Changes in the prevalence of physical inactivity and sedentary behavior during COVID-19 pandemic: a survey with 39,693 Brazilian adults

Mudanças na prevalência de inatividade física e comportamento sedentário durante a pandemia da COVID-19: um inquérito com 39.693 adultos brasileiros

Cambios en la prevalencia de inactividad física y comportamiento sedentario durante la pandemia de COVID-19: una encuesta con 39.693 adultos brasileños

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Abstract

This study analyzed changes in the prevalence of physical inactivity and sedentary behaviors according to correlates during the COVID-19 pandemic among Brazilian adults. A national retrospective online survey was conducted with 39,693 Brazilian adults. Physical activity (weekly frequency and daily duration; cut-off point of 150 minutes/week), TV-viewing time and computer/tablet use (daily duration; cut-off point of 4 hours/day) before and during the pandemic period were reported. Sex, age group, schooling level, skin color, per capita income, country region, working status during the quarantine, and adherence to the quarantine were the correlates. Descriptive statistics were used. The prevalence of physical inactivity, high TV-viewing time and computer/tablet use increased, respectively, 26%, 266%, and 38% during the pandemic. While increases in physical inactivity and computer/tablet were more widespread, higher increases in the prevalence of high TV viewing tiem were observed among younger adults (660%), with higher schooling level (437%) and those who were at home office (331%). The prevalence of physical inactivity and sedentary behaviors increased in all population sub-groups during the COVID-19 pandemic in Brazil.

Health Behavior; Exercise; Healthy Lifestyle; COVID-19

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Introduction

Physical inactivity and sedentary behavior are reaching alarming levels worldwide [1]. Specifically, previous study found that approximately 55% of Brazilian adults did not attend the recommended levels of physical activity and 15% spend more than four hours per day watching TV [2]. Thus, the promotion of active lifestyles has been challenging researchers, policy makers, and international organizations [3].

However, the new coronavirus (COVID-19) pandemic came unexpectedly and changed the human lives [4,5]. Measures of quarantine to mitigate the virus spread, encouraging people to stay at their homes have been recommended as a significant measure, but it can also present indirect negative effects on healthy behaviors, reducing the opportunities to practice physical activity outside as well as increasing possibilities of sedentary activities, especially through screens (e.g., TV viewing, computer, and smartphones) [6,7]. This scenario can be a risk for cardiovascular [8], metabolic [9], and mental disorders [10], in addition to compromise immune systems [11,12,13], directly associated to the COVID-19 progression.

In this sense, to survey the frequency and distribution of changes in movement behaviors with nationwide samples during the COVID-19 pandemic can foment and drive interventions and public policies to encourage people to stay active and with low sedentary behavior [7], mitigating the harmful effects of the quarantine period. Here, we analyzed changes in the prevalence of physical inactivity and sedentary behaviors during the COVID-19 pandemic according correlates, among Brazilian adults.

Methods

Design and sample

The *ConVid – Behavior Survey* is a health survey using a virtual questionnaire to assess the changes that occurred in the lives of Brazilians after the arrival of the coronavirus pandemic in the country, related to social restriction initiatives for the protection of people, including quarantine. Data collection was conducted between April 24th and May 24th, 2020.

Participants were invited by a chain sampling procedure. In the first stage, the 15 members of the research team choose a total of 200 other researchers from different states in Brazil (approximately 13 invitation per member). Furthermore, members of the research team choose 20 other people from their social network, making a total of 500 people chosen (200 researchers + 300 people of social network), which were called as influencers. Each influencer sent the survey link to at least 12 people from their social networks, obeying a stratification by sex, age range (18-39; 40-59; 60+ years) and education level (incomplete high school or less; complete higher education). That is, six women and six men, two in each age group, one of each education level. People invited by the influencers were encouraged to invite at least three more people of their social networks, representing the second wave of invitations). Moreover, information about the study was disseminated by press releases, social communications from participating research institutions, state health departments, and social media. The survey link was also available at the influencers' research institutions. Futher details about the study procedures are available elsewhere [14]. All procedures were approved by the Brazilian National Ethics Research Committee (CONEP) (process: 30598320.1.0000.5241). From the initial sample (n = 45,160), 5,467 presented missing data in at least one variable and were excluded from the analyses. The current study excluded missing data and analyzed 39,693 participants. The sample was weighted according to characteristics from the *Brazilian National Household Sample Survey* (PNAD – conducted annually), considering population in each state, education, age, sex, and prevalence of chronic diseases, aiming to let the sample nationally representative.

Physical activity

For physical activity before COVID-19 pandemic, participants were asked "Before the COVID-19 pandemic, how many days a week did you practice any type of physical exercise or sport? (do not consider physical therapy)". Possible answers were: (a) less than 1; (b) 1-2; (c) 3-4; or (d) 5 or more. For those reporting physical activity practice, we also asked: "How long did this activity last?". Pos-

sible answers were: (a) less than 30 minutes; (b) 30-45 minutes; (c) 46-60 minutes; or (d) more than 60 minutes. Furthermore, for physical activity during the COVID-19 pandemic was asked: "During the COVID-19 pandemic how many days a week did you practice any type of physical exercise or sport? (do not consider physical therapy)". Possible answers were: (a) less than 1; (b) 1-2; (c) 3-4; or (d) 5 or more. For those reporting physical activity practice, we also asked: "How long did this activity last?". Possible answers were: (a) less than 30 minutes; (b) 30-45 minutes; (c) 46-60 minutes; or (d) more than 60 minutes. Physical inactivity was classified as less than 150 minutes/week of physical activity, which was calculated using the median point of frequency and duration in each category. Physical activity practice patterns were created using four change patterns: (1) consistently active; (2) become active; (3) become low active; or (4) consistently insufficiently active.

