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ORIGINAL ARTICLE

Frequency, distribution and time trends of types of leisure-time physical activity in Brazil, 2006–2012

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Abstract
Objectives To describe the frequency and the distribution of the main types of leisure time physical activity (LTPA) practiced by Brazilian adults in 2012 and to observe their time trends from 2006 to 2012.
Methods Cross-sectional data from the Brazilian surveillance system of risk and protective factors for non-transmissible chronic diseases from 2006 to 2012 (around 54,000 adults aged 18 years or older in all Brazilian State capitals interviewed yearly). Participants were asked whether they had practiced any type of exercise or sport in the last 3 months, and if so which type. Linear regression was used to identify trends of the five most cited LTPA.
Results In 2012, walking was reported as the main LTPA (18.1 %), followed by strength training/gymnastics (11.2 %) and football (7.2 %). Time–trend analysis showed reduction in football (9.1–7.2 %; $p = 0.004$, $\beta = -0.25$, $R^2 = 0.79$) and increase in strength training/gymnastics (7.9–11.2 %; $p = 0.02$, $\beta = 0.50$, $R^2 = 0.62$) and running (1.7–3.1 %; $p < 0.001$, $\beta = 0.22$, $R^2 = 0.93$).
Conclusions Walking was the main type of LTPA. Patterns of LTPA types remained relatively stable over the last 7 years.

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Keywords Environment and public health · Physical education and training · Walking · Resistance training · Bicycling · Football

Introduction

Leisure-time physical activity (LTPA) promotion has been part of most guidelines, plans, and public policies on physical activity promotion around the world. In Brazil, recent government initiatives have included actions to reverse the current unfavorable stagnation (at around 15 %) in the prevalence of LTPA-active people, (Hallal et al. 2011), such as the nationwide program "Academia da Saúde" (Health Academy) (Brazil Ministry of Health 2013) and the intersectoral plan for obesity control and prevention (in its final stages of elaboration and approval) (Brazil Ministry of Health 2011). There are major concerns about the growing epidemic of non-communicable diseases and the continuous prevalence increase of excess weight (Schmidt et al. 2011). LTPA has also gained emphasis in Brazil as the country is going to be the host of the next Fédération Internationale de Football Association (FIFA) World Cup and the Olympic Games.

To be successful, initiatives that promote LTPA need to be based on scientific evidence (Brownson et al. 2009), which includes evaluation studies of different strategies to promote LTPA and data about individual, interpersonal, and contextual factors associated with LTPA practice. Despite recent advances, there is no doubt that more evidence is needed on these topics, (Hallal et al. 2007; Hoehner et al. 2013). Moreover, some key information for LTPA promotion has usually remained outside of the research focus, such as the types of physical activity people take part in their leisure time (Khan et al. 2012).

Physical activity guidelines worldwide (U.S. Department of Health and Human Services 2008; World Health Organization 2010) emphasize the importance of support activities with adequate frequency, duration and intensity for health, and as diverse as possible. However, while scientific literature is abundant about population distribution of LTPA volume and intensity, surprisingly, information on types of LTPA is scarce. In Brazil, for example, we found few works dealing with the subject (Monteiro et al. 2003; Cunha et al. 2008; Malta et al. 2009; Dumith et al. 2009; Zanchetta et al. 2010; Sousa 2012; Silva et al. 2013), three of them with a large national representativeness (Monteiro et al. 2003; Malta et al. 2009; Silva et al. 2013), one of which exclusive for industrial workers (Silva et al. 2013). Nevertheless, none of them analyzed time trends. National data coming from other countries are also rare, especially those with time trends. However, promotion policies, strategies and actions usually are targeted to increase LTPA practice by enabling different types of activities (e.g., walking, dancing and swimming) but not necessarily physical activity intensity or volume. As an example, LTPA is related to some environmental characteristics, such as proximity to recreation facilities (Bauman et al. 2012), whose design and organization are intrinsically dependent on the type of LTPA.

