Brazil before and during COVID-19 pandemic: Impact on the practice and habits of physical exercise

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Abstract. *Introduction:* The goal of this study was to investigate the practice and habits of physical exercise impact due to COVID-19 social isolation before and during the outbreak in Brazil and its mains macro-regions, which have social and economic disparities. *Methods:* This is an observational cross-sectional study through an online questionnaire survey. A self-administered survey (PEF-COVID19) was applied in the Brazilian general population, age ≥ 18 years. T-test for independent samples and Chi-square tests were used to compare Brazil and different macro-regions, $p < 0.05$. *Results:* 1,977 participants filled the survey and 1,845 were included; 80% of the included ones were in social isolation. In general, the self-related physical exercise practice before and during the COVID-19 pandemic and exercise characteristics were highly affected by the pandemic ($p < 0.05$). Sedentary behavior increased significantly (14.9 vs. 29.8%) and between the active ones, the frequency of PEx per week and duration of the PEx practice decreased significantly. The motivation to exercise also changed considering performance and health before and during the pandemic, respectively (10 vs. 5.6% and 72.4 vs. 79.1%). Also, the sample started to exercise less in the night and more in the afternoon, respectively (33.7 vs. 25.3% and 19.1 vs. 31.5%). *Conclusions:* The COVID-19 pandemic highly influenced the physical exercise practice and habits (frequency, duration, motivation, period to exercise) in Brazil and its main macro-regions. These results can be used to create measures, as home-based exercise programs, to avoid the harm of sedentary behaviors and mental health impact during and after the pandemic. (www.actabiomedica.it)

Keywords: COVID-19, Exercise, SARS-CoV-2, Quality of life, Social isolation

Introduction

Brazil is a country of continental dimensions with different climates, culture and local economic disparities. The population quality of life regarding the health and mental status facing a pandemic, may cause serious public health problem in different dimensions considering its macro-regions realities. In March of 2020, the new coronavirus disease (COVID-19) was considered a pandemic (1) , and Brazil had the first confirmed COVID-19 case on February 26th 2020 (2).

The outbreak of COVID-19 not only caused great public concern considering the necessity of being confined at home, but also changed drastically people daily life, the economy and the nations' health systems. As a consequence of the social distancing, the level of physical exercise (PEx) and physical activity is expected to decrease due to the reduction in outside daily activities (3). This seems to have a negative impact in the general health due to sedentary behaviors (4-5), muscle loss, body fat increase and systemic inflammation (5) worsening chronic diseases, and lead to psychological conditions, such as anxiety and stress to psychological conditions, such as anxiety and stress (6-7), isolation and home confinement. While these measures are imperative to abate the spreading of COVID-19, the impact of these restrictions on health behavior and lifestyle at home is undefined. Therefore, an international online survey was launched in April 2020 in five languages to elucidate the behavioral and lifestyle consequences of COVID-19 restrictions. This report presents the results from the responders from Brazil on physical activity (PA) considering its mains macro-regions.

Since Brazil has considerable regional variations with areas of absolute poverty and economic diversity, illness and higher level of institutionalization to the elderly (8), how the population quality of life will change regarding the health and mental status facing the COVID-19 pandemic is important to know for fast public health implementation measures. The pandemic though the social isolation and worsening physical inactivity can cause serious implications to the general population in Brazil. The aim of this study was to use the validated questionnaire "Physical exercise level before and during social isolation" (PEF-COVID19),

to identify in Brazil, the changes in the level and habits of physical exercise during the COVID-19 outbreak. Our hypothesis was that COVID-19 lockdown will result in lesser PEx practice and habits in the mains Brazilian macro regions.

Material and Methods

This is an observational cross-sectional study through an online questionnaire survey. A self-administered questionnaire survey delivered through the internet was conducted. The data collection happened in Brazil from 21th April until May 3rd 2020. Ethical approval was obtained from of the *Hospital Universitário Pedro Ernesto (HUPE), Universidade do Estado do Rio de Janeiro (UERJ)*, *Plataforma Brasil,* approved this work with the number CAAE 30649620.1.0000.5259.

Sample

Brazilian population in general, over 18 years old was invited to participate of this study. The responders who agreed to participate of this study after an explanation of the consent form in the beginning of the survey, with ≥18 years old, were included. At any time, the responder could give up concluding the survey without any penalty or constraints.

