-time physical activity in São Paulo adults: a trend analysis from 2006 to 2016

*Nível de atividade física no lazer em adultos paulistanos: uma análise de tendência de 2006 a 2016*

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**ABSTRACT:** *Objective:* To investigate the temporal trend of practicing physical exercise and sports during leisure time in adults in São Paulo between 2006 to 2016. *Methods:* Time series analysis study using the VIGITEL System. Adding up the number of people who participated each year, a total 21,357 people were studied. Analyzes of the physical exercises and sports practiced during leisure time (yes or no) stratified by sex, age and education were performed. The prevalences and the differences for all of the years were calculated using the Prains-Winster regression. *Results:* Practice of physical exercises or sports increased by 7.9 percentage points in the period ( $p = 0.003$ ) (from 39.9% 95%CI 37.4 – 42.4 to 47.8% 95%CI 45.2 – 50.4). There was a significant increase for women ( $p = 0.011$ ), for people between 18-24 years old ( $p = 0.001$ ), 25–34 years old ( $p = 0.003$ ), 45–54 years old ( $p = 0.003$ ), and for people with up to eight years of schooling ( $p = 0.010$ ). There was a decrease in walking and playing soccer and there was an increase in doing gymnastics. *Conclusion:* There was an increase in the practice of physical exercise and sports during leisure time in adults from São Paulo. These increases were observed mainly in women, in people between 18 and 34 years old, between 45 and 54 years old, and in people with up to eight years of schooling. These results are important, as they have shown an increase in general and in more vulnerable groups, and may be related to environmental changes and interventions that have occurred in the city in the last 15 years.

**Keywords:** Physical Activity. Leisure activities. Adults. Time series studies.

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**RESUMO:** *Objetivo:* Investigar a tendência temporal da prática de exercícios físicos e esportes no lazer de adultos em São Paulo entre 2006 e 2016. *Métodos:* Estudo de análise de série temporal que utilizou a base de dados do Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (VIGITEL). Somando-se todos os anos, foram estudadas 21.357 pessoas. Foram realizadas análises das práticas de exercícios físicos ou esportes no lazer (sim ou não) estratificadas por sexo, idade e escolaridade. Calcularam-se as prevalências e as diferenças para todos os anos por meio da regressão de Poisson-Winster. *Resultados:* A prática de exercícios físicos ou esportes aumentou em 7,9 pontos percentuais no período ( $p = 0,003$ ) (foi de 39,9% [intervalo de confiança de 95% — IC95% 37,4 – 42,4] para 47,8% [IC95% 45,2 – 50,4]). Houve aumento significativo para as mulheres ( $p = 0,011$ ), para as pessoas entre 18 e 24 anos ( $p = 0,001$ ), entre 25 e 34 anos ( $p = 0,003$ ), entre 45 e 54 anos ( $p = 0,003$ ) e para pessoas com até oito anos de escolaridade ( $p = 0,010$ ). Houve queda na prática de caminhada e futebol e aumento na prática das ginásticas. *Conclusão:* Verificou-se aumento na prática de exercícios físicos ou esportes no lazer em adultos de São Paulo. Esse crescimento foi observado principalmente em mulheres, nos jovens entre 18 e 34 anos, em indivíduos entre 45 e 54 anos e em pessoas com até oito anos de estudo. Esses resultados são importantes, pois mostraram aumento em geral e em grupos mais vulneráveis e podem estar relacionados com mudanças ambientais e intervenções ocorridas na cidade nos últimos 15 anos.

**Palavras-chave:** Atividade física. Atividades de lazer. Adultos. Estudos de séries temporais.

## INTRODUCTION

Chronic non-communicable diseases are some of the greatest global health problems<sup>1</sup>. Cardiovascular disease, all types of cancer, and diabetes are responsible for almost two thirds of deaths worldwide and 72% of deaths in Brazil, generating disabilities and years of life lost that cost US\$ 4 billion<sup>2</sup>. Most of these diseases are preventable at a lower cost than curative-care treatment<sup>3</sup>. It should be noted that the four main risk factors for chronic non-communicable diseases are smoking, inadequate nutrition, alcohol abuse and physical inactivity<sup>1</sup>.