Thus, the objective of our study was to describe the frequency and the distribution of the main types of LTPA practiced by Brazilian adults in 2012 and to observe their time trends from 2006 to 2012. This information is useful for stakeholders and policymakers and can help to improve LTPA promotion in Brazil.

Methods

Sample and study design

We examined cross-sectional data from the surveillance system of risk and protective factors for non-transmissible chronic diseases by telephone interview (VIGITEL) in Brazil from 2006 to 2012, which is described in detail elsewhere (Monteiro et al. 2005; Moura et al. 2008). Since 2006, the system interviews annually (through a telephone interview) about 54,000 adults aged 18 years or older in the 26 Brazilian State capitals and the Federal District, living in a household with at least one landline telephone (Monteiro et al. 2005; Moura et al. 2008). The sample size of at least 2,000 interviews in each study site was chosen to estimate with a maximum error of 2 % points and a 95 % confidence interval any surveyed variable in each sex (Moura et al. 2009). Post-stratification weights are employed in the system, by dividing the percentage of each stratum of sex and schooling in each study site in the reference population (obtained in the last national census, dated from 2000) by the corresponding percentage in the studied population as an attempt to represent the entire populations of each city (with and without a landline telephone). No forecast of population growth, with sufficient details, was available by the time this study was concluded. In 2012, 54,144 interviews were performed, with a response rate of 64.9 % and refusal rates varying from 1.4 to 3.1 % among the capitals. These values were similar from 2006 to 2012. Ethical approval was obtained by the Ethics Committee of Research in Human Beings from the Brazilian Ministry of Health.

Main type of LTPA

Participants were asked whether they carried out any type of exercise or sport in the last 3 months and, in case of a positive answer, what was the main type of exercise or sport they had done (only the first spontaneous answer was recorded). Interviewers used an structured questionnaire with 16 categories previously specified, to facilitate its completion (walking; treadmill walking; running; treadmill running; strength training; gym aerobics, including spinning, step and jump; water aerobics; gymnastics, including stretching, pilates and yoga; swimming; martial arts, including jiu-jitsu, karate and judo; bicycling; football; basketball; volleyball; tennis; others). For the analysis of this study, strength training, gym aerobics, and gymnastics were all grouped together. Treadmill walking and running were grouped together with walking and running, respectively.

Co-variables

The co-variables used were: sex, age group (six categories 18–24, 25–34, 35–44, 45–54, 55–64 and ≥65), years of study (three categories 0–8, 9–11 and ≥12) and federal units' capitals (26 capitals + the Federal District).

Statistical analysis

The prevalences of the main types of LTPA in 2012 were estimated for the whole population and stratified by sex and location (states' capitals + the Federal District), with a confidence interval of 95 %. The distribution of practitioners of the five most cited LTPA according to sex, age groups and years of study in 2012 was also estimated (confidence interval of 95 %). Linear regression models (having the years as the explanatory variable) were used to identify statistically significant trend in the prevalence of the five most cited LTPA in the period of 2006–2012. The regression coefficient indicates the direction and the

Table 1 Distribution of active adults in the studied sample according to the main type of leisure-time physical activity (LTPA), Brazil 2012

Main type of LTPA	Total			Men			Women		
	%	95 % CI		%	95 % CI		%	95 % CI	
Walking[a]	18.1	17.4	18.8	15.4	14.4	16.3	20.4	19.5	21.3
Strength training/gymnastics	11.2	10.6	11.8	11.5	10.6	12.5	10.9	10.2	11.6
Football	7.2	6.7	7.7	15.1	14.1	16.1	0.4	0.3	0.6
Running	3.1	2.8	3.4	4.9	4.3	5.6	1.6	1.2	1.9
Bicycling[a]	2.0	1.7	2.3	2.8	2.3	3.3	1.3	1.0	1.6
Water aerobics	0.9	0.8	1.1	0.2	0.1	0.3	1.6	1.4	1.8
Swimming	0.9	0.7	1.1	1.1	0.8	1.4	0.7	0.5	1.0
Others	3.6	3.3	3.9	4.4	3.8	5.0	2.9	2.5	3.3
Do not practice LTPA	53.0	52.0	53.9	44.6	43.1	46.1	60.1	59.0	61.2