Survey

The questionnaire PEF-COVID19 was created to assess the levels of physical exercise and psychological impact of general population before and during the social isolation due to the COVID-19 pandemic. The psychometric properties of this instrument is described in the study of SÁ-CAPUTO, et al. (2020)(9) that reports the validity indexes and the test-retest reliability, being considered a valid and reliable instrument.

The instrument was divided into four sections, (I) Subjects characterization with demographic, anthropometric and health status questions; (II) Physical exercise performed or not, pain, anxiety and stress before COVID-19; (III) Confinement situation update; (IV) Physical exercise performed or not, pain, anxiety and stress during COVID-19.

The questionnaire was prepared in the Google Forms platform to create an online self-administered questionnaire automatically hosted via a unique URL. The confidentially of the study was ensured through a Unique ID, password protected, of all self-reported data using a "Cloud" database. The survey was conducted anonymously.

Among the 47 questions, the questions type were open-ended, closed-ended, Yes/No and for the pain, anxiety and stress level evaluation, a scale from 0 (minimal) up to ten (maximum) was used (9).

Data collection

The questionnaire was distributed using social and network media (Whatsapp, Facebook, Messenger, Linkedin), and email inviting people in general to participate and asking them to share with family and friends through the link: https://docs.google.com/forms/d/e/1FAIpQLScgnHqfHH5NjLQHv6sLnbtz38eg1hBTu3Uy3jxgIV0Ou7-_gw/viewform?usp=sf_link.

Participant responses were secured where the data was recorded, scaled and scored in electronic sheets by custom Excel formulas for later statistical analysis.

Statistical analysis

All data were exported to an Excel sheet. Nominal data were coded for statistical purposes. The statistical analyses were performed using IBM SPSS Statistics for Windows (version 21.0., IBM Corp., Armonk, NY, USA). Descriptive statistical analyses (n, %) were performed and the independent chi-square test. Post hoc analyses were performed on multiple category data with the Bonferroni correction.

Comparisons between the groups (Brazil and mains Brazilian macro-regions before and during the pandemic) for the categorical variables of sex, smoking habits, physical exercise practice and exercise category were made using chi squared analysis. Age distributions, mass, height, body mass index, years smoking, number of cigarettes per day, between the groups, were compared using an independent t test.

Results

A total of 1,977 participants filled the survey. Prior to data analysis, 129 answers were excluded (6.5%) of the initial respondents because they were from different countries or with age below 18 years-old, leaving a total of 1,848 questionnaires to analyze.

Brazil has five different macro-regions. The two regions less populated are North and Center-west regions; however, they cover 64% of the Brazilian territory. About 4% of the survey respondents came from these regions. The Southeast (SE) region with 10.9% of the territory is the most populated and industrialized area with ~52% of the respondents. The Northeast (NE) region is the third bigger territory (18.2%) and the second most populated area with tourism-based economy; ~23% of the respondents. The South (S) region has the smallest territory (6.8%) and its demographics and culture had large influence from the European immigrants and is the second highest per capita income of the country. For this survey, S had the higher percentages of respondents per million of inhabitants (12.6), followed by SE (10.9) and NE (7.5). In general, the survey reached 8.8% of respondents per million of person considering the Brazilian population. As expected, Center-west and North regions, with the bigger territories and smaller population, had a little number of answers and for that reason these answers were analyzed in the Tables with the overall Brazilian population.

Sociodemographic characteristics and sample health condition

Table 1 summarizes the sociodemographic and health condition characteristics of the Brazilian sample, considering the three mains macro-regions regions of Brazil, with bigger demographic density and also the total sample. It is possible to observe that the female respondents were prevalent (70%), in all analyzed regions. The mean Body Mass Index (BMI) was overweight (from 25 to 29.9 kg/m²) for the Brazilians in general and SE region and normal (from 18.5 to 24.9 kg/m²) for the other macro-regions, with statistic difference between those regions. The educational level was considered high

between the respondents with university professions. At the moment the survey, the S region presented the smaller and the NE region reached the higher percentage of salary reduction or unemployment (10.3% and 16.2%, respectively) due to COVID-19.