Sedentary behavior

TV viewing and computer/tablet use were adopted as independent proxies of sedentary behavior. For TV viewing, participants were asked: "Usually, before the pandemic, how many hours a day did you used to spend watching television?" and "During the pandemic, how many hours a day have you been watching television?". For computer/tablet, participants were asked: "Usually, before the pandemic, how many hours a day did you used to spend on computer or tablet?" and "During the pandemic, how many hours a day have you been using computer or tablet?". We adopted 4 hours/day as cut-offs for high TV viewing and computer/tablet use as separately outcomes [15]. TV-viewing and computer/tablet use patterns were created using four change patterns: (1) consistently low; (2) become low; (3) become high; or (4) consistently high.

Correlates

We used gender (male/female), age group (18-29, 30-39, 40-49, 50-59, 60+ years), schooling level (none or elementary school, high school and higher education), skin color (white, black, brown, and other), per capita income (< 1, 1-2, and > 2 minimum wages – ~USD 195), and country regions (North, Northeast, Central, South, and Southeast) as sociodemographic correlates.

For correlates directly associated to the COVID-19 pandemic, we used the working status during the pandemic (normal, home office, no working for any reasons [including vacation]) and the adherence to the quarantine. This last was assessed with the question "During the Coronavirus pandemic, to what extent did you (or are you still) restricting contact with people?," with possible answers: "I did nothing, I led a normal life"; "I tried to take care, stay away from people, reduce contact a little, not visit the elderly, but I kept working and leaving"; "I stayed at home just going shopping at the supermarket and drug store" or "stayed strictly at home, leaving only for health care needs." We classified stricter adherence to the quarantine with the answers "I stayed at home just going shopping at the supermarket and drug store" or "stayed strictly at home, leaving only for health care needs". Among them, time in quarantine was also collected (< 1 month, 1-2 months, and > 2 months). Those who answered "I did nothing, I led a normal life"; "I tried to take care, stay away from people, reduce contact a little, not visit the elderly, but I kept working and leaving" was classified as no adherence to the quarantine (lower impact on daily activities).

Statistical procedures

Data were analyzed using percentages and 95% confidence intervals (95%CI). Four mutually exclusive categories of the change pattern of physical activity, TV viewing, and computer/tablet use were separately created based on the behaviors adopted before and during the pandemic. Distribution of these behavioral categories within each population sub-group was analyzed. All statistical procedures were conducted using sampling weights (survey command) in Stata 15.1 (https://www.stata.com).
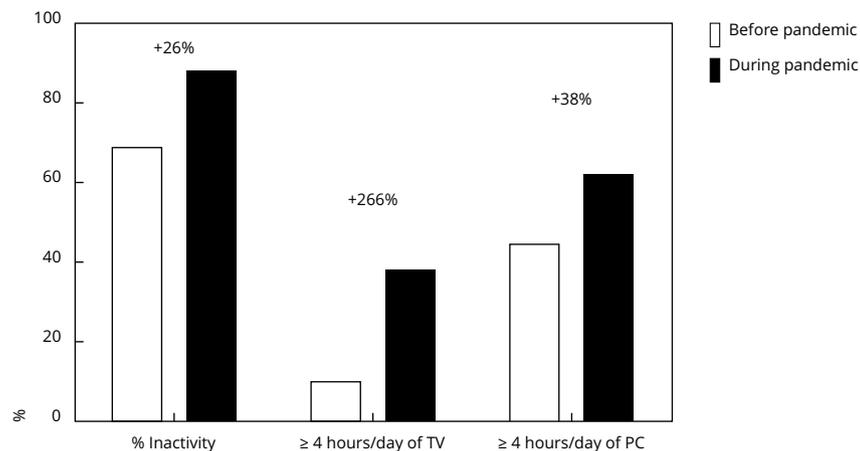
Results

After exclusions for missing information, 39,693 participants (48% women; 95%CI: 46.4-49.5) composed the final sample. The proportion of participants with none or elementary school level was 9.8% (95%CI: 8.8-10.9) and 45.6% (95%CI: 44.1-47.0) were white. More than half the participants were not working during quarantine (53.4%; 95%CI: 51.9-55.0) and 25.9% (95%CI: 24.6-27.2) were at home office. Around a quarter of participants (26.2%; 95%CI: 24.8-27.6) reported no adherence to stricter measures of quarantine and 46.5% (95%CI: 44.8-47.9) were between one and two months on quarantine. The prevalence of physical inactivity, ≥ 4 hours/day of TV viewing and ≥ 4 hours/day of computer/tablet use before and during the pandemic are presented in Figure 1.

Table 1 shows the distribution of physical activity patterns among each population sub-group. Higher proportion of "become low active" was observed among the younger age group (25%), people with higher schooling level (28%), and higher per capita income (28%) compared to their counterparts. Higher proportion of "become active" was observed among people who were not working during the pandemic (4%) and who were at home office (5%) (compared to normal routine group), among higher per capita income group (5%) and in the Southeast region (4%) (compared to Central). However, regardless of changes, higher proportion of consistently insufficiently active and active was observed, respectively, among women vs. men, lower vs higher schooling level, and lower vs higher income. Furthermore, Central Region showed higher proportion of consistently insufficiently active than Northeast and Southeast regions, while the older adults group showed higher proportion of consistently active in comparison to the younger age group.