[a] Not considering walking and bicycling for transportation purposes

average magnitude of the change and it was considered statistically significant for a p value <0.05. Data analysis was carried out with Stata version 12.0 (StataCorp, College Station, TX, USA).

Results

LTPA was practiced by 47.0 % of the adults (55.4 % among men and 39.9 % among women) in 2012. Table 1 presents the distribution of active individuals in the studied sample according to their main type of LTPA. Walking was the most reported LTPA (18.1 %), followed by strength training/gymnastics (11.2 %) and football (7.2 %). The comparison between genders reveals a higher prevalence of football, running, bicycling and swimming and a smaller prevalence of walking and water aerobics among men when compared to women. The frequency of treadmill walking and running was 1.4 and 0.2 %, respectively. In the category 'Others', it is important to highlight the frequency of martial arts reported among men (0.7 %) and volleyball among women (0.4 %).

Table 2 describes the characteristics of the practitioners of the five most cited LTPA in 2012. When considering walking, the majority of reports came from women (60.9 %), people aged 25–54 years (61.6 %) and people with 9–11 years of schooling (38.7 %). In Table 3, we present the frequency of those activities according to the State capitals and Federal District. Walking was the most reported LTPA in all cities.

On the time–trend analysis between 2006 and 2012, we observed, for the whole population, a reduction in the frequency of football (from 9.1 to 7.2 %; $p = 0.004$), with much of this variation being explained by the variable 'year' ($R^2 = 0.79$) and with a decrease of 0.25 % points per year ($\beta = -0.25$). We also observed an increase of strength training/gymnastics (from 7.9 to 11.2 %; $p = 0.02$, $\beta = 0.50$, $R^2 = 0.62$) and running (from 1.7 to 3.1 %; $p < 0.001$, $\beta = 0.22$, $R^2 = 0.93$), without any change in the other types of LTPA over time (Fig. 1). The same trends can be observed both among men (Fig. 2a) and women (Fig. 2b).

Discussion

The aims of this study were to describe the main types of LTPA practiced by Brazilian adults in 2012 and to observe their time trends from 2006 to 2012. Walking was the most reported LTPA in all Brazilian State capitals and Federal District in 2012. Strength training/gymnastics was the second most reported activity, followed by football (football was the first among sports types). This pattern is slightly different form that previous to 2009 because of the increase in strength training/gymnastics and running as well as decrease in football, both in men and women, which might reflect important changes in Brazilian State capitals in the period.

Some limitations need to be considered when interpreting our results. First, our data include only the main LTPA in the last 3 months, not allowing us to capture other types of LTPA practiced in the same period. Another limitation of our study refers to the use of landline telephone interviews, since the coverage in the surveyed cities varies from 34 to 82 % of total households (Brazil Ministry of Health 2007). This bias is minimized by the use of post-stratification weights, as used by similar studies conducted through telephone interviews, such as the BRFSS, for more than 25 years (U.S. National Center for Chronic Disease Prevention and Health Promotion 2010). Due to the high cost, longer time needed and the vast territory of the country, the use of more traditional survey methodologies (such as household interviews) would make the investigation of short-term trends, as those described by this study, unfeasible.

