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COVID-19 pandemic and physical inactivity in Brazilian university students: a multicenter study

Pandemia de COVID-19 e inatividade física em estudantes universitários brasileiros: um estudo multicêntrico

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ABSTRACT

The aim of this study was to investigate the prevalence of physical inactivity during the COVID-19 pandemic and its association with variables of the pandemic context in Brazilian university students. A cross-sectional, multicentric study was carried out in five public universities in different geographic regions of Brazil. The study included 5,720 students, aged 18 or over, between September 2020 and May 2021. Data collection was performed through a self-administered online questionnaire on the REDCap platform. The dependent variable was physical inactivity. The independent variables were the aspects related to the pandemic. The prevalence of physical inactivity was 48.8% (95%CI: 47.5%; 50.1%), ranging from 26.3% for those who went out every or almost every day for non-essential activities and 64.9 % for those who stayed at home all the time. University students who reported continuing to work normally and who were afraid of the pandemic were more likely to be physically inactive. The groups that were less likely to have the outcome were those with a reduction in income, those who left home more often for essential and non-essential activities, those who started working at home, those who complied with the social distancing, and those who had a risk factor for COVID-19. The findings indicate that one in two Brazilian university students are physically inactive and the main risk factors were isolation and fear of the pandemic. Interventions are recommended to promote physical activity, especially for the groups most affected by the COVID-19 pandemic.

Keywords: COVID-19; Physical activity; College students; Sedentary lifestyle; Social isolation.

RESUMO

O objetivo deste estudo foi investigar a prevalência de inatividade física durante a pandemia de COVID-19 e a associação com variáveis do contexto pandêmico em universitários brasileiros. Conduziu-se uma pesquisa transversal, multicêntrica, em cinco universidades públicas das diferentes regiões geográficas do Brasil. Participaram do estudo 5.720 estudantes, de 18 anos ou mais, entre setembro de 2020 e maio de 2021. A coleta de dados foi realizada por meio de um questionário autoaplicável online na plataforma REDCap. A variável dependente foi inatividade física. As variáveis independentes foram os aspectos relacionados à pandemia. A prevalência de inatividade física foi de 48,8% (IC95%: 47,5%; 50,1%), variando entre 26,3% para os que saíram todos ou quase todos os dias para atividades não essenciais e 64,9% para os que ficaram em casa o tempo todo. Universitários que referiram continuar trabalhando normalmente e que tinham medo da pandemia tiveram maior probabilidade de serem inativos fisicamente. Já os grupos que tiveram menor probabilidade para o desfecho foram os que tiveram redução na renda, os que saíram mais de casa para atividades essenciais e não-essenciais, os que passaram a trabalhar em casa, os que cumpriram o distanciamento social e os que tinham algum fator de risco para COVID-19. Os achados indicam que um a cada dois universitários brasileiros são inativos fisicamente e os principais fatores de risco foram continuar trabalhando normalmente e medo da pandemia. Recomendam-se intervenções para promover a atividade física, especialmente para os grupos mais afetados pela pandemia de COVID-19.

Palavras-chave: *COVID-19; Atividade física; Universitários; Sedentarismo; Isolamento social.*

Introduction

The first control and protection recommendations to reduce the transmission rate of SARS-CoV-2 were instituted without epidemiological information on their impact on health behaviors in the medium and long term regarding the physical, psychological, and social effects of isolation[1,2]. Several countries around the world, including Brazil, have adopted social distancing strategies, restriction of the functioning of non-essential services and recreational places, mandatory protection and personal hygiene actions, reduction in the number of passengers on collective transport, guidance for home office, and suspension of face-to-face school activities from early grades to universities, affec-

ting more than 90% of students worldwide[3].

Although the emergence of COVID-19 has affected the entire population[1], social distancing led to a significant change in the lifestyle of university students, with the suspension of classes and subsequent implementation of remote learning[2,3]. Thus, studies have been conducted to understand the impact of the pandemic on the lifestyle of university students in several countries[4], with physical activity being one of the objects of study[5,6], as well as its relationship with other variables that can reflect a higher quality of life, less stress, and better mental health[7].