Table 2 shows the TV-viewing (≥ 4 hours/day) patterns according to sub-groups. The proportion of "become high" was higher among women (30%), 30-39 years group (31%) (compared to > 60 years old), white (27%) (compared to black), among those who were not working during the pandemic (33%) (compared to normal routine and home office groups), in Northeast (31%) and Southeast (28%) regions (compared to Central), among people who reported < 1 month (29%) and 1-2 months of quarantine (30%) (compared to no stricter quarantine). Higher proportion of consistently high and low TV-viewing time was observed, respectively, among older vs. younger, lower vs. higher school-

Figure 1

Changes in the prevalence of movement behaviors during the COVID-19 pandemic in Brazil (n = 39,693).

PC: personal computer or tablet.
Note: inactivity was defined as < 150 minutes of physical activity per week.

Table 1

Patterns of physical activity according to the correlate categories during the COVID-19 pandemic. Brazil, 2020.

	Consistently insufficiently active % (95%CI)	Become active % (95%CI)	Become low active % (95%CI)	Consistently active % (95%CI)
Gender				
Female	69.0 (67.4-70.4)	3.3 (2.8-3.8)	20.7 (19.4-22.1)	7.1 (6.3-7.9)
Male	63.8 (61.3-66.3)	3.4 (2.6-4.5)	21.8 (19.7-24.0)	11.0 (9.5-12.7)
Age group (years)				
18-29	63.7 (60.9-66.3)	4.3 (3.5-5.3)	25.1 (22.7-27.6)	7.0 (5.8-8.4)
30-39	66.3 (62.9-69.5)	3.0 (2.1-4.1)	22.6 (19.9-25.7)	8.0 (6.3-10.2)
40-49	69.8 (66.4-72.9)	2.6 (1.5-4.3)	18.3 (15.9-21.1)	9.3 (7.4-11.1)
50-59	67.0 (63.9-70.0)	3.3 (2.3-4.7)	19.0 (16.7-21.6)	10.7 (8.9-12.3)
60	67.0 (63.2-70.6)	3.2 (2.1-4.9)	19.2 (16.3-22.5)	10.6 (8.4-13.4)
Schooling level				
Less than elementary school	76.0 (70.2-80.5)	2.9 (1.4-5.7)	13.2 (9.7-17.6)	8.0 (5.4-11.6)
High school	67.5 (65.6-69.3)	3.3 (2.7-4.0)	20.7 (19.1-22.2)	8.5 (7.5-9.7)
Higher education	56.9 (56.2-57.6)	3.9 (3.6-4.1)	28.2 (27.5-28.8)	11.1 (10.6-11.5)
Skin color				
White	65.1 (63.6-66.7)	3.0 (2.6-3.6)	22.2 (21.0-23.6)	9.6 (8.7-10.6)
Black	65.3 (60.3-70.0)	4.3 (2.4-7.6)	20.3 (16.8-24.5)	10.1 (7.5-13.4)
Brown	68.1 (65.5-70.7)	3.5 (2.7-4.5)	20.4 (18.2-22.7)	8.0 (6.6-9.8)
Other	66.3 (59.2-72.8)	3.9 (2.4-6.2)	22.1 (16.8-28.5)	7.6 (5.1-11.3)
Per capita income (minimum wage)				
< 1	70.5 (68.3-72.7)	2.7 (2.1-3.6)	18.6 (16.8-20.6)	8.1 (6.8-9.6)
1-2	69.7 (66.9-72.4)	2.9 (2.2-3.9)	19.4 (17.3-21.8)	7.9 (6.3-9.8)
> 2	56.3 (54.0-58.7)	4.8 (3.8-6.0)	27.5 (25.5-29.7)	11.3 (10.1-12.7)
Country region				
North	68.1 (61.4-74.2)	3.4 (1.8-6.5)	20.9 (16.1-26.8)	7.5 (4.4-12.6)
Northeast	64.4 (60.6-68.0)	2.8 (1.8-4.3)	23.5 (20.3-27.1)	9.3 (7.2-11.9)
Southeast	65.2 (63.7-66.7)	3.9 (3.3-4.7)	21.1 (19.9-22.4)	9.7 (8.8-10.8)
South	68.7 (65.2-72.1)	3.1 (2.0-4.9)	20.4 (17.7-23.5)	7.7 (5.9-10.0)
Central	76.2 (70.1-81.4)	1.6 (0.9-2.8)	15.7 (11.7-20.8)	6.4 (4.1-10.0)
Working during the pandemic				
No	66.2 (64.2-68.2)	3.6 (3.0-4.4)	21.6 (19.9-23.4)	8.6 (7.4-9.9)
Normal routine	69.1 (65.8-72.2)	1.5 (0.9-2.2)	19.8 (17.3-22.6)	9.6 (7.7-11.9)
Home office	65.0 (62.3-67.5)	4.2 (3.2-5.7)	21.6 (19.6-23.8)	9.1 (7.7-10.7)
Adherence to the quarantine (months)				
No	67.2 (64.2-70.1)	2.5 (1.7-3.7)	20.1 (17.7-22.8)	10.1 (8.3-12.3)
< 1	69.7 (66.1-73.1)	2.7 (1.7-4.1)	20.6 (17.6-24.0)	7.0 (5.5-8.8)
1-2	65.0 (63.1-66.8)	4.1 (3.3-4.9)	21.9 (20.4-23.4)	9.1 (7.9-10.4)
> 2	64.7 (58.8-70.2)	3.7 (2.3-5.8)	22.6 (17.7-28.3)	9.0 (6.1-13.2)

95%CI: 95% confidence interval.

ing level, no working vs. working during the pandemic, Southeast Region vs. Central. Whereas the proportion of consistently low TV-viewing time was lower among those who reported less strict adherence to quarantine measures.