As a protection strategy for chronic non-communicable diseases, the World Health Organization (WHO) has recommended that adult individuals practice at least 150 minutes of moderate-intensity aerobic physical activity per week or 75 minutes of vigorous-intensity aerobic physical activity, weekly, or even a combination of the two, and this includes time in leisure, commuting and chores, and professional activities<sup>4</sup>. The recommendation also includes muscle strength activities at least twice a week. Based on this recommendation, in 2012 it was found that 31.1% of the world's adult population did not achieve the minimum recommended aerobic physical activity<sup>5</sup>.

Although all of the ways in which physical activity is practiced are important for disease prevention, physical activity, when done during leisure time, can be modified more easily through interventions. In addition, studies show that exercise during leisure time can bring great gains both in decreasing years of life lost<sup>6</sup> and in improving people's quality of life<sup>7</sup>.

In this sense, making people physically active during leisure time is an important task that has been the focus of public health policies in Brazil<sup>8</sup>.

Among the institutional actions that seek to insert physical activity into people's daily lives, it is worth highlighting some governmental strategies that have been implemented in São Paulo in the last 15 years<sup>9,10</sup>. More than 400 km of bike paths were built between 2014 and 2016, linear parks were created starting in the 2000s, and leisure streets were implemented. These are streets, which are closed to motor vehicles on weekends, but open for the population. Furthermore, there has been an expansion of Family Health Support Centers that work in basic health units<sup>11</sup>.

Considering this, temporal tendency studies are necessary in order to verify possible population changes in physical activity during leisure time in adults from São Paulo. It is worth noting that some studies with temporal analyses of physical activity trends have been published in Brazil in recent years. They have mostly used the Surveillance System for Risk and Protection Factors for Chronic Diseases by Telephone Survey (*Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico - VIGITEL*) database, from the Ministry of Health<sup>12-14</sup>, but none of them had temporal analyses that lasted longer than 10 years and included different modalities of physical exercise or sports.

Therefore, it is important to verify if there were changes in the practice of physical exercise and sports during leisure time throughout the 11-year period, and if there were differences according to sociodemographic characteristics, such as sex, age and education. And, lastly it is important to confirm whether there were changes in the types of activities practiced in the city of São Paulo, a megalopolis with diverse environmental inequalities, but which has been implementing several actions to improve public health. Therefore, the aim of the present study was to investigate the temporal trend in the practice of physical exercise and sports in leisure time among adults living in São Paulo between 2006 and 2016.

## METHODS

### STUDY TYPE

This was a time series study based on annual cross-sectional surveys carried out by VIGITEL between 2006 and 2016.

### THE SURVEILLANCE SYSTEM FOR RISK AND PROTECTION FACTORS FOR CHRONIC DISEASES BY TELEPHONE SURVEY (*SISTEMA DE VIGILÂNCIA DE FATORES DE RISCO E PROTEÇÃO PARA DOENÇAS CRÔNICAS POR INQUÉRITO TELEFÔNICO*)

In 2006, in order to assess the prevalence of physical activity and other protective and risk factors for health, such as smoking, alcohol consumption, dietary indicators and nutritional

status in the 26 Brazilian capitals and the Federal District, the Ministry of Health implemented VIGITEL, a telephone surveillance system that conducts a minimum of two thousand interviews with adults in each of the cities and in the Federal District each year<sup>15</sup>.

The VIGITEL methodology, with regard to the selection of telephone lines to be contacted for the interviews, the sample composition, and the questionnaire characteristics, is described in detail by Moura et al.<sup>15</sup>. To briefly describe the process, initially, 5,000 landline phone numbers are systematically drawn. They are provided by the telephone companies that serve the cities. The phone numbers are selected again and divided into replicas of 200 numbers each. After identifying all of the eligible telephone numbers and after the residents have agreed to participate in the survey, the individuals over 18 years of age residing in each household are identified and the decision over who will respond the telephone interview is made.