Studies have shown that European[6-8], American[9,10], and Canadian university students[11] presented increased weight, significantly reduced practice of physical activity, and increased sedentary behavior during the period of social distancing. A French study observed a significant decrease in moderate and vigorous physical activity comparing before and during the pandemic[12]. In Australia[13], a cohort reported a 30% decrease in physical exercise in college students who had reported 150 minutes before social distancing and an increase in sedentary behavior during the pandemic. However, among Italian university students, the most active had a healthier diet and better mood[7]. Recent evidence found that longer sitting was associated with depression and anxiety among American college students[10-14].

Recently, the COVITEL Brazil study shown that there was a 40% increase in physically inactive people (13.1% and 18.4% before and after the pandemic, respectively)[15]. However, little is known about the prevalence of physical inactivity among university students in Brazil during the pandemic and most of the available research included small samples that demonstrated a 6-fold increase in sedentary lifestyle and a 40% increase in leisure-time physical inactivity[15,16]. Thus, to address these gaps, a multicenter study was conducted to investigate the prevalence of physical inactivity during the COVID-19 pandemic and the association with variables of the pandemic context in university students from five regions of Brazil.

Methods

This is a cross-sectional study, with a quantitative approach and national coverage, forming part of a multicenter study entitled Health and Well-Being in Undergraduate Students (SABES-Grad), with participants from the Federal University of Rio Grande (FURG), the Fluminense Federal University (UFF), the Federal University of Mato Grosso (UFMT), the Federal Rural University of Pernambuco (UFRPE), and the State University of Amazonas (UEA).

This study took place online and was approved by the CEP (CAAE: 24520719.2003.5016) and (no. FURG 4.146.935; no. UFF 4.351.740; no. UFMT 4.229.295; no. UFRPE 4.417.328; and no. UEA 4.335.298). All ethical principles established by the National Health Council in Resolution 466/12 and Resolution 346/2005 were respected. Those who agreed to participate in the study informed their decision after reading the Informed Consent Form.

The target population consisted of undergraduate students from presential courses regularly enrolled in participating institutions, aged 18 years or older. Those who dropped out or interrupted the undergraduate course after enrolling in the semester and those with physical and/or cognitive limitations that made it impossible for them to complete the questionnaire were considered ineligible. Participating institutions were selected by convenience sampling through contacts with researchers in the field. Two sample size calculations were performed for the SABES-Grad survey, one descriptive and one for associated factors. The descriptive sample calculation indicated that it was necessary to include at least 847 undergraduate students (parameters: expected prevalence of 15% (risk of suicide - basis used for the sample calculation of the study as a whole), with a margin of error of 3 percentage points, Power of 80 %, significance level of 5%, plus 10% for possible losses and refusals and a deff of 1.5). The sample size calculation for associated factors pointed to the need to sample 1,089 individuals (parameters: 1:3 exposed/unexposed ratio, 2.0 prevalence ratio, 80% power, 5% significance level, plus 10% for possible losses and refusals, 15% for confounding control and a deff of 1.5).

Data collection took place between September 2020 and May 2021. Initially, an invitation was extended with the link to the questionnaire via the university systems or by email from undergraduate course coordinators, professors, academic directories, or directly to students. The link was later publicized through social networks and messaging apps. The questionnaire was applied online and took between 20 and 30 minutes to complete. This instrument was available for two months on the REDCap® platform (acronym for Research Electronic Data Capture).

The dependent variable was "physical inactivity" obtained through the following question: "Considering

the last 7 days, on how many days did you physical activity?" Those who answered 0 days were considered physically inactive. This variable was dichotomized into "no" and "yes".

The study's independent variables are detailed in a supplementary table and included: work during the pandemic; concern about getting behind academically; income during the pandemic; routine activities during the pandemic; number of days you left home in the last two weeks; adherence to social distance; time spent per day accessing information; performing a diagnostic test for COVID-19; relative, friend, or person close to you contracted COVID-19; relative, friend or person close to you died due to COVID-19; have a risk factor for severe COVID-19; and fear of the pandemic. In addition to the variables mentioned above, sex (male/female), age (in complete years), per capita family income (in reais), region (South/Southeast/Midwest/North/Northeast), and university (FURG/UFF / UFMT/UFRPE/UEA) were inserted as intervening variables.