The current mains diseases of the sample (Table 1) are respiratory, musculoskeletal, cardiovascular, or related conditions and mental health diseases, respectively. For S and SE regions, respiratory diseases were more prevalent and musculoskeletal diseases for NE region. Most of the sample (56%) declares do not have any disease. The medication types more used were for cardiovascular diseases and related conditions followed by mental health diseases.

Smoking habits occur in 4.1% of the total sample, with a mean of 5 cigarettes per day. The S region has a sample that, in mean, smokes less years as the sample from the other regions and Brazil in general.

Social isolation status

About the current social isolation status, Figure 1 shows how many people were in social isolation during the survey application and the reasons why they were not in social isolation. Most of the individuals were in social isolation (~80%) and the ones that were not in social isolation (~15%) were not released from their jobs. Few respondents (1.5%) do not believe in social isolation.

PEx practice and habits

The self-related PEx practice before and during COVID-19 pandemic and exercise characteristics (frequency, duration, PEx type, fatigue, motivation and period of the day which the exercise was performed) are presented on Table 2. Data are from the Brazilian general

Table 1. Sociodemographic and health characteristics of the sample from the Brazilian general population (n = 1,848), aged from 18 years old and divided by the 3 mains Brazilian macro-regions (South, Southeast and Northeast), considering the demographic density. Values are presented as mean±SD or percentage (%).

	Brazil (n=1,848)	South (n=378)	Southeast (n=964)	Northeast (n=431)
Age (general)	39.5±13.3	38.6±13	42.8±28	36±12.8
Young	21.8±1.6(14.7)	21.8±1.5(14.5)	21.8±1.6(9.4)	21.5±2.1(19.6)
Young-Adult	34.7±5.7(53.3)	34.8±5.8(53.2)	35.3±5.5(46.5)	33.7±5.9(51.4)*
Adult	51.8±4.2(23.4)	51.7±4.4(18.5)	52.1±4.2(26.1)	51.2±4.3(16.8)
Elderly	65.5±4.6(8.6)	65.2±3.7(7.6)	65.4±4.8(9.8)	66.8±4.4(4.8)
Gender				
Female	70	72.2	68.9	69.8
Male	29.8	27.8	31	29.7
Not declared	0.2	0	0.1	0.5
Anthropometry				
Body mass (kg)	71.4±26.3	68.3±15.1*	73.5±33.5	69.5±13.3*
Height (m)	1.7±0.4	1.66±0.1	1.7±0.5	1.67±0.1
BMI (kg/m2)	25.4±7.8	24.5±4.3*	26±9.9	24.8±4.1*
Marital Status				
Not married	38.3	38.1	38	38.5
Married	50.8	50.5	50.7	52.2
Divorced	9.4	9.8	9.3	8.6
Widowed	1.5	1.3	1.8	0.7
Education level				
Elementary school	0.4	0.5	0.6	0
High school	7.9	7.1	8.2	7.2
Undergraduation	35	40.5	35.4	30.4
Graduation⁶	56.7	51.6	55.7	62.4

Table 1. (*Continued*)

	Brazil (n=1,848)	South (n=378)	Southeast (n=964)	Northeast (n=431)
Profession				
Universitary	62	62.2	66.1	66.1
Non-universitary	7.6	8.5	7.5	6.7
Military	4.1	4.2	4.7	1.9
Retired	7	6.3	6.7	8.1
Student	16.4	18.8	15	17.2
Working Status				
Student	15.5	16.7	14.4	16.7
Public sector	30.1	28.1	31	28.3
Private sector	28.2	30.5	29.2	25.1
Unemployed	6.5	8	6.3	5.6
Retired	7	6.4	6.6	8.1
Current main disease				
CD&RC	10.2	9	10.2	10.7
ND	0.6	0.3	0.5	1.2
RD	14	16.7	14.3	10.4
MD	10.7	11.4	9.9	13.2
MH	8.4	6.9	9.1	7.9
Any disease	56	55.7	56	56.6
Medication				
Yes/No (%)	38/62	38.9/61.1	40.5/59.5	33.4/66.6
Medication type for⁕				
CD&RC/C2+	6.9/6.3	6.9/6.3	7/6.2	6.7/6.3
ND/C2+	0.3/0.5	0.5/0.5	0.2/0.3	0.2/0.5
RD&A/C2+	2.1/2.1	2.6/1.3	2/2.2	1.6/1.9
MD/C2+	0.8/1.6	0.3/2.4	1/1	0.5/1.6
MH/C2+	5.1/3.1	4.2/3.7	4.4/2.9	6.7/2.3
TH/C2+	3.5/2.8	4.8/2.1	2.5/3	4.6/2.8
CP/C2+	3.7/1.3			
Food supplements/C2+	1.7/2.5	1.6/1.6	2.1/2.9	0.9/1.9
Other/C2+	1.8/3.5	1.9/4	1.8/3.4	1.6/2.3
Smoking habits				
Yes(%)/years smoking	4.1/18.6±10.2	5/6.4±6.8*	4.5/19.1±11.1	3.5/21.6±12.1
n. cigarettes per day(mean)	5.2±4.8	5.7±5.1	5.4±5.1	7.8±5.9*
No (%)	95.9	95	95.5	96.5
SR/U	12.7	10.3	12.4	16.2