Table 3 shows the patterns of computer/tablet use (≥ 4 hours/day) according to population subgroups. The younger age group (27%), people who were not working during pandemic (25%), and those who adhered to the quarantine (23% and 24% to 1 and 1-2 months, respectively) presented higher proportion of "become high" computer/tablet use. Higher proportion of "become low" were

Table 2

Patterns of TV-viewing according to the correlate categories during the COVID-19 pandemic. Brazil, 2020.

	Consistently high % (95%CI)	Become low % (95%CI)	Become high % (95%CI)	Consistently low % (95%CI)
Gender				
Female	9.2 (8.1-10.4)	1.0 (0.7-2.4)	30.2 (28.7-31.8)	59.6 (57.9-61.3)
Male	10.0 (8.4-11.6)	0.5 (0.2-0.9)	26.0 (23.8-28.3)	63.7 (61.1-66.2)
Age group (years)				
18-29	3.9 (3.0-5.2)	0.2 (0.1-0.4)	26.7 (24.3-29.3)	69.1 (66.4-71.7)
30-39	6.8 (5.4-8.5)	0.5 (0.3-1.1)	31.1 (27.9-34.6)	61.5 (58.0-64.9)
40-49	9.5 (7.2-12.3)	0.7 (0.4-1.3)	29.9 (26.7-33.2)	59.9 (56.3-63.5)
50-59	12.8 (10.8-15.2)	1.1 (0.6-1.8)	29.2 (26.3-32.2)	56.9 (53.7-60.2)
60	17.4 (14.5-20.7)	1.4 (0.8-2.8)	24.2 (21.2-27.5)	57.0 (53.1-60.7)
Schooling level				
Less than elementary school	14.0 (10.3-19.0)	1.5 (0.8-3.0)	27.2 (22.7-32.1)	57.2 (51.6-62.7)
High school	9.8 (8.8-11.1)	0.7 (0.5-1.1)	28.6 (26.9-30.4)	60.8 (58.9-62.7)
Higher education	5.5 (5.2-5.8)	0.5 (0.4-0.6)	26.7 (26.1-27.4)	67.3 (66.6-67.9)
Skin color				
White	8.6 (7.7-9.6)	0.9 (0.6-1.3)	26.8 (25.4-28.2)	63.7 (62.1-65.3)
Black	11.9 (8.8-16.0)	1.1 (0.4-2.9)	30.7 (26.0-35.8)	56.3 (51.0-61.4)
Brown	10.0 (8.4-11.9)	0.6 (0.3-1.0)	29.1 (26.7-31.6)	60.3 (57.5-63.0)
Other	7.6 (4.0-14.2)	0.3 (0.1-2.0)	28.8 (21.6-37.3)	63.2 (54.7-71.0)
Per capita income (minimum wage)				
< 1	9.6 (8.3-11.0)	0.9 (0.6-1.3)	28.2 (26.2-30.4)	61.3 (59.0-63.6)
1-2	10.7 (8.5-13.3)	0.3 (0.2-0.7)	28.7 (26.0-31.5)	60.3 (57.0-63.4)
> 2	8.4 (7.1-9.7)	0.9 (0.5-1.6)	27.6 (25.4-29.8)	63.2 (60.8-65.5)
Country region				
North	11.2 (6.2-19.2)	1.5 (0.5-4.6)	28.8 (22.8-35.6)	58.5 (51.0-65.7)
Northeast	9.7 (7.7-12.2)	0.5 (0.2-0.9)	31.0 (27.6-34.7)	58.8 (55.0-62.5)
Southeast	9.9 (8.9-10.9)	0.7 (0.5-1.0)	28.9 (27.4-30.4)	60.6 (58.9-62.1)
South	9.3 (7.1-12.1)	0.8 (0.4-1.6)	24.3 (22.1-28.0)	65.0 (61.6-68.4)
Central	5.1 (3.2-7.9)	1.1 (0.2-5.2)	19.5 (14.9-25.3)	74.3 (67.8-80.0)
Working during the pandemic				
No	11.1 (9.8-12.6)	0.8 (0.5-1.0)	32.7 (30.7-34.6)	55.5 (53.4-57.6)
Normal routine	9.2 (7.0-11.8)	0.9 (0.4-2.0)	21.2 (18.1-24.6)	68.8 (65.0-72.3)
Home office	6.5 (5.3-8.0)	0.6 (0.3-1.4)	24.5 (22.3-26.8)	68.4 (65.8-70.8)
Adherence to the quarantine (months)				
No	8.8 (6.9-11.0)	0.9 (0.4-1.7)	22.8 (20.2-25.6)	67.6 (64.5-70.5)
< 1	9.7 (7.7-12.2)	0.6 (0.3-1.2)	29.2 (25.9-32.9)	60.0 (56.6-64.2)
1-2	9.3 (8.1-10.7)	0.7 (0.5-1.2)	30.4 (28.6-32.3)	59.5 (57.5-61.5)
> 2	13.1 (9.8-17.2)	0.9 (0.4-2.1)	30.3 (25.0-36.1)	55.8 (50.0-61.5)

95%CI: 95% confidence interval.

observed in 50-59 years old group (7%) (compared to two younger age groups) and people in 1-2 months of quarantine (5%) (compared to no quarantine group). Differences in maintenance of low and high computer/tablet use were observed for gender, age groups, academic achievement, skin color, per capita income, and working status during the pandemic, while changes reduced the proportion of "consistently low" among people who were between 1-2 months in quarantine.