Statistical procedures were performed using STATA 15.1. Bivariate analysis was performed to calculate the prevalence of the outcome according to the independent variables using the Fisher's exact test. In the multivariate analysis, the independent variables (pandemic context) were adjusted for each other and adjusted for the intervening variables (demographic and socioeconomic) using Poisson regression with robust adjustment of variance. The values were used to calculate the crude and adjusted prevalence ratio (PR) and the corresponding 95% confidence intervals (95%CI). The Wald ratio test for heterogeneity (dichotomous or nominal exposures) was used. The significance level established was 5% for two-tailed tests.

Results

The sample of this study consisted of 5,720 individuals, with a response rate of 84.3% of those who started filling out the questionnaire.

Of these, the majority were female (66.8%), approximately 29.1% from the Midwest region, with a mean age of 24.9 years (SD = 5.51), and median family income per capita of BRL 1,000 (interquartile range [IIQ] 500-1,800).

With respect to the variables of the pandemic context, 48.6% reported not working before and continued not to work during the pandemic, 35.1% reported that their income decreased a little during the pandemic, 44.0% went out only for essential activities, 49.5% properly complied with social distancing, 54.2% reported having accessed information about the pandemic for between 10 and 59 minutes a day, and the majority (64.5%) reported having a risk factor for severe COVID-19. The prevalence of physical inactivity was 48.8% (95%CI: 47.5% to 50.1%), ranging from 26.3% for those who went out every or almost every day for non-essential activities to 64.9 % for those who stayed at home all the time.

Table 1 – Distribution of physical inactivity according to pandemic context variables in undergraduate students (N = 5,720). SABES multicenter study, Brazil, 2021.

Variable	N (%)	Prevalence of physical inactivity
Work during the pandemic		
Didn't work before and continued not working	2746 (48.6)	49.5
Continued working normally	577 (10.2)	51.2
Continued working, but at home	911 (16.1)	44.7
Started working during the pandemic	630 (11.1)	48.4
Lost their job or stopped working	789 (14.0)	50.6
Concern about academic delay		
Not worried	271 (4.7)	45.0
A little worried	613 (10.7)	46.8
Moderately worried	1655 (29.0)	46.8
Very worried	1635 (28.6)	48.1
Completely worried	1546 (27.0)	53.1
Income during the pandemic		
Increased	496 (8.7)	50.4
Remained the same	1852 (32.4)	47.8
Decreased a little	2009 (35.1)	46.3
Decreased a lot	1208 (21.1)	52.7
Had no income	155 (2.7)	57.8
Activity Routine During Pandemic		
Stayed at home all the time	595 (10.9)	64.9
Went out only for essential activities	2417 (44.0)	50.4
Went out occasionally for non-essential activities	1451 (26.4)	41.6
Went out every or almost every day for non-essential activities	114 (2.1)	26.3
Went out every or almost every day for work or other regular activity	912 (16.6)	48.1
Number of days left home in the previous two weeks		
No days	283 (5.2)	61.7
Between 1 and 5 days	3099 (56.4)	52.3
Between 6 and 10 days	1139 (20.8)	40.8
Between 11 and 15 days	966 (17.6)	43.0
Adherence to social distancing		
Very little	226 (4.1)	50.0

Continue…

Continue of **Table 1 –** Distribution of physical inactivity according to pandemic context variables in undergraduate students (N = 5,720). SABES multicenter study, Brazil, 2021.

Variable	N (%)	Prevalence of physical inactivity
Little	297 (5.4)	48.2
Somewhat	1344 (24.5)	47.2
Quite a lot	2715 (49.5)	47.1
Practically isolated	907 (16.5)	56.1
Time spent per day accessing pandemic information		
Less than 10 minutes	1291 (23.5)	49.2
Between 10 and 59 minutes	2970 (54.2)	47.5
One hour or more	1225 (22.3)	51.6
Fear of the pandemic		
Little	1998 (77.6)	47.1
Medium	2251 (41.1)	50.3
A lot	1227 (22.4)	54.4
Performed a diagnostic test for Covid-19		
No	3974 (72.5)	48.6
Yes, negative result	1082 (19.7)	48.9
Yes, positive result	430 (7.8)	50.4
Relative, friend, or person close to you contracted Covid-19		
No one	1267 (22.2)	48.4
One person	2267 (39.6)	48.7
Two people	1196 (20.9)	50.5
Three or more people	990 (17.3)	47.2
Relative, friend, or person close to you passed away due to Covid-19		
No one	3895 (68.1)	48.6
At least one person	1825 (31.9)	49.1
Do you have any risk factor for severe Covid-19		
No	2033 (35.5)	52.4
Yes	3687 (64.5)	46.8
Physical inactivity	2780 (48.8)	95%CI: 47.5 – 50.1

SABES-Grad = Health and Well-Being Study with Undergraduate Students from Brazil.
95%CI = 95% confidence interval.