Legend: BMI, body mass index; SR/U, Salary reduction or unemployed due to COVID-19; ᵟ masters, doctorate; Young (18-24 years); Young-Adult (25-44 years); Adult (45-59 years); Elderly (60- years); CD&RC, cardiovascular diseases and related conditions, ⁕anti-diabetic, hypo-cholesterolemic, anti-hypertensive, anti-coagulants and beta-blockers; C2+, combined with two or more medicaments from any category; ND, neurological diseases, ⁕anti-epileptic; RD&A, respiratory diseases and allergy, ⁕anti-histaminic and anti-asthmatic; MD, Musculoskeletal, ⁕corticosteroids, anti-osteoporosis, non-steroidal anti-inflammatory, painkillers; MH, mental health, ⁕psychotropic; TH, Thyroid hormones; CP, Contraception, ⁕Contraceptive pill; Other, ⁕anti-acid, anti-tumoral, others. *T test for independent samples, comparing Brazil with Brazilian macro-regions, $p<0.05$. ᴸChi-square test for categorical variables, comparisons between Brazil and different macro-regions, $p<0.05$.
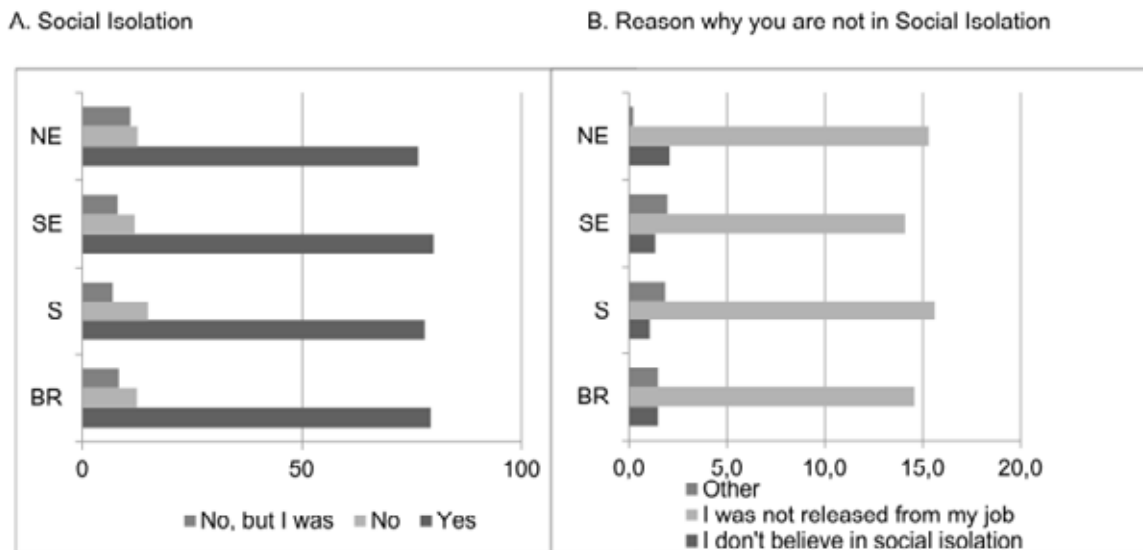
Figure 1. Number of individuals (%) in social isolation (A) and reasons why the individual was not isolated (B). Sample comes from the Brazilian general population (n = 1,848), aged from 18 years old and divided by the 3 mains Brazilian macro-regions (South, Southeast and Northeast), considering the demographic density.