Changes in prevalence of movement behaviors are presented in Table 4. Prevalence of physical inactivity (< 150 minutes/week), high TV-viewing time (≥ 4 hours/day) and computer/tablet use (≥ 4

Table 3

Patterns of computer/tablet use according to the correlate categories during the COVID-19 pandemic. Brazil, 2020.

	Consistently high % (95%CI)	Become low % (95%CI)	Become high % (95%CI)	Consistently low % (95%CI)
Gender				
Female	34.7 (33.2-36.3)	4.0 (3.5-4.7)	22.7 (21.4-24.0)	38.5 (36.8-40.2)
Male	47.0 (44.4-49.7)	3.7 (2.9-4.9)	19.2 (17.1-21.5)	30.0 (27.6-32.5)
Age group (years)				
18-29	51.2 (48.4-54.1)	2.5 (1.9-3.2)	27.1 (24.4-30.0)	19.2 (17.3-21.2)
30-39	46.7 (43.2-50.2)	2.8 (2.0-4.0)	19.0 (16.6-21.8)	31.5 (28.1-35.0)
40-49	37.7 (34.4-41.1)	4.0 (3.0-5.5)	21.3 (18.3-24.7)	37.0 (33.4-40.7)
50-59	33.3 (30.1-36.8)	6.8 (5.4-8.7)	19.1 (16.8-21.7)	40.7 (37.4-44.1)
60	28.7 (25.2-32.5)	4.4 (2.8-6.7)	16.3 (14.1-18.9)	50.6 (46.8-54.5)
Schooling level				
Less than elementary school	21.6 (17.2-26.8)	2.6 (1.5-4.5)	17.9 (14.2-22.3)	57.9 (52.2-63.4)
High school	39.7 (37.7-41.6)	4.0 (3.3-4.8)	21.7 (20.1-23.4)	34.7 (32.9-36.6)
Higher education	55.7 (54.9-56.4)	4.3 (4.1-4.6)	19.9 (19.3-20.5)	20.1 (19.5-20.6)
Skin color				
White	43.9 (42.3-45.6)	3.9 (3.3-4.5)	21.4 (20.1-22.7)	30.8 (29.3-32.4)
Black	36.3 (31.3-41.5)	3.2 (2.1-5.1)	20.1 (16.9-23.7)	40.4 (35.3-45.8)
Brown	38.1 (35.4-40.8)	4.0 (3.1-5.2)	20.8 (18.5-21.2)	37.1 (34.5-39.9)
Other	46.3 (38.5-54.3)	4.4 (2.5-7.7)	22.3 (15.7-30.8)	26.9 (19.8-35.4)
Per capita income (minimun wage)				
< 1	35.3 (33.1-37.6)	3.4 (2.7-4.3)	20.7 (18.9-22.7)	40.6 (38.2-43.0)
1-2	44.4 (41.2-47.7)	4.0 (2.9-5.5)	21.2 (18.7-24.0)	30.3 (27.4-33.3)
> 2	47.0 (44.6-49.3)	4.7 (3.8-5.7)	21.3 (19.4-23.3)	27.1 (25.0-29.3)
Country region				
North	38.2 (31.5-45.4)	3.4 (1.9-6.0)	20.1 (15.3-25.8)	38.3 (31.2-45.9)
Northeast	39.4 (35.7-43.2)	4.3 (3.0-6.4)	20.2 (17.3-23.3)	36.1 (32.6-39.8)
Southeast	40.5 (39.0-42.1)	3.9 (3.3-4.6)	21.8 (20.5-23.2)	33.8 (32.2-35.4)
South	44.9 (41.2-48.7)	2.9 (2.1-4.1)	19.9 (17.4-22.7)	32.3 (28.9-35.8)
Central	39.3 (31.7-47.5)	4.8 (2.7-8.3)	22.1 (14.6-32.0)	33.8 (25.7-43.0)
Working during the pandemic				
No	31.3 (29.3-33.3)	4.4 (3.7-5.4)	24.5 (22.8-26.3)	39.8 (37.7-41.9)
Normal routine	39.1 (35.6-42.7)	1.6 (1.1-2.3)	16.0 (13.4-19.1)	43.3 (39.7-46.9)
Home office	61.3 (58.3-64.1)	4.6 (3.6-6.0)	17.7 (15.5-20.3)	16.3 (14.2-18.7)
Adherence to the quarantine (months)				
No	40.1 (37.0-43.2)	2.6 (1.9-3.5)	15.7 (13.6-18.0)	41.7 (38.6-44.8)
< 1	37.1 (33.4-41.0)	3.2 (2.4-4.4)	22.9 (19.7-26.4)	36.8 (33.0-40.7)
1-2	43.2 (41.2-45.2)	5.0 (4.0-6.0)	23.5 (21.8-25.4)	28.3 (26.5-30.2)
> 2	36.1 (30.8-41.8)	3.8 (2.2-6.4)	18.9 (15.4-23.0)	41.2 (35.4-47.3)

95%CI: 95% confidence interval.

hours/day) increased in all population sub-groups. Increases in physical inactivity varied from 13% (lower schooling level) to 37% (higher income). Increases in high TV viewing varied from 121% (> 60 years) to 613% (18-29 years), and the increases of high computer/tablet use ranged from 20% (people at home office) to 56% (no working during the pandemic)

Table 4

Changes in prevalence of physical inactivity and sedentary behavior according to correlates, before and during the COVID-19 pandemic. Brazil, 2020.