In the adjusted analysis, the groups that were most likely to be physically inactive during the pandemic were: those who continued to work normally during the pandemic and those who reported being afraid of the pandemic. The group that reported being excessively concerned about academic delay lost association in the adjusted analysis.

The groups that provided protection for the outcome were: those whose income decreased a little during the pandemic, those who did not stay home all the time, those who left home on more days in the previous two weeks, those who fulfilled the social distancing, and those who reported having a factor for severe COVID-19. The group that started to work remotely, on the other hand, lost association after adjustments (Table 2).

Table 2 – Crude and adjusted analysis between pandemic variables and physical inactivity in undergraduate students (N = 5,432). SABES multicenter study, Brazil, 2021.

Variable	Crude analysis	Adjusted analysis*
	PR (95%CI)	PR (95%CI)
Work during the pandemic		
Didn't work before and continued not working	1.00	1.00
Continued working normally	1.03 (0.95; 1.13)	1.11 (0.99; 1.25)
Continued working, but at home	0.90 (0.83; 0.98)#	0.94 (0.86; 1.02)
Started working during the pandemic	0.98 (0.89; 1.07)	1.05 (0.95; 1.16)
Lost their job or stopped working	1.02 (0.94; 1.11)	0.98 (0.90; 1.06)
Concern about academic delay		
Not worried	1.00	1.00
A little worried	1.04 (0.89; 1.22)	1.02 (0.87; 1.20)
Moderately worried	1.04 (0.90; 1.20)	1.04 (0.90; 1.21)
Very worried	1.07 (0.93; 1.23)	1.04 (0.90; 1.20)
Completely worried	1.18 (1.03; 1.36)#	1.10 (0.96; 1.27)
Income during the pandemic		
Increased	1.00	1.00
Remained the same	0.95 (0.86; 1.05)	0.97 (0.87; 1.07)
Decreased a little	0.92 (0.83; 1.02)	0.89 (0.81; 0.99)#
Decreased a lot	1.05 (0.94; 1.16)	0.97 (0.87; 1.08)
Had no income	1.15 (0.98; 1.35)	0.95 (0.80; 1.13)
Activity Routine During Pandemic		
Stayed at home all the time	1.00	1.00
Went out only for essential activities	0.78 (0.72; 0.84)#	0.80 (0.74; 0.86)#
Went out occasionally for non-essential activities	0.64 (0.59; 0.70)#	0.69 (0.63; 0.77)#
Went out every or almost every day for non-essential activities	0.41 (0.30; 0.56)#	0.49 (0.35; 0.67)#
Went out every or almost every day for work or other regular activity	0.74 (0.68; 0.81)#	0.83 (0.73; 0.95)#
Number of days you left home in the last two weeks		
No days	1.00	1.00
Between 1 and 5 days	0.85 (0.77; 0.94)#	0.97 (0.86; 1.07)
Between 6 and 10 days	0.66 (0.59; 0.74)#	0.76 (0.67; 0.87)#
Between 11 and 15 days	0.70 (0.62; 0.78)#	0.72 (0.62; 0.84)#
Adherence to social distancing		
Very little	1.00	1.00
Little	0.96 (0.81; 1.15)	0.95 (0.80; 1.13)
Somewhat	0.94 (0.82; 1.09)	0.88 (0.76; 1.02)

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Continue of **Table 2 –** Crude and adjusted analysis between pandemic variables and physical inactivity in undergraduate students (N = 5,432). SABES multicenter study, Brazil, 2021.