The questionnaire contains objective questions asked by a trained interviewer with computer knowledge<sup>15</sup>. The section on physical activity includes questions related to their leisure practices (if they had practiced any type of physical exercise or sport in the last three months; if the answer was positive, what was the weekly frequency and daily duration), their commuting routine or the transportation they used to get to and from work or school/university, their work routine (if they carried a lot of weight or walked a lot) and their home activities (did they do heavy cleaning/cleaning by themselves at home). The physical activity questionnaire was validated by Monteiro et al.<sup>16</sup>. For the section that investigated leisure-time physical activities, kappa values = 0.80 were obtained for repeated measures with an interval of 15 days. In comparison with 24-hour recalls of physical activity, people classified as physically active during leisure time through the telephone interviews (those who practiced 30 minutes or more of physical activity for at least five times a week) had a higher average of time spent practicing physical activity and sports obtained by the recalls compared to those that were not physically active ( $p < 0.001$ ). The VIGITEL questionnaire is published annually in the report compiled by the Ministry of Health<sup>17</sup>.

## PARTICIPANTS

For this time trend study, secondary data from 21,357 individuals interviewed by VIGITEL from 2006 to 2016 in the city of São Paulo were used.

## DATA ANALYSIS

The analyses of the databases were carried out in three phases:

- Downloading free-use data through the official website of the Ministry of Health ([http://svs.aids.gov.br/bases\\_vigitel\\_viva/vigitel.php](http://svs.aids.gov.br/bases_vigitel_viva/vigitel.php)), in a CSV format;

- Transforming the databases from a CSV format to an XLS format in order to create files with a DTA extension (Stata version 12.1, StataCorp LP, College Station, United States);
- Consulting the databases, using the questionnaire and dictionary of variables as a reference, in order to identify the issues of interest (leisure-time physical activity, sex, age and education).

Leisure-time physical activity was analyzed in a dichotomous way (practicing some type of physical exercise or sport during leisure time: yes or no). For this, the following question from the VIGITEL questionnaire was used: “In the past three months, have you practiced any type of physical exercise or sport?” (yes or no). Subsequently, the types of physical exercise and sports were analyzed for the people who answered that they had practiced certain activities (question: “If yes, what was the main type of physical exercise or sport that you practiced?”). For the answers to this question, between 2006 and 2012, there was a list with 15 different types of physical exercises or sports to be chosen by the interviewees (walking; walking on a treadmill; running; running on a treadmill; weight training; football or futsal; biking (including an exercise bike); playing volleyball or foot-volley; playing basketball; playing tennis; doing aerobics (spinning, step, jump); doing gymnastics in general (including stretching, pilates, yoga); doing water aerobics; swimming; practicing martial arts (including jiu-jitsu, karate, judo, boxing, muay thai, and capoeira). As of 2013, a dance category (including ballet, ballroom, and belly dance) was added. It is important to emphasize that each interviewee could choose only one modality.

The practice of physical exercise or leisure sports variable was analyzed in general and stratified by sex, age group (18 to 24 years; 25 to 34 years; 35 to 44 years; 45 to 54 years; 55 to 64 years; 65 years or more) and education level (0 to 4 years; 5 to 8 years; 9 to 11 years; 12 years or more), between 2006 and 2016. These variables were chosen based on the results of time trend studies<sup>12,13</sup> and the VIGITEL report<sup>17</sup>, which showed differences in the levels of leisure-time physical activity according to sex, age and education.

Regarding the different types of exercise, gymnastics (aerobics and general), aquatic activities (swimming and water aerobics) and sports (volleyball/foot-volley and basketball) were grouped for this study, and working out was called strength training. The 12 most prevalent types were analyzed between 2006 and 2016.

The descriptive analysis of the sociodemographic data was represented by calculating frequencies, means and standard deviations<sup>18</sup>. For the practice of physical exercises or sports in general leisure time, the prevalences (%) and the 95% confidence intervals (95%CI) were calculated for all of the years.

Prais-Winsten linear regression models suitable for use in time series analysis were used to analyze the magnitude and statistical significance of time variations<sup>19</sup>. As such, the regression coefficient of the model indicated the average annual rate, expressed in the outcome unit, of increase or decrease of the indicator in the period. The temporal

variations corresponding to a regression coefficient that were statistically different from 0 ( $p \leq 0.05$ ) were considered to be significant. These analyses were performed for the following outcomes:

- Physical exercise or sports in general leisure time;
- The practice of physical exercises or sports according to sex, according to age groups and according to educational levels;
- The practice of different types of exercise or sports.

The explanatory variable was always the year of the survey expressed as a continuous variable.