	< 150 minutes/week of physical activity			≥ 4 hours/day of TV viewing			≥ 4 hours/day of computer/ tablet		
	Before % (95%CI)	During % (95%CI)	%Δ	Before % (95%CI)	During % (95%CI)	%Δ	Before % (95%CI)	During % (95%CI)	%Δ
Gender									
Female	72.2 (70.7-73.7)	89.7 (88.7-90.6)	24	10.2 (9.1-11.4)	39.4 (37.7-41.1)	286	38.8 (37.2-40.4)	57.4 (55.7-59.1)	48
Male	67.3 (64.8-69.6)	85.6 (83.7-87.3)	27	10.3 (8.8-12.1)	35.8 (33.4-38.4)	248	50.8 (48.1-53.4)	66.2 (63.7-68.7)	30
Age group (years)									
18-29	68.0 (65.3-70.5)	88.7 (87.0-90.2)	30	4.2 (3.2-5.5)	30.7 (28.1-33.3)	631	53.7 (50.8-56.6)	78.4 (76.2-80.3)	46
30-39	69.3 (66.0-72.4)	88.9 (86.6-90.9)	31	7.3 (5.9-9.1)	37.9 (34.6-41.4)	419	49.5 (46.0-53.0)	65.7 (62.1-69.1)	33
40-49	72.3 (69.1-75.4)	88.1 (85.4-90.3)	22	10.2 (7.9-13.1)	39.3 (35.8-43.0)	285	41.7 (38.3-45.2)	59.0 (55.2-62.6)	42
50-59	70.3 (67.3-73.2)	86.0 (83.6-88.1)	22	13.9 (11.8-16.3)	42.0 (38.7-45.4)	202	40.2 (36.8-43.6)	52.4 (49.0-55.8)	30
60	70.2 (66.5-73.7)	86.1 (83.1-88.7)	23	18.8 (15.8-22.2)	41.6 (37.8-45.4)	121	33.1 (29.4-37.0)	45.0 (41.2-48.9)	36
Schooling level									
Less than elementary school	78.8 (73.8-83.1)	89.1 (85.1-92.2)	13	15.6 (11.7-20.5)	41.2 (35.8-46.9)	164	24.2 (19.6-29.4)	39.5 (34.1-45.1)	63
High school	70.8 (69.0-72.5)	88.2 (86.9-89.4)	25	10.6 (9.4-11.8)	38.5 (36.6-40.4)	263	43.6 (41.7-45.6)	61.3 (59.4-63.2)	41
Higher education	60.8 (60.0-61.5)	85.1 (84.5-85.6)	40	6.0 (5.7-6.4)	32.2 (31.5-32.9)	437	60.0 (59.3-60.7)	75.6 (75.0-76.2)	26
Skin color									
White	68.1 (66.6-69.6)	87.3 (86.2-88.4)	28	9.5 (8.6-10.5)	35.4 (33.9-37.0)	273	47.8 (46.1-49.4)	65.3 (63.7-66.9)	37
Black	69.6 (64.9-73.9)	85.6 (81.6-88.9)	23	13.0 (9.8-17.2)	42.5 (37.4-47.8)	227	39.5 (34.5-44.7)	56.3 (51.0-61.5)	43
Brown	71.6 (69.0-74.1)	88.5 (86.6-90.1)	24	10.6 (9.0-12.5)	39.1 (36.3-41.9)	269	42.1 (39.4-44.9)	58.8 (56.0-61.6)	40
Other	70.2 (63.3-76.3)	88.4 (84.3-91.6)	26	7.9 (4.2-14.5)	36.5 (28.7-45.1)	362	50.7 (42.6-58.9)	68.7 (60.3-76.0)	36
Per capita income (minimum wages)									
< 1	73.3 (71.0-75.4)	89.1 (87.5-90.6)	22	10.4 (9.1-11.9)	37.8 (35.6-40.1)	263	38.7 (36.4-41.0)	56.0 (53.6-58.4)	45
1-2	72.7 (69.9-75.3)	89.2 (87.1-90.9)	23	11.1 (8.9-13.7)	39.4 (36.2-42.6)	255	48.4 (45.2-51.7)	65.6 (62.5-68.7)	36
> 2	61.1 (58.8-63.4)	83.9 (82.1-85.4)	37	9.3 (8.0-10.7)	36.0 (33.7-38.3)	287	51.6 (49.2-54.0)	68.2 (65.9-70.5)	32

(continues)

Table 4 (continued)