Variable	Crude analysis	Adjusted analysis*
	PR (95%CI)	PR (95%CI)
Quite a lot	0.94 (0.82; 1.08)	0.79 (0.68; 0.92)#
Practically isolated	1.12 (0.97; 1.29)	0.81 (0.69; 0.95)#
Time spent per day accessing pandemic information		
Less than 10 minutes	1.00	1.00
Between 10 and 59 minutes	0.97 (0.90; 1.03)	0.97 (0.91; 1.04)
One hour or more	1.05 (0.97; 1.13)	1.04 (0.96; 1.13)
Fear of the pandemic		
Little	1.00	1.00
Medium	1.15 (1.08; 1.23)#	1.09 (1.02; 1.16)#
A lot	1.25 (1.16; 1.34)#	1.09 (1.01; 1.18)#
Performed a diagnostic test for Covid-19		
No	1.00	1.00
Yes, negative result	1.01 (0.94; 1.08)	1.03 (0.96; 1.11)
Yes, positive result	1.04 (0.94; 1.15)	1.06 (0.95; 1.17)
Relative, friend, or person close to you contracted Covid-19		
No one	1.00	1.00
One person	1.01 (0.94; 1.08)	1.00 (0.92; 1.08)
Two people	1.04 (0.96; 1.13)	1.04 (0.95; 1.13)
Three or more people	0.98 (0.90; 1.07)	0.96 (0.87; 1.06)
Relative, friend, or person close to you passed away due to Covid-19		
No one	1.00	1.00
At least one person	1.01 (0.95; 1.07)	0.95 (0.90; 1.01)
Do you have any risk factor for severe Covid-19		
No	1.00	1.00
Yes	0.90 (0.85; 0.94)#	0.93 (0.88; 0.98)#

SABES-Grad = Health and Well-Being Study with Undergraduate Students from Brazil.
PR = Prevalence ratio; 95%CI = 95% confidence interval.
* The adjustment was performed for all variables in the table, plus sex, age, income, region, university. # Associations with statistical significance.

Discussion

The present study demonstrated a prevalence of physical inactivity during the COVID-19 pandemic and the association with variables related to the pandemic in university students from five regions of Brazil. It was found that approximately half of the university students were physically inactive, that is, they did not practice physical activity on any day in the previous week. Starting to work remotely, having a reduction in income, maintaining the routine of activities, leaving home on more days in the previous two weeks, complying with the social distancing, and having a risk factor for severe COVID-19 were factors associated with a lower probability of physical inactivity during the pandemic. However, continuing to work normally and being afraid of the pandemic were associated with a higher probability of physical inactivity.

The estimated prevalence of physical inactivity in the present study was slightly higher than that found in the study by Rahman et al.[17], carried out in Bangladesh, which identified that 42.5% of young people, aged 18 to 25 years, were physically inactive during the COVID-19 pandemic. In Brazil, Tavares et al.[18], found that 44.4% of students at the Federal University of Uberlândia, Minas Gerais, were physically inactive in leisure time during the pandemic. Direct comparisons with our findings are quite difficult due to the lack of studies that have evaluated this measure during the pandemic in this population, as well as the differences in the data collection period and in the social restriction guidelines implemented between countries and territories. The high proportion of physical inactivity found in our study was already expected, since the pandemic significantly changed the lifestyle of individuals, including restrictions on the practice of outdoor physical activities[19]. The implications of the high levels of physical inactivity in this period can be diverse, such as an increase in obesity[4], cardiovascular[20], metabolic[21], and mental diseases[6,14], as well as compromising the immune system[21], which is directly associated with the progression of COVID-19. Furthermore, recent evidence suggests that a lack of physical activity is associated with an increased risk of serious outcomes of COVID-19[22].

Interestingly, university students who reported working remotely during the pandemic were less physically inactive. In the study of Silva et al.[23], it was found that those who worked from home offices were 39% less likely to be physically inactive during the pandemic. A probable explanation for these findings is that, with the possibility of remote work, individuals started to save time commuting to work/university, enabling them to readjust their schedules to practice physical activities.

Even though the general income of university students was low, it was observed that the reduction in income during the pandemic was not a risk factor for physical inactivity, corroborating the results of Silva et al.[23], who identified that individuals with lower income were the least physically inactive during the pandemic. In our subgroup analyses, it was found that college stu-

dents who had the greatest reduction in income during the pandemic were those who had earned more previously, and these were the least physically inactive (data not shown). This may explain our findings.