VIGITEL weighing factors were used to correct the sample selection bias. These factors also allowed for the distribution of the population studied by VIGITEL to be matched - according to sex, age and education - to that identified for the adult population of the city of São Paulo from inter-census projections, using a post-stratification procedure<sup>18</sup>.

All analyzes were weighted using the rake weight variable and were performed using the svy command of Stata software version 12.1 (StataCorp LP, College Station, TX, United States).

## ETHICAL ISSUES

The study was approved by the Research Ethics Committee of the School of Arts, Sciences and Humanities of the Universidade de São Paulo (process number 00351018.6.00005390). The data collection of the VIGITEL System was approved by the National Commission of Ethics in Research for Human Beings of the Ministry of Health<sup>17</sup>.

## RESULTS

The number of interviews carried out each year of observation and the descriptive characteristics are presented in Table 1. Women represented the majority of the sample in all of the years, the average age increased from 40.8 years in 2006 to 42.9 years in 2016, and most individuals had nine years or more of schooling.

There was an increase of 7.9 percentage points in the practice of physical exercise or sports during leisure time over the 11-year observation period (Figure 1).

The increases were significant for women, for people aged between 18 and 24 years old, between 25 and 34 years old and between 45 and 54 years old, and for people with up to eight years of schooling (Table 2).

There was a significant decrease in the practice of walking and playing soccer, and a significant increase in doing gymnastics throughout the 11 years (Table 3).

Table 1. The number of interviews and the composition of the sample according to sex, age group, and education in the city of São Paulo, VIGITEL 2006–2016\*.

Years	No. of interviews	Women	Age (years)		Schooling % (years)			
		%	Average	SD	0–4	5–8	9–11	12 or more
2006	2,012	53.6	40.8	0.41	20.4	19.4	34.9	25.3
2007	2,000	53.7	41.0	0.43	17.6	19.9	35.6	26.8
2008	2,000	53.7	41.3	0.42	17.2	20.8	34.7	27.2
2009	2,010	53.7	41.5	0.44	15.8	20.4	33.9	29.8
2010	2,008	53.8	41.7	0.42	16.1	18.7	35.9	29.4
2011	2,001	53.8	41.8	0.42	17.0	19.4	35.3	28.3
2012	1,737	53.8	42.1	0.45	16.5	19.0	35.5	29.0
2013	1,999	53.9	42.3	0.41	16.1	19.1	35.3	29.5
2014	1,535	53.9	42.5	0.49	17.3	21.8	35.8	25.1
2015	2,002	53.9	42.6	0.43	13.8	16.7	37.1	32.4
2016	2,034	54.0	42.9	0.41	16.1	17.0	33.4	33.5

SD: standard deviation; \*weighted values to adjust the sociodemographic distribution of the sample to the distribution of the adult population of the city of São Paulo.

Source: VIGITEL database 2006–2016.

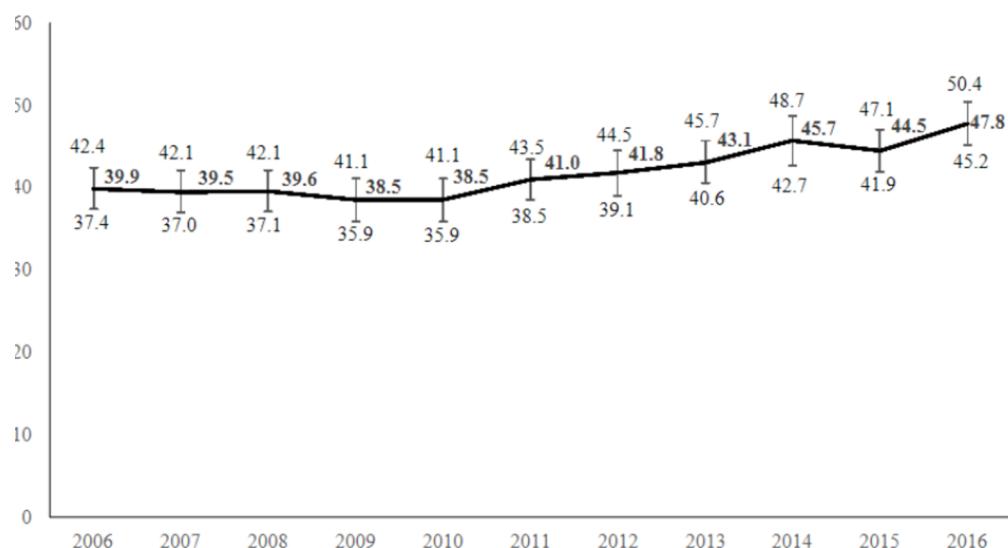


Figure 1. Prevalence and 95% confidence intervals of physical exercise or sports during leisure time in adults in São Paulo, SP, VIGITEL 2006–2016.