Legend: BR, Brazil; S, South; SE, Southeast; NE, Northeast.

Table 2. Self-related physical exercise practice of the sample from the Brazilian general population (n = 1,848), aged from 18 years old and divided by the 3 mains Brazilian macro-regions, South (S) n=378, Southeast (SE) n=964 and Northeast (NE) n=431, considering the demographic density, before and during the COVID-19 pandemic. Values are presented as percentage (%).

	PE Practice Before COVID-19				PE Practice During COVID-19			
	Brazil	**S**	**SE**	**NE**	**Brazil**	**S**	**SE**	**NE**
SR Level of PEx								
Sedentary	14.9	19.1	16.5	9.3	**28.9***	**29.3***	**31.7***	**23***
A bit active	24.4	22.3	24.7	24	**33.3***	**34.7***	**30.8***	**37.7***
Active	43.6	40.1	42.1	50	**32***	**29.1***	**32.4***	**32.6***
Very active	17	18.6	16.6	16.7	**5.9***	**6.9***	**5.1***	**6.7***
PEx Practice								
Yes/No	80.4/19.6	76.7/23.3	78.4/21.6	82.7/12.8	**71/29***	**61.9/30.9***	**69.6/30.4***	**75.3/24.7***
Frequency								
1 t/w	4.7	4.1	4.9	2.6	**8.8***	**9.8**	**9.2***	**8.4***
2-3	45.6	43.6	38	40.8	**39.1**	**40.2**	**41.2**	**39.9**
4-5	33.1	38.1	32	41.9	**31**	**34.6**	**31.9**	**32.3**
6-7	16.5	14.1	25.1	14.7	**17.4**	**15.4**	**17.7***	**19.3**
Duration								
0-30min	5.6	6.2	6	4.5	**30.4***	**34***	**30.2***	**28.7***
31-60	14.4	12.4	15.3	14	**28***	**24.8***	**29.1***	**28.7***
61-	80	81.4	78.6	81.5	**41.6***	**41.2***	**40.7***	**42.6***

(continued)

Table 2. (*Continued*)

	PE Practice Before COVID-19				PE Practice During COVID-19			
	Brazil	**S**	**SE**	**NE**	**Brazil**	**S**	**SE**	**NE**
PEx type								
Aerobic	44.4	44.4	45.7	39.3	**54.9***	**51.5**	**56.7***	**52.3**
Resistance	10.4	8	9.1	15.3	**21.2***	**19.7***	**21.3***	**22.2**
Strengthening	28.9	25.9	29.9	30.5	**11.6***	**13.3***	**10.9***	**12.6***
Other/CM	16.4	21.8	15.3	14.6	**12.3**	**15.5**	**8**	**12.9**
SR Fatigue PEx								
0-3	28.5	27.5	29.1	28.3	**24.2**	**20.8**	**26.5**	**23.1**
4-7	49.9	52.7	49.3	52.7	**52.9**	**54.3**	**52.2**	**53.4**
8-10	20.6	19.8	21.6	18.9	**22.9**	**24.9**	**21.2**	**23.4**
Motivation								
Entertainment	7.8	7.9	8.5	7.4	**8.2**	**9.1**	**8.3**	**7.2**
Performance	10	10	8.7	12.9	**5.6***	**5.3**	**5.5**	**6.3**
Aesthetics	9.8	7.9	9.8	10	**7.1**	**6.8**	**7**	**6.9**
Health	72.4	74.2	73	69.7	**79.1***	**78.9**	**79.2**	**79.6**
Period PEx								
Dawn	1.5	1.4	1.7	1.1	**0.7**	**0.8**	**0.7**	**0.9**
Morning	45.7	43	47.2	45	**42.5**	**42.6**	**42.6**	**40.5**
Afternoon	19.1	16.5	19.6	20	**31.5***	**31.7***	**31.2***	**33.3***
Night	33.7	39.2	31.5	33.9	**25.3***	**24.9***	**25.4**	**25.2**

Legend: PEx, Physical Exercise; TS, total sample; SR, self-related; t/w, times/week; min, minutes; CM, combined modalities; *Chi-square test with Bonferroni correction for categorical variables, comparisons between before and after COVID-19, p<0.05.

population and divided by the 3 mains Brazilian macro-regions (South - S, Southeast - SE and Northeast - NE).