Our study presents a comprehensive description of the main types of LTPA among LTPA practitioners in a large representative sample of the Brazilian population. Unlike our study, the two other nationally representative studies for a whole population were either limited to some regions of Brazil (Monteiro et al. 2003) or restricted to active LTPA practitioners, i.e., adults achieving at least 30 min of light to moderate LTPA in 5 or more days or 20 min of vigorous LTPA in 3 or more days of the week (Malta et al. 2009). The first one was the Brazilian Living Standards Measurement Survey, conducted in 1996 and 1997, with

Table 2 Distribution of practitioners of the five activities most cited as the main leisure-time physical activity, according to sex, age groups and years of study, Brazil 2012

Variables	Walking			Strength training/gymnastics			Football			Running			Bicycling		
	%	95 % CI		%	95 % CI		%	95 % CI		%	95 % CI		%	95 % CI	
Sex															
Men	39.1	37.2	41.1	47.4	44.6	50.1	96.7	95.6	97.8	72.9	68.1	77.8	64.9	58.8	71.0
Women	60.9	58.9	62.8	52.6	49.9	55.4	3.3	2.2	4.4	27.1	22.2	31.9	35.1	29.0	41.2
Age groups															
18–24	7.4	6.4	8.5	28.4	25.8	31.0	38.9	35.3	42.5	26.3	21.6	31.0	18.5	11.9	25.1
25–34	20.4	18.6	22.2	31.4	28.7	34.1	35.0	31.4	38.5	39.6	33.7	45.4	30.7	24.3	37.0
35–44	20.3	18.7	21.9	17.2	15.1	19.2	17.7	15.0	20.4	18.9	15.1	22.6	20.1	15.5	24.7
45–54	20.9	19.4	22.4	10.8	9.3	12.3	5.6	4.3	6.9	10.8	7.8	13.7	18.1	12.9	23.3
55–64	16.4	15.1	17.7	5.9	4.9	6.8	2.0	1.1	2.8	2.8	1.5	4.1	7.8	5.5	10.0
≥65	14.6	13.4	15.8	6.4	5.4	7.4	0.8	0.3	1.4	1.7	0.4	3.7	4.9	3.1	6.7
Years of study															
0–8	35.8	33.9	37.7	15.2	13.0	17.3	27.1	23.5	30.7	13.4	9.2	17.7	36.0	29.0	42.9
9–11	38.7	36.8	40.6	39.8	37.2	42.5	52.5	48.8	56.1	38.6	33.3	43.9	41.7	35.2	48.1
≥12	25.5	23.9	27.1	45.0	42.3	47.7	20.4	17.6	23.3	48.0	42.3	53.6	22.4	17.0	27.8

11,033 adults in the country's Southeast and Northeast. The results showed that 5.3 % of women practiced walking/jogging as LTPA (most practiced activity), followed by strength training/gymnastics (1.6 %). On the other hand, the practice of collective sports (football, basketball or volleyball) were the most frequent LTPA in men (11.5 %), followed by walking/jogging (4.4 %) and strength training/gymnastics (1.3 %) (Monteiro et al. 2003). The second study, also using Vigitel database, with data of 54,369 adults from 2006, observed that, in active LTPA practitioners, walking was the most prevalent type among women (61.1 %), followed by strength training (11.1 %). For men, the main LTPA was also walking (27.9 %), followed by football (25.5 %), and strength training/gymnastics (18.8 %) (Malta et al. 2009). It is possible to note that despite differences regarding reference populations, denominators and time period, the patterns observed in these two studies and in our survey in 2012 are similar. Similar patterns were also found in other representative studies in Brazil, such as of four regions of the State of São Paulo (Zanchetta et al. 2010), of two Brazilian cities—Pelotas (Dumith et al. 2009) and Goiânia (Cunha et al. 2008); of college students (Sousa 2012), and of industry workers (Silva et al. 2013).