Table 2. The annual evolution of the prevalence of physical exercise or sports during leisure time in adults living in the city of São Paulo according to sex, age group, and education, VIGITEL 2006–2016.

Variables	6	7	8	9	10	11	12	13	14	15	16	pp/year
Male	49.3	48.5	45.4	48.9	47.9	51.4	48.8	48.8	52.1	52.9	56.0	0.01
Female	31.7	31.8	34.6	29.5	30.4	32.1	35.8	38.3	40.3	37.3	40.8	0.02*
<b>Age</b>												
18–24	46.4	52.6	55.4	55.1	54.4	52.2	55.7	55.4	66.8	60.8	65.8	1.49*
25–34	45.7	44.1	41.3	42.6	43.5	46.7	47	51.2	50.1	51.3	56.8	1.18*
35–44	38.3	35.3	32.5	31.3	29.1	32.4	38.6	43.3	40.4	44.3	41.9	0.68
45–54	34.8	26.2	33.2	34.4	33.6	35.9	32.9	32.7	38.5	34.4	39.8	0.66*
55–64	37.1	39.8	38.3	31.9	35.5	36.1	34	34.4	41.4	38.2	41.3	0.27
65 or more	29.0	36.4	36	30.8	32.3	41.4	39.3	34.8	35.3	33.3	37.2	0.38
<b>Schooling</b>												
0–8 years	28.6	27.3	27.6	25	27.2	30.6	26.3	30.5	31.9	30	32.1	0.48
9–11 years	43.7	46.9	45.3	46.5	41.7	41.8	46.5	44.7	49.4	46.1	49.2	0.34
12 years or more	59.4	58	57.5	53.7	54.8	57.7	59.9	59.9	62.1	63	64.6	0.59

6: 2006; 7: 2007; 8: 2008; 9: 2009; 10: 2010; 11: 2011; 12: 2012; 13: 2013; 14: 2014; 15: 2015; 16: 2016; pp/year: values of the average changes in % points (2006 to 2016) obtained by the Prais-Winsten regression coefficients according to the survey years; \*significant values of changes in the period ( $p < 0.05$ ) according to the statistical trend test of the indicator using the Prais-Winsten regression.

Table 3. The annual evolution of the prevalence of different types of physical exercise or sports during leisure time in adults living in the city of São Paulo according to sex, age group, and education, VIGITEL 2006–2016.

Types <sup>#</sup>	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	pp/year
Walking	38.0	40.7	37.4	37.2	37.4	33.3	36.5	33.7	37.3	33.4	33.1	-0.58*
Soccer	20.3	20.0	18.2	22.3	20.2	17.8	13.1	14.9	15.8	15.8	13.4	-0.73*
Strength Training	11.8	11.0	9.1	11.0	12.2	14.9	16.1	19.1	17.0	16.5	15.1	0.55
Gymnastics	5.5	5.1	5.9	5.3	5.6	5.7	7.2	8.1	6.2	7.5	7.7	0.26*
Aquatic activities	4.7	4.0	5.1	5.6	4.7	5.1	4.8	4.1	3.6	3.6	3.7	-0.12
Walking/Treadmill	4.1	2.2	3.6	3.3	2.6	4.3	3.6	3.3	2.7	2.2	3.8	-0.03
Biking	4.1	4.9	5.8	4.1	5.1	4.1	4.0	4.3	3.8	5.3	5.0	-0.01