The present study showed that being very afraid of COVID-19 and having greater adherence to social distancing were risk factors for physical inactivity. However, it appears that the consequences of suspension from classes and prolonged isolation have several effects on global lifestyle and mental health, which although not the scope of this study, are the end products of all the stressors in the COVID-19 context. In this sense, a French study with almost 70,000 university students found that less frequent physical activity was associated with suicidal thoughts, depression, anxiety, and severe self-reported stress in isolation[24]. An American study showed that characteristics of sedentary behavior (sitting time) were associated with higher levels of depression and anxiety[14]. These findings are repeated in insufficiently active individuals, in which worse depression scores were related to fewer minutes of physical activity after the home stay order among American university students[10.]

In our study, nearly half of the university students were physically inactive. The decrease in physical activity due to the requirement to stay at home was perhaps one of the most evident consequences of isolation and social distancing. Current data show that students became more sedentary and reported increased symptoms of anxiety and depression as the pandemic spread[14,24]. Both anxiety and depression were significantly associated with news related to COVID-19[25]. An interesting fact was that, despite the psychological burden, suspension of classes, and fear of the pandemic, in the university population of the current study, having people close to them who contracted or died from COVID-19 was not associated with physical inactivity.

Our hypothesis is that the suspension of classes and the inexistence of academic assignments during the nearly 6 months of effective beginning of online education generated a high psychological burden on students, associated with more time at home. In our study, students who reported greater concern about academic delay were more likely to be inactive. The highest prevalence of physical inactivity was among students who reported excessive concern. This factor deserves attention in the current context, as it can lead to anxiety conditions. Considering this, Tavolacci et al.[12] observed that concerns of university students related to the non-validation of the school year and the stress related to changes in the modality of teaching impacted the practice of physical activity. The perceived stress of English students increased during the first 9 months of the pandemic and concluded that the practice of physical activity may have some protective effect on mental well-being[6].

It seems that the practice of physical activity can positively influence other areas of daily life, such as healthy eating and better mental health. Physical activity was positively associated with healthier eating and mediated the effects of mood states caused by social restriction among Italian university students[7], as less healthy eating was associated with levels of depression in Italian university students[7]. In Turkey, the nutritional behaviors of health care university students who reported feelings of fear and anxiety over a short period of time worsened after the suspension of classes[8]. In this sense, the current study, supported by current literature, suggests that the pandemic context and its unintended effects may be contributing to a reduction in physical activity, an increase in sedentary behavior and, consequently, greater symptoms of psychological distress in university students. This scenario was already a public health concern before COVID-19 and these risks appear to have increased significantly during the pandemic.

Regarding adherence to social distancing, in line with the present study, the systematic review conducted by Lopez-Valenciano et al.[19] indicated that in nine out of ten included studies there were significant reductions in physical activity levels during social restriction. In the summary review of Arora and Gray[26] and in the study of Santos and Santos[27], the authors indicated that increased social isolation was associated with higher rates of physical inactivity in adults and undergraduates, respectively. The results of the present study can be explained by the fact that social distancing may have limited the practice of physical activity due to the closing of gyms, squares and parks, however it is necessary to interpret the findings with caution, as the different restrictions imposed by each state need to be considered.

Contrary to expectations, there was no association between physical inactivity and COVID-19 infection. However, having a serious risk factor for COVID-19 was a protective factor for physical inactivity. It is noteworthy that this finding can be hypothesized in the premise of the "Health Beliefs Model"[28], in which people's belief about a possible disease and the desire to prevent these negative health conditions constitute their motivation to act. According to this theory, a per-

son's proactivity to engage in some behavior that benefits their health, such as physical activity, depends on their belief about the severity of the disease and that involvement in this behavior will effectively prevent the threat of negative outcomes to health[28,29]. In this way, perhaps because they were informed about the benefits of physical activity, students may have become involved or started to practice physical activity even in periods of social isolation.

With respect to the strengths of the current study, as far as we know, this study is the largest and the first multicenter study to explore the association of physical inactivity with the burden imposed by the COVID-19 pandemic on university students in Brazil. Second, the sample size can aid understanding of the effects of the pandemic on the behavior, characteristics, and health of university students whose classes were suspended due to COVID-19. Third, university managers can use these data to implement physical activity as an instrument to improve quality of life in the pandemic context and in the gradual return to academic activities, as it has a direct influence on the control and prevention of chronic diseases, immunity, improved mental health, and socialization.