	< 150 minutes/week of physical activity			≥ 4 hours/day of TV viewing			≥ 4 hours/day of computer/tablet		
	Before % (95%CI)	During % (95%CI)	%Δ	Before % (95%CI)	During % (95%CI)	%Δ	Before % (95%CI)	During % (95%CI)	%Δ
Country region									
North	71.5 (64.9-77.3)	89.1 (83.7-92.8)	25	12.7 (7.5-20.6)	40.0 (32.9-47.5)	215	41.6 (34.8-48.8)	58.3 (50.8-65.4)	40
Northeast	67.2 (63.4-70.8)	87.9 (85.1-90.2)	31	10.2 (8.2-12.7)	40.8 (37.0-44.6)	300	43.7 (40.0-47.6)	59.5 (55.8-63.2)	36
Southeast	69.2 (67.7-70.6)	86.3 (85.1-87.4)	25	10.6 (9.6-11.7)	38.7 (37.1-40.3)	265	44.4 (42.8-46.0)	62.3 (60.7-63.9)	40
South	71.9 (68.4-75.0)	89.2 (86.6-91.3)	24	10.1 (7.8-12.9)	34.2 (30.8-37.8)	237	47.8 (44.1-51.6)	64.8 (61.2-68.2)	36
Central	77.8 (71.9-82.8)	92.0 (88.3-94.6)	18	6.2 (3.9-9.7)	24.6 (19.2-30.9)	297	44.1 (36.0-52.5)	61.4 (52.4-69.7)	39
Working during the pandemic									
No	69.9 (67.8-71.8)	87.8 (86.4-89.1)	26	11.9 (10.5-13.3)	43.8 (41.7-45.9)	268	35.7 (33.7-37.8)	55.8 (53.6-57.9)	56
Normal routine	70.6 (67.3-73.6)	88.9 (86.5-90.9)	26	10.1 (7.9-12.8)	30.3 (26.8-34.1)	200	40.7 (37.2-44.3)	55.2 (51.5-58.7)	36
Home office	69.2 (66.7-71.6)	86.6 (84.6-88.4)	25	7.2 (5.9-8.7)	31.0 (28.6-33.5)	331	65.9 (63.0-68.7)	79.0 (76.5-81.4)	20
Adherence to the quarantine (months)									
No	69.7 (66.7-72.6)	87.4 (85.0-89.4)	25	9.6 (7.7-11.9)	31.5 (28.6-34.6)	228	42.7 (39.6-45.8)	55.8 (52.6-58.8)	31
< 1	72.4 (68.8-75.7)	90.3 (88.2-92.1)	25	10.3 (8.3-12.8)	38.9 (35.2-42.8)	278	40.3 (36.6-44.2)	60.0 (56.0-63.8)	49
1-2	69.0 (67.2-70.8)	86.9 (85.4-88.2)	26	10.0 (8.8-11.4)	39.7 (37.7-41.7)	297	48.2 (46.2-50.2)	66.8 (64.8-68.7)	39
> 2	68.3 (62.4-73.8)	87.3 (83.0-90.6)	28	13.4 (10.6-18.1)	43.3 (37.7-49.2)	223	39.9 (34.4-45.6)	55.0 (49.0-60.8)	38

95%CI: 95% confidence interval.

Discussion

Main finding of this study

Our main results showed that the prevalence of ≥ 4 hours/day of TV-viewing increased 266% during the pandemic among Brazilian adults, while physical inactivity and ≥ 4 hours/day of computer/tablet use increased 26% and 38%, respectively. We observed that the prevalence of these behaviors increased in all population groups. However, groups presented different proportions of changed behaviors ("become low active/high" and "become active/low"), and differences were observed in between-groups comparisons before and during the COVID-19 pandemic. Thus, we observed an effect of quarantine on the prevalence of high TV-viewing time (affected by working status and adherence to stricter quarantine measures), but not on computer/tablet use and physical inactivity, which increased similarly between groups.

What is already known on this topic

Other studies were conducted to identify the effect of the COVID-19 pandemic on movement behaviors worldwide [10,16,17,18,19,20,21]. However, to the best of our knowledge, this is the first survey with a nationwide sampling, which strengthen the prevalence analyses.

What this study adds

Although these results confirm previous hypotheses of increases in physical inactivity and sedentary behaviours with quarantine measures, we observed that the prevalence of high TV viewing increases more than three time during the pandemic and the increase was substantially higher among youngers (18-29 years: 631% and 30-39 years: 419%) compared to the older adults (> 60 years: 121%), and among the higher academic achievement (437%) compared to the lower academic achievement group (164%). In these cases, even with reductions on the differences between-groups, the prevalence of high TV-viewing remains higher among older adults and lower academic achievement groups during the pandemic.

In other way, there were no differences in the prevalence of high TV-viewing time between country regions before the pandemic, but changes due to the COVID-19 pandemic increased the prevalence in the North, the Northeast, and the Southeast regions when comparing with the Central during the pandemic. These findings suggest that Brazilian adults become much more sedentary during the COVID-19 pandemic. TV-viewing is a classical proxy of sedentary behavior, being one of the types of behavior more associated with harmful effects on cardiovascular and mental health [15,22].

Increases in the prevalence of high computer and tablet use seemed more widespread, and these changes during the pandemic were similar among population groups. Younger participants presented higher relative increase than older adults. On the other hand, people who were at home office during the pandemic already had higher prevalence of computer/tablet use before it, and even with lower relative increases, their prevalence remained higher than among people who were not working or remained their normal working routines during the pandemic. In quarantine times, computer and tablet are options to keep work-related and study activities as well as social interaction, highlighting computer/tablet use as a significant manifestation of sedentary behaviors during this period. Therefore, recommendations about the screens use, such as breaking up long bouts of sedentary behaviors [23] or avoid their use until late at night [24], should be disseminated.