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**Table 3. Continuation.**

Types <sup>#</sup>	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	pp/year
Running	2.7	4.2	4.9	2.9	3.3	4.6	7.0	5.1	4.0	5.7	5.0	0.21
Basketball/Volleyball	1.1	1.2	1.6	1.1	0.3	1.2	0.8	1.4	1.0	2.2	1.9	0.07
Martial Arts	0.9	1.7	0.3	0.4	1.2	1.1	0.3	1.3	1.2	2.0	3.1	0.16
Running/Treadmill	0.5	0.2	0.6	0.5	0.7	1.2	0.4	0.7	0.4	0.8	2.4	0.10
Tennis	0.2	0.2	0.6	0.6	0.5	0.1	0.2	0.1	0.7	0.2	0.1	-0.01
Other types	6.1	4.6	6.9	5.5	6.2	6.6	6.0	3.9	6.3	4.8	5.7	-0.06

<sup>#</sup>Analyses only of people who practiced some type of physical exercise or sport during leisure time between 2006 to 2016; pp/year: values of average changes in percentage points between 2006 and 2016 obtained by the Prais-Winsten regression coefficients according to the years of the survey; \*significant values of changes in the period ( $p < 0.05$ ) according to the statistical tests of the trend of the indicator using the Prais-Winsten regression.

## DISCUSSION

The main result of this study showed that there was an increase of 7.9 percentage points in the practice of physical exercise or sports during leisure time in adults from São Paulo between 2006 and 2016. This increase was significant in women, in the age groups between 18 and 24 years old, 25 and 34 years old, and 45 and 54 years old, and in people with up to eight years of schooling. There was a significant decrease in the practice of walking and playing soccer, and a significant increase in doing gymnastics.

As in the present study, other studies have also found changes in leisure-time physical activity practice over time<sup>12,13</sup>. The work published by Mielke et al.<sup>12</sup> analyzed the practice of leisure-time physical activity with data from VIGITEL between 2006 and 2012. A total of 371,271 Brazilian adults from all of the capital cities plus the Federal District were studied. It was observed that the frequency of people who did not practice any type of physical exercise or sports during leisure time dropped from 59.1 to 55.6%. The work developed by Cruz et al.<sup>13</sup> analyzed the practice of leisure-time physical activity in the last three months using data from VIGITEL between 2006 and 2016, including 572,437 people in all of the Brazilian capitals plus the Federal District. The authors showed that the prevalence increased from 44% in 2006 to 53.6% in 2016. These studies indicate that the Brazilian adult population has been increasing their levels of leisure-time physical activity.

It is worth noting that increases in the practice of physical activity during leisure time have also been observed in other international studies of time trends carried out with adults in high-income countries, such as England and Canada<sup>20,21</sup>.

The increase in the practice of physical exercise or sports during leisure time in adults from São Paulo may be related to several actions implemented over the last 15 years within

the city. Despite being one of the capital cities with the highest prevalence of physically inactive adults during leisure time compared to other capitals<sup>22</sup>, the city of São Paulo was elected as the first in the ranking of infrastructure and was considered to be the most friendly for practicing physical activity in Brazil<sup>23</sup>.

A few programs have been implemented. *Ruas de Lazer* was an initiative of the São Paulo Municipal Department of Sports, Leisure and Recreation that has aimed to expand exercise spaces for people, by closing down streets and avenues for motor vehicles between 10 am and 4 pm on Sundays<sup>24</sup>. Another important program, coordinated by the Municipal Mobility and Transport Secretariat of São Paulo, is called *Ciclofaixas de Lazer*, which since 2009 has also been implemented on Sundays, when more than 117km of bicycle lanes are made available on streets and avenues in the city<sup>25</sup>.

Linear parks have the specific function of protecting the banks of rivers and streams and they are always open. They began to be implemented in São Paulo in 2006<sup>26</sup>. Also, worth noting are the 22 Unified Education Centers and 17 Municipal Sports Centers<sup>27</sup>. These structures offer free and organized programs, many of which are supervised by professionals in the field of physical education. Additionally, as of 2014, 96% of the more than 400 km of cycle paths have been built, which are not only used for cycling, but also for walking and running<sup>27</sup>.

Regarding the differences according to the sociodemographic variables, Cruz et al.<sup>13</sup> identified significant increases in both sexes, with men going from 54.5% in 2006 to 62.0% in 2016 and women going from 35.0% in 2006 to 46.4% in 2016. The present study carried out in São Paulo identified significant increases only for women and, as in the study by Cruz et al.<sup>13</sup>, women had greater increases compared to men.