The few nationwide surveys about LTPA types and type trends in other countries indicate that the most reported types are also the same as the ones from our study (Australian Sports Commission 2011; Stamatakis and Chaudhury 2008). We also see a similar increase in the prevalence of strength training/gymnastics and running from 2001 to 2010 in Australia (Australian Sports Commission 2011) and from 1997 and 2004 in England (Stamatakis and Chaudhury 2008). The comparison between our data and those coming from other countries suggests that changes in the prevalence of the most practiced types of LTPA tend to occur slowly, which might be a consequence of the interaction between cultural, geographic, and climatic aspects of a given region (Bauman et al. 2012). These temporal patterns and differences among places could also be explained by economic frameworks for physical activity participation (Cawley 2004; Humphreys and Ruseski 2009), which explore how people allocate their time to competing activities and what factors affect their decisions. The idealization of a fit body, a common trace in the cultures of Brazil, Australia and England, might help to explain the increase of practice in strength training/gymnastics and running (Prichard and Tiggemann 2008). Along with that, it is to notice the growing market around these two LTPA types in Brazil followed by the increase in purchasing power of the population (Almeida and Gutierrez 2005), which had increased the promotion efforts and had eased the access to facilities, such as gyms (Brazilian Service of Support for Micro and Small Enterprises 2014) and running groups (Corpore 2014). On the other hand, the availability of areas for football practice, traditionally done in open and public areas, such as streets and vacant lots, dramatically reduced in Brazilian State capitals given to the recent intensification of an urbanization process based on the privilege for cars and housing speculation (Rodrigues 2008). The reduction

Table 3 Frequency of the five activities most cited as the main leisure-time physical activity in adults of each federal units' capitals + the Federal District, Brazil 2012

Cities	Walking			Strength training/gymnastics			Football			Running			Bicycling		
	%	95 % CI		%	95 % CI		%	95 % CI		%	95 % CI		%	95 % CI	
Aracaju	18.8	16.6	20.9	16.5	14.1	18.9	6.0	4.4	7.5	2.6	1.6	3.6	3.0	2.0	4.1
Belém	17.6	15.4	19.8	11.7	9.8	13.6	10.3	8.1	12.5	2.8	1.8	3.7	2.5	1.5	3.4
Belo Horizonte	21.5	19.2	23.8	10.2	8.6	11.8	7.8	6.2	9.4	3.7	2.6	4.7	1.5	0.8	2.1
Boa Vista	17.8	15.4	20.2	9.2	7.4	10.9	8.0	6.0	9.9	4.5	3.2	5.7	2.9	1.7	4.0
Campo Grande	21.5	19.3	23.8	8.6	6.9	10.3	8.1	6.2	9.9	2.9	1.8	3.9	2.8	1.7	3.9
Cuiabá	20.6	18.3	22.8	10.0	8.1	11.8	8.2	6.4	10.0	2.2	1.5	3.0	2.5	1.4	3.6
Curitiba	20.5	18.3	22.6	12.5	10.6	14.4	8.2	6.5	10.0	4.5	3.2	5.7	2.7	1.8	3.6
Florianópolis	22.4	20.1	24.8	13.4	11.3	15.5	7.8	5.9	9.8	5.6	4.0	7.2	2.7	1.8	3.6
Fortaleza	17.2	15.0	19.4	12.0	9.8	14.1	6.5	4.9	8.1	2.4	1.4	3.5	1.7	0.8	2.6
Goiânia	21.5	19.3	23.6	10.7	8.9	12.5	8.5	6.7	10.3	2.7	1.8	3.7	2.3	1.5	3.1
João Pessoa	17.6	15.4	19.9	11.8	9.7	13.9	7.0	5.1	8.9	1.9	0.9	2.8	3.7	2.4	5.0
Macapá	16.2	13.8	18.5	10.0	8.1	12.0	10.3	7.8	12.8	3.0	1.8	4.3	2.2	1.4	3.0
Maceió	19.4	16.9	21.9	9.4	7.7	11.2	8.9	6.4	11.4	1.8	1.0	2.6	1.2	0.5	1.9
Manaus	17.3	14.9	19.7	9.0	7.3	10.7	12.2	9.1	15.3	4.5	2.6	6.4	0.7	0.2	1.1
Natal	19.4	17.1	21.7	12.6	10.4	14.7	5.0	3.6	6.4	2.5	1.5	3.4	1.8	0.9	2.8
Palmas	23.4	20.9	26.0	10.7	8.9	12.6	7.0	5.3	8.8	3.8	2.5	5.1	3.2	1.9	4.5
Porto Alegre	21.8	19.5	24.1	12.3	10.3	14.2	7.5	5.6	9.4	3.1	1.9	4.3	1.9	1.1	2.7
Porto Velho	16.7	14.5	18.8	8.3	6.6	10.0	10.7	8.5	12.9	2.6	1.8	3.5	3.2	2.1	4.4
Recife	18.7	16.4	21.0	11.3	9.4	13.2	6.5	4.7	8.3	1.7	1.0	2.5	2.4	1.4	3.4
Rio Branco	17.0	14.5	19.6	8.4	6.8	10.1	9.8	7.5	12.0	2.7	1.7	3.7	3.0	1.8	4.2
Rio de Janeiro	15.3	13.4	17.3	14.1	12.0	16.2	6.8	5.1	8.4	3.0	1.9	4.0	2.0	1.1	3.0
Salvador	16.9	14.9	18.9	10.5	8.7	12.3	8.7	6.7	10.7	2.7	1.7	3.6	1.4	0.7	2.1
São Luis	16.7	14.6	18.8	10.0	7.8	12.3	10.6	8.5	12.7	2.1	1.3	2.9	2.2	1.4	3.0
São Paulo	16.8	14.8	18.7	9.7	8.1	11.3	5.5	4.1	6.9	3.1	2.0	4.1	1.7	0.9	2.4
Teresina	22.0	19.1	24.9	8.9	7.3	10.5	7.4	5.2	9.5	1.6	0.8	2.4	2.8	1.6	3.9
Vitória	21.8	19.6	24.1	14.8	12.8	16.9	6.0	4.4	7.7	5.0	3.6	6.5	2.2	1.4	3.0
Federal District	20.6	18.5	22.8	12.8	11.0	14.7	5.7	4.1	7.2	5.0	3.7	6.2	2.6	1.5	3.6