Considering self-related PEx practice before and during COVID-19 pandemic for the Brazilian general population, the independent chi-square test showed that the COVID-19 pandemic influenced the self-related PEx [X^2(3)= 240.094;p<0.0001]; when analyzing the different regions of Brazil, the S region [X^2(3)= 44.768;p<0.0001], SE [X^2(3)= 123.001;p<0.0001] and NE [X^2(3)= 77.331;p<0.001] regions showed the same pattern, with statistical significance after Bonferroni Correction between all answers.

The Brazilian general population sample decreased significantly the PEx practice [X^2(1)= 44.254;p<0.0001]; the S region [X^2(1)= 6.098;p=0.014], SE [X^2(1)= 20.053;p<0.0001] and NE [X^2(1)= 19.876;p<0.001] regions also decreased the PE practice. The number of days practicing PEx

for the Brazilians during the pandemic also changed [X^2(3)= 23.860;p<0.0001] and more people started doing exercise only once a week (p<0.0001); when analyzing the different regions of Brazil, no changes were found for the S [X^2(3)= 7.539;p=0.057], for the SE [X^2(3)= 21.404;p<0.0001], more people started to exercise once a week and less people 6-7 times per week. For the NE [X^2(3)= 18.025;p<0.001] region, also more people started to exercise once a week. The duration of the exercise also changed for Brazil [X^2(2)= 480.355;p<0.0001], and other Brazilian macro regions - S [X^2(2)= 101.109;p<0.0001], SE [X^2(2)= 263.749;p<0.0001] and NE [X^2(2)= 126.292;p<0.001] regions and decreased significantly in general.

The PEx type changed for the Brazilian general population [X^2(3)= 190.663;p<0.0001] before and after the pandemic; when analyzing the different regions of Brazil, the S [X^2(3)= 32.840;p<0.0001], SE

$[X^2(3)= 120.334;p<0.0001]$ and NE $[X^2(3)= 38.297;p<0.001]$ regions and the strengthening exercise suffered the major changes. The fatigue levels before and after the pandemic for the Brazilian general population $[X^2(2)= 8.142;p=0.017]$ and the macro regions (S $[X^2(2)= 4.824;p>0.05]$, SE $[X^2(2)= 1.682;p>0.05]$ and NE $[X^2(2)= 3.914; p>0.05]$) were not different after the Bonferroni correction.

The motivation to perform the exercise before and after the pandemic changed for the Brazilian general population $[X^2(3)= 28.111;p<0.0001]$, increasing motivation for health and decreasing for performance. When dividing the sample per macro regions, no changes were found after Bonferroni correction (S $[X^2(3)= 4.773;p>0.05]$, SE $[X^2(3)= 10.350;p=0.016]$ and NE $[X^2(3)= 12.277;p=0.006]$).

Considering the period of the day to perform the exercise before and after the pandemic for the Brazilian general population this habit changed $[X^2(3)= 65.373;p<0.0001]$ and more people started to exercise in the afternoon and less people at night. When dividing the sample per macro regions, S $[X^2(3)= 22.724; p<0.0001$ followed the same pattern after Bonferroni correction. The SE $[X^2(3)= 28.848; p<0.0001]$ and NE $[X^2(3)= 17.413;p=0.001]$) started to exercise statistically more in the afternoon period.

Discussion

To the best of our knowledge, this is the first study to evaluate the level of physical exercise of Brazil and its mains macro-regions during the COVID-19 outbreak. Our hypotheses were confirmed.

About 80% of the studied Brazilian general population was in social isolation during the survey application and 1.5% did not believe in social isolation. As in February 3rd the epidemic was declared a Public Health Emergency of National Concern (10) following the notifications of the disease spread and deaths in all continents (11), it was observed that the majority of the respondents were following the social isolation and government restrictions.