This result of increase for women found in both surveys is important. A study developed by Uvinha et al.<sup>28</sup>, carried out with 2,400 people in the 26 Brazilian states plus the Federal District, showed that 64% of the men interviewed opted for physical sports activities as preferred during leisure time, while 70.9% of women highlighted their preference for social activities.

Regarding the age groups, excluding the ages between 55 and 64 years old, Cruz et al.<sup>13</sup> showed significant increases for all other age ranges, with the greatest increases for those aged 18 to 24 and 25 to 34 years old. The present study with adults in São Paulo identified significant changes over the years in the age groups of 18 to 24 years old, 25 to 34 years old, and 45 to 54 years old. Larger increases were also identified in people up to 34 years old, showing that the trend is stronger in younger people.

As for the different levels of education, Cruz et al.<sup>13</sup> identified changes in all of the ranges. In the case of the present study with adults from São Paulo, a significant increase was found only for people with up to eight years of schooling. This result is also considered to be quite relevant, as a study conducted with the VIGITEL database from 2006 showed a higher prevalence of leisure-time physical activity in people with 12 years of schooling or more compared to people with up to eight years of schooling<sup>22</sup>.

Regarding the different types of exercised practiced, Sa et al.<sup>14</sup> showed a tendency for walking to continue, soccer practice to be reduced by 1.9 percentage points, strength/gymnastics training to be increased (by 3.3 percentage points) and running practice to be

increased (by 1.6 points percentage). The present study showed that in São Paulo there was a significant decrease in the practice of soccer and walking and a significant increase in the practice of gymnastics. In addition, practices such as running and martial arts were at the limit of statistical significance to show increases in the analyzed period.

The decrease in playing soccer over the years of observation can be explained by the lesser availability of open spaces due to the growth of cities and real estate speculation<sup>29</sup>. Florindo et al.<sup>30</sup> showed that 76% of soccer players used public spaces for practicing in 2006. Open spaces are important not only for playing soccer, but also for walking, which is the type of physical exercise most practiced during leisure time by adults in São Paulo. In a study carried out with a sample of adults from São Paulo, it was found that people who had at least two open public spaces, such as squares, parks and bike paths within 500m of their homes, were more likely to walk during their leisure time<sup>10</sup>.

The decrease in walking can be explained because younger people and women in São Paulo have opted for other types of physical exercise, such as running, martial arts, and gymnastics.

The significant increase in the practice of gymnastics can be explained by Brazil being one of the largest markets in the segment of fitness centers in Latin America, and there was a large growth of these places in São Paulo between 2006 and 2016<sup>31</sup>. In addition, it is worth noting that some types of gymnastics programs are offered in basic health units, mainly those that have Family Health Support Centers. They have also seen an expansion in the number of teams in São Paulo between 2006 and 2016<sup>11</sup>.

A limitation of this study was that self-reporting was the main source of the physical activity assessment data. It should be added that VIGITEL questions are directed to ask about physical exercise or sports that have been practiced in the past three months. Therefore, the main outcome investigated in the present study was subject to bias from the interviewees' memory. On the other hand, the only feasible way to ascertain the different ways of practicing physical activity in epidemiological studies is through questionnaires<sup>32</sup>. Another limitation was due to the fact that the VIGITEL sample is made up of individuals who have a landline telephone in their residence, a fact that could exclude people of lower socioeconomic status. These people practice less physical activity in their leisure time, which may also have affected the results. However, the weighting factors obtained with the use of post-stratification weight, which takes into account the socio-demographic composition of the city of São Paulo, aim to correct the under and overestimation of risk or protective factors obtained by VIGITEL<sup>14,17</sup>. It should be noted that in the municipality of São Paulo, landline telephone coverage is over 70%.

The strength of this study is that it was able to demonstrate an 11-year temporal analysis carried out with more than 21 thousand people in São Paulo between 2006 and 2016. The study identified that there was a significant increase in the practice of physical exercises and sports during leisure time, and which types of activities increased and decreased. It is worth highlighting that the increase in infrastructure and actions in the municipality during this period may have contributed to the growth of practicing physical activity, as there were more opportunities for people to be physically active.

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