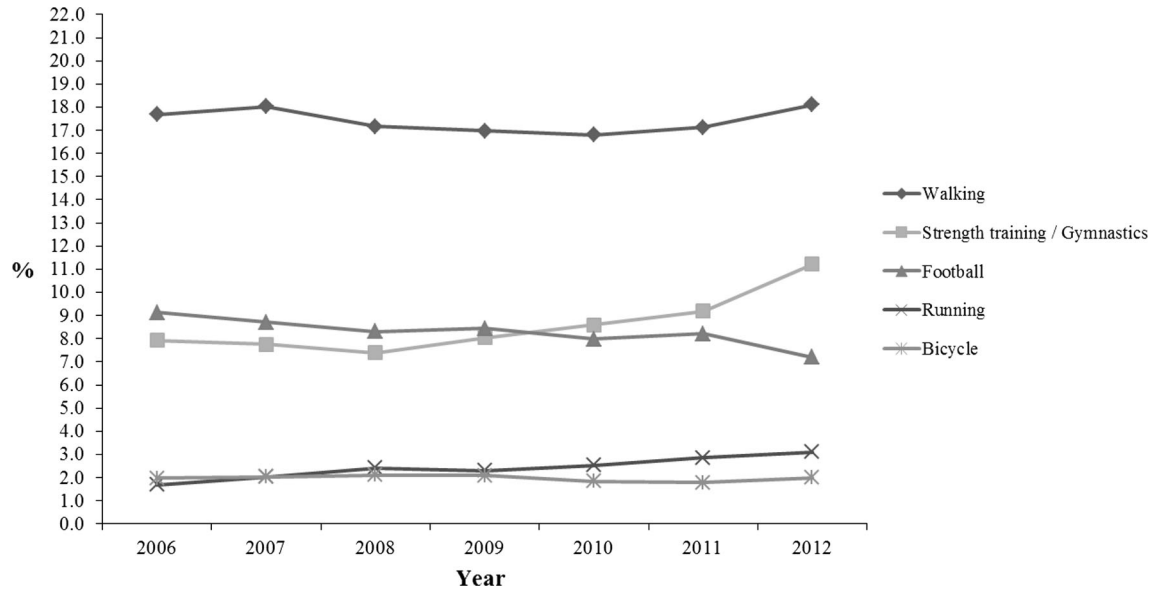

Fig. 1 Time trend of the five activities most cited as the main leisure-time physical activity for Brazilian adults. Brazil 2006–2012