The prevalence of physical inactivity was already higher in comparison with TV viewing time and computer use before the COVID-19 pandemic, however it was similar to the last *Brazilian National Health Survey* [2]. Generally, higher increases in physical inactivity prevalence were observed among more active groups before the pandemic. For example, people with higher schooling level presented a higher increase in the prevalence of physical inactivity and differences between lower and higher school levels groups disappeared during the COVID-19 pandemic. Similar results were found on per capita income, in which the difference between higher and lower per capita income reduced during the COVID-19 pandemic. Moreover, we observed no effect in working status during the pandemic and the adherence to the quarantine on physical inactivity prevalence. These findings are worrying, considering the benefits of physical activity for physical and mental health. While the *Global Physical Activity Action Plan* 2018-2030 [3] targets reductions of 15% by 2025 and 30% by 2030, we observed an increase of 26% after around two months of quarantine in Brazil, which suggests further studies and actions are necessary considering the unpredictable scenario ahead. The World Health Organization and scientific societies launched some initiatives, such as educational materials on the relevance of exercises at home [8]. Studies have suggested the use of text messages and phone calls as an effective and viable contact channel between healthcare professionals and patients [8]. It is necessary to mobilize governments and civil society to mitigate these results.

Limitations of this study

Limitations of the current study include the online survey. Although our sampling process was planned to include people of different social strata and the sample was weighted according characteristics from the PNAD to let the sample nationally representative, this type of survey limits the participation of people with lower socioeconomic position without access to Internet. Also, the retrospective design can produce recall bias. However, this is the first nationwide survey examining the changes in the prevalence of movement behaviours during the COVID-19 pandemic among Brazilian adults, which could foment policies to promote active habits during the present and next quarantine times.

Conclusion

The prevalence of physical inactivity and sedentary behaviors increased during COVID-19 pandemic among Brazilian adults. Although all population groups were affected, higher increases in the prevalence of high TV-viewing time were found among younger adults and those who adhered to more stricter measures of quarantine. During the pandemic, around 88% of adults are not meeting international guidelines for physical activity, 38% are spending ≥ 4 hours/day watching TV and 62% are ≥ 4 hours/day in computer or tablet use. Considering that the COVID-19 pandemic is not in its peak in Brazil in the period of this survey, population should be continuously surveyed, and interventions must be developed to promote physical activity and to reduce sedentary behaviors during the quarantine period.

Contributors

All authors contributed to the study conception and design. Material preparation and data analysis were performed by D. R. Silva, A. O. Werneck and C. L. Szwarcwald. The first draft of the manuscript was written by D. R. P. Silva and all authors commented on previous versions of the manuscript.

Additional informations

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Resumo

O estudo buscou analisar mudanças na prevalência de inatividade física e comportamento sedentário de acordo com correlatos durante a pandemia da COVID-19 entre adultos brasileiros. Foi realizado um inquérito retrospectivo online, *de base nacional, com 39.693 adultos brasileiros. Foram relatadas antes e durante a pandemia: atividade física (frequência semanal e duração diária; ponto de corte de 150 minutos/semana), tempo em TV e computador/*tablet *(duração diária; ponto de corte de 4 horas/dia). Os correlatos foram sexo, faixa etária, escolaridade, cor da pele, renda per* capita, *macrorregião, situação de trabalho durante o isolamento social e adesão ao isolamento. Foram utilizadas estatísticas descritivas. A prevalência de inatividade física, tempo de TV e tempo de computador/*tablet *aumentaram 26%, 266% e 38%, respectivamente, durante a pandemia. Os aumentos na inatividade física e no uso de computador/*tablet *foram mais prevalentes em geral, mas o aumento na prevalência de tempo elevado na frente da televisão foi maior entre adultos mais jovens (660%), com maior escolaridade (437%) e aqueles que trabalhavam em* home office *(331%). A prevalência de inatividade física e de comportamento sedentário aumentou em todos os subgrupos da população brasileira durante a pandemia da COVID-19.*

Comportamentos Relacionados com a Saúde; Exercício Físico; Estilo de Vida Saudável; COVID-19

Resumen

*El objetivo de este estudio fue analizar los cambios en la prevalencia de inactividad física y comportamientos sedentarios, según correlaciones durante la pandemia de COVID-19, entre adultos brasileños. Se realizó una encuesta nacional retrospectiva con 39.693 adultos brasileños. Se informó de actividad física (frecuencia semanal y duración diaria; punto de corte de 150 minutos/semana), ver TV y el uso de computadora/*tablet *(duración diaria; punto de corte de 4 horas/día) antes y durante el periodo pandémico. Las correlaciones fueron: sexo, grupo de edad, logros académicos más altos, color de piel, ingresos per cápita, macrorregión del país, estatus laboral durante la cuarentena, y adherencia a la cuarentena. Se usaron estadísticas descriptivas. La prevalencia de inactividad física, ver la TV durante mucho tiempo y el uso de computadora/*tablet, *incrementó, respectivamente, un 26%, 266% y 38% durante la pandemia. Al igual que el incremento en inactividad física, y que el uso de la computadora/*tablet *era el más extendido, se observaron incrementos más altos en la prevalencia de ver más la TV entre los jóvenes adultos (660%), con un nivel de educación más alto (437%) y entre quienes estaban teletrabajando (331%). La prevalencia de inactividad física y comportamientos sedentarios se incrementaron en todos los subgrupos de población durante la pandemia de COVID-19 en Brasil.*

Conductas Relacionadas con la Salud; Exercício Físico; Estilo de Vida Saludable; COVID-19