The main limitations of this study are the fact that the physical activity data were self-reported by the participants and online collection due to the suspension of in-person academic activities, so the findings should be interpreted with caution. Second, sample for convenience: the research was conducted only with students of face-to-face courses in public institutions (03 federal, 01 state, and 01 rural) from different regions of Brazil and may not reflect the large student population of universities in the country due to the local impact of the pandemic, private institutions, distance course modality (public and private) and the profile of students from different undergraduate courses. Despite this, the study privileges social, economic, demographic and cultural diversity existing in the country. Third, the sample size considered in this study was performed with other objectives (to study the association of pandemic with mental health components). However, the prevalence of our outcome (physical inactivity) overcame the prevalence previously considered, resulting in more statistical power to the current analyses. Fourth, the cross-sectional design does not allow the establishment of temporality, which may lead to reverse causality bias in some cases. Fifth, we did not collect other kinds of information regarding our outcome, such as intensity, duration or type of physical activity.

Admittedly, the academic environment plays an important role in the professional training, mental and physical health, socialization, and maintenance of healthy habits in students. For this reason, longitudinal studies are suggested to monitor the university population, as well as intervention studies to encourage students to become involved in regular physical activity programs, since undesirable changes in physical activity patterns, especially if continued for some time, can have negative consequences for physical, cognitive, and social well-being. Finally, this study can contribute to the identification of the most vulnerable groups for the practice of physical activity among university students in Brazil during the pandemic.

It is concluded that about half of Brazilians undergraduate students were completely physically inactive during the pandemic. The main risk factors for that behavior were continuing to work normally and the fear of the pandemic. Interventions are recommended to promote physical activity, especially for the groups most affected by the COVID-19 pandemic.

Conflict of interest

The authors declare no conflict of interest.

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Author's contributions

Dumith SC participated in the design of the manuscript, performed the analyzes and critically reviewed the manuscript. Viero VSF, Alexandrino EG, Silva LCB participated in the writing of the manuscript. Tassitano RM and, Demenech LM supervised the analyzes and revised the manuscript. Demenech LM coordinated the study. All authors approved the publication of the manuscript.

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Supplementary Table

Description of independent variables, instruments, and operationalization (Multicenter Study SABES-Grad. Brazil, 2021).

Variable	Instruments/ operationalization
Work during the pandemic	Question about how the Covid-19 pandemic affected occupation/work, with the following answer options: did not work before and continued not working/ continued working normally/ continued working, but at home/ started working during the pandemic/ lost their job or stopped working.
Concern about getting behind academically	Question with the following answer options: not at all worried/ slightly worried/ moderately worried/ very worried/ completely worried
Income during the pandemic	Question with the following answer options: Increased/ Remained the same/ Decreased a little/ Decreased a lot/ Had no income
Routine of activities during the pandemic	Question about the participant's routine during the Covid-19 pandemic with the following answer options: stayed at home all the time/ only went out for essential activities/ went out occasionally for non-essential activities/ went out every or almost every day for non-essential activities/ went out every or almost every day for work or other regular activity
Number of days left home in the previous two weeks	Question about how many times the participant left home in the previous two weeks, operationalized into: none/ between one and five days/ between six and 10 days/ between 11 and 15 days
Adherence to social distancing	Question on how much the participant thinks they complied with the recommendations on social distancing with the following response options: very little/ little/ somewhat/ a lot/ practically isolated
Time per day accessing pandemic information	Less than 10 minutes/ between 10 and 59 minutes/ one hour or more
Performed a diagnostic test for COVID-19	Question about performing a Covid-19 infection test. If the answer was yes, it was followed by a question about the test result (positive or negative), operationalized into: no/ yes with a negative result/ yes with a positive result.
Relative, friend, or person close to you contracted COVID-19	Question about COVID-19 infection of loved ones with the following answer options: none/ one person/ two people/ three people or more
Relative, friend, or person close to you died due to COVID-19	Question about death from COVID-19 of loved ones with the following answer options: no one/at least one person
Having a risk factor for severe COVID-19	Questions about the presence of the following risk factors: age (65 years or older), hypertension, diabetes, high cholesterol or triglycerides, heart disease, history of stroke, cancer, respiratory problems and/or obesity, operationalized into: no/ yes
Fear of the pandemic	Fear of COVID-19 scale (FCV-19S)(30), operationalized into: A little/ medium/a lot