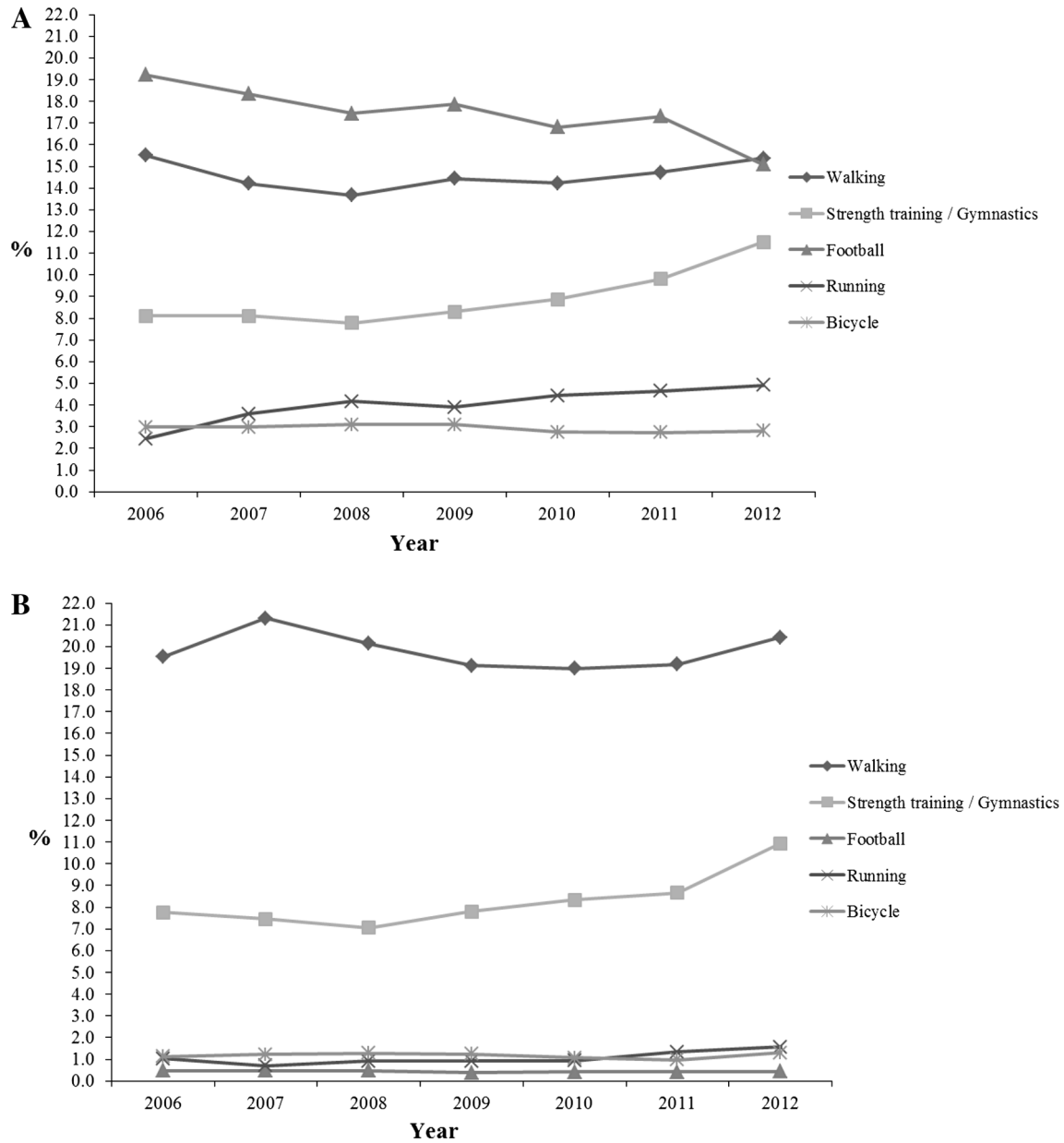

Fig. 2 Time trend of the five activities most cited as the main leisure-time physical activity for Brazilian men (**a**) and women (**b**). Brazil 2006–2012. Men: strength training/gymnastics: from 8.1 to 11.5 %; $p = 0.013$, $\beta = 0.53$, $R^2 = 0.69$. Football: from 19.2 to 15.1 %; $p = 0.006$, $\beta = -0.54$, $R^2 = 0.77$. Running: from 2.5 to 4.9 %; $p = 0.004$, $\beta = 0.34$, $R^2 = 0.80$. Women: strength training/gymnastics: from 7.8 to 10.9 %; $p = 0.034$, $\beta = 0.46$, $R^2 = 0.55$. Football: from 0.5 to 0.4 %; $p = 0.012$, $\beta = -0.02$, $R^2 = 0.70$. Running: from 1.0 to 1.6 %; $p = 0.048$, $\beta = 0.11$, $R^2 = 0.49$

in the prevalence of football makes walking—which remained relatively constant in the study period, around 15 %—to become the most prevalent LTPA type among men. The fact that all trends were observed both among men and women, regardless of the LTPA type prevalence in each sex, reinforces the idea of major contextual factors driving these changes.

Therefore, it is important to ask whether the choice for a LTPA type is based on personal or social preferences or if it has been restricted due to the availability and access to appropriate places for practice as well as a sort of 'physical activity monotony' for LTPA promotion. In Brazil, 77.7 % of LTPA practice was based on three types of activity: walking, strength training/gymnastics or football. Even though there are many reasons that could help to explain their predominance, such as affordability, convenience and cultural backgrounds, it is still desirable to increase the share of other types in total LTPA (e.g., running and