As Brazil has continental dimensions, the country is divided in macro regions, with specific characteristics. One of them is the population density. The

Pesquisa Nacional por Amostra de Domicílios − 2015 (PNAD 2015) found that the Southeast Region (SE) has the bigger population density (41.9%), followed by Northeast (NE) (27.6%), South (S) (14.3%) %), North (N) (8.6%) and Center-west (CW) (7.6%) (12). These findings, justify that, CW and N regions, with the bigger territories and smaller population, had a little number of answers. As, it was expected, SE and NE, without large territories, but with a big population density, had an elevated number of answers. However, the S region with a smaller percentage of populational density compared to SE and NE, had proportionally the highest number of answers.

Although, there are differences, in various characteristics, among the Brazilian regions, the sociodemographic results indicate no substantial differences among the regions S, SE and NE regarding the sex and age of the respondents, marital status (about half were married, education level that was high within all regions, profession and working status. The NE region had the highest number of the respondents (16.2%) that registered salary reduction or unemployment due to COVID-19 pandemic as the tourism plays an important role in regional income redistribution for this region (13) and this aspect was one of the first affected by the social isolation. The numbers of salary reduction or unemployment may not reflect the reality considering 30.1% of the sample was from public sector that kept its salaries or the small rate of respondents with low education level.

The Centers for Disease Control and Prevention (CDC) (14) states that there is limited information regarding risk factors for severe illness due to COVID-19 as a new disease. It is pointed out that, the current available information and clinical expertise, older adults and people of any age who have serious underlying medical conditions might be at higher risk for severe illness from COVID-19. World Health Organization (15) considers older people (over 60 years old); and those with underlying medical conditions, such as, cardiovascular disease, diabetes, chronic respiratory disease, and cancer. Moreover, it is indicated that the risk of severe disease gradually increases with age starting from around 40 years. Considering the health current condition of the sample, respiratory diseases are prevalent in Brazil, S and SE regions. The S region

is the coldest region of Brazil and this incidence might be related to the seasonal changes (16) and the SE region, the most industrialized and populated are of Brazil has also the highest levels of pollution which affects the respiratory system (17), since the number of smokers are not so high for this Brazilian sample (4.1%). Musculoskeletal diseases, cardiac and related conditions are the second and third most prevalent.

Sedentary lifestyle is an important risk factor for the incidence of chronic-degenerative diseases, since there is strong scientific evidence on the inverse association of caloric expenditure and the total time of physical exercise with the incidence of cardiovascular diseases (3). However, a sedentary lifestyle must be understood as a multifactorial phenomenon, simultaneously involving social, cultural and biological aspects (18). The PEF-COVID19 also investigated the PEx practice and exercise characteristics. The self-related PEx practice before and during COVID-19 pandemic and exercise characteristics (frequency, duration, PEx type and period of the day which the exercise was performed) were affected by the pandemic for the Brazilian general population sample and also for the main macro regions. The disease has negatively impacted the population's health and the global economy (19). Since the COVID-19 cases are still growing in Brazil (20) and the lack of an efficient treatment for the severe cases, Brazil through the Health Ministry adopted the international guidelines (2) and social isolation, quarantine and hygiene education were the main measures to contain the virus spread. As a consequence, sedentary behaviors are expected with an impact on physical activity and well-being since gyms, stadiums, pools, dance and fitness studios, physiotherapy centers, parks and playgrounds were closed (21). This study confirmed the harm of the pandemic on the PEx practice of the Brazilian general population and consequently the increase of sedentary behaviors that might influence the quality of life of the population (22).

Considering the return to the normal life is still unexpected, the results from this study can help to create measures to decrease sedentary behaviors and mental health disturbances. Moreover, it is expected that with the comparison of some parameters before and during the outbreak, the results can aid in the definition of policies to help the Brazilian population, in general, and in specific regions, due to the COVID-19 period post-pandemic.

As a limitation, the number of respondents was different in the various regions that were investigated. Moreover, in two Regions, North and Midwest, the number of respondents was reduced. Due to the unknown home-quarantine in each Region country, a specific adaptation of the questionnaire was not possible to be done. In general, the Brazilian Regions have specific characteristics, as nutrition, political approaches, and local costumes. Also, self-reported instruments can induce bias.

Conclusion

The findings obtained with the PEF-COVID19 showed, in general, that the Brazilian general population was affected by the pandemic considering the reduction of PEx habits. These results will be valuable to the establishment of actions to aid the population of Brazil to minimize, with different approaches, the undesirable commitment due the social distancing related to the COVID-19.

Conflicts of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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