bicycling, both with low prevalence in our population). The diversification of types of LTPA accessible for the whole population could help to reduce the inequalities observed in our results against women and people aged more than 55 years. By offering more alternatives for LTPA practice, we could also tackle the growing epidemic of non-communicable diseases in Brazil, especially those with alarming rates (Schmidt et al. 2011) and against which LTPA already has recognized benefits, such as hypertension, diabetes and cancer (Lee et al. 2012).

While the study of population levels of LTPA based only on intensity and duration provides a relevant evidence, especially for health practitioners, stakeholders with an interest in planning and promoting LTPA are likely to be somewhat frustrated by this approach. One might ask how useful this information is while identifying country regions more likely to receive each kind of sports initiation programs or even when deciding whether to build a court or a pool, for example. The analysis of the types of LTPA attempts to address these issues by reporting a physical activity construct more directly related to cultural practices and preferences, and more tangible to stakeholders planning decisions. This is of major importance in a country about to receive the FIFA World Cup in 2014 and the Olympic Games in 2016.

In conclusion, patterns and trends of the main LTPA types have remained relatively stable over the last years, with walking as the most common type of LTPA reported and the same five LTPA types responding to the majority of LTPA practice in Brazil. Changes were observed in certain LTPA types as well as some differences in the prevalence of LTPA type among sex and state capitals, which raise the necessity of targeted promotion actions.

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Conflict of interest The authors declare that there are no conflict of interest.

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