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Cross-sectional study on the impact of the COVID-19 pandemic on the physical activity of Brazilian adults in the Southeast region

Estudo transversal sobre o impacto da pandemia de COVID-19 nas atividades físicas de adultos brasileiros da região Sudeste

Estudio transversal sobre el impacto de la pandemia de COVID-19 en la actividad física de los adultos brasileños de la región Sudeste

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Objective: to gather information about physical activity practices, sleep quality, and the use of medications in the pandemic. **Methods**: a cross-sectional and prospective study was conducted, using an online survey form in the first semester of 2021, containing questions based on the Brazilian National Survey on Access, Use, and Promotion of Rational Use of Medicines in Brazil questionnaire. The analyses by describing the prevalence of all the main questions, the Test of Equality of Two Proportions was used. **Results**: statistical analyses indicated changes during the pandemic period, with worse sleep quality among younger adults, as well as changes in habits related to physical activity practices. The most used medications were those for systemic arterial hypertension and diabetes. Participants also self-reported use of antidepressant medications during this period. **Conclusion**: it is concluded that the importance of physical activity for population health is clear, and during the COVID-19 pandemic, the practice of physical activity has experienced a significant decline, which has directly influenced public health. Furthermore, this study emphasizes the importance of physical activity for immunity, quality of life, and health.
Descriptors: Exercise; Covid-19; Sleep quality; Medication Adherence.

Objetivo: levantar informações sobre práticas de atividades físicas, qualidade do sono e uso de medicamentos durante a pandemia. **Métodos:** estudo transversal e prospectivo, por meio de formulário de pesquisa *online* durante o primeiro semestre de 2021, contendo questões baseadas no questionário da Pesquisa Nacional sobre Acesso, Utilização e Promoção do Uso Racional de Medicamentos no Brasil. Para descrever a prevalência de todas as questões principais nas análises, foi utilizado o Teste de Igualdade de Duas Proporções. **Resultados:** as análises estatísticas indicaram mudanças durante o período pandêmico, com pior qualidade do sono entre os adultos mais jovens, bem como mudanças nos hábitos relacionados às práticas de atividades físicas. Os medicamentos mais utilizados foram os para hipertensão arterial sistêmica e diabetes. Os participantes também relataram o uso de antidepressivos durante esse período. **Conclusão:** conclui-se que é clara a importância da atividade física para a saúde da população, e, durante a pandemia da COVID-19, a prática de atividade física sofreu um declínio significativo, o que influenciou diretamente a saúde pública. Além disso, este estudo enfatiza a importância da atividade física para imunidade, qualidade de vida e saúde.
Descritores: Exercício Físico; Covid-19; Qualidade do sono; Adesão à Medicação.

Objetivo: recopilar información sobre las prácticas de actividad física, calidad del sueño y el uso de medicamentos en la pandemia. **Método:** estudio transversal y prospectivo, utilizando un formulario de encuesta en línea en la primera mitad de 2021, que contenía preguntas basadas en el cuestionario de la Encuesta Nacional sobre Acceso, Uso y Promoción del Uso Racional de Medicamentos en Brasil. Para analizar la prevalencia de todas las preguntas principales, se utilizó la Prueba de Igualdad de Dos Proporciones. **Resultados:** los análisis estadísticos indicaron cambios durante el período de la pandemia, con un empeoramiento de la calidad del sueño entre los adultos más jóvenes, así como cambios en los hábitos relacionados con las prácticas de actividad física. Los medicamentos más utilizados fueron aquellos para la hipertensión arterial sistémica y la diabetes. Los participantes también informaron del uso de medicamentos antidepresivos durante este período. **Conclusión:** se concluye que la importancia de la actividad física para la salud de la población es clara, y durante la pandemia de COVID-19, la práctica de actividad física ha experimentado un descenso significativo, lo que ha influido directamente en la salud pública. Además, este estudio enfatiza la importancia de la actividad física para la inmunidad, calidad de vida y salud.
Descriptores: Ejercicio Físico; Covid-19; Calidad del sueño; Cumplimiento de la Medicación.

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INTRODUCTION

Human longevity and healthy aging are challenges for Biology and Medicine, as population aging has been accompanied by a higher incidence of health problems, requiring efficient health and social security systems. The emergence of more diseases and disabilities in the population leads to an increase in demand for health services[1-3].

Data from the 2019 Brazilian National Health Survey[4] indicated a considerable prevalence of polypharmacy in the elderly Brazilian population in 2019, which may expose them to potential risks. This practice is related to significant socio-economic inequalities and it risks patient safety.

Regular physical activity is important for promoting health and quality of life, and there is epidemiological evidence supporting the positive effect of an active lifestyle and/or individuals' involvement in physical exercise programs in preventing and minimizing the deleterious effects of aging[5]. The habit of engaging in regular physical activity promotes a healthy lifestyle, preserving one's autonomy and freedom to perform daily tasks, resulting in prolonged independence. In addition, physical activity has a positive impact on physiological and psychological processes, minimizing risks of stress, depression, and loss of functional capacity[6].

During the SARS-CoV-2 (COVID-19) pandemic[7], regular physical activity practitioners had to adapt their routines, and it is important to keep practicing physical activity for maintaining good health. For many people, physical activity during this period occurred without the guidance of a physical education professional[8,9].

Based on the assumption that people who regularly engage in physical activity have better quality of life and require fewer medications, it is assumed that the quarantine imposed by the COVID-19 pandemic has influenced such practices and their consequences. Therefore, the objective of this research was to gather information about physical activity practices, sleep quality, and use of medications in the pandemic.

METHODS

Cross-sectional and observational study conducted on a sample of the Brazilian population in 2021 (data collection between April and June) in the context of the COVID-19 pandemic. The research was advertised through invitations posted on social media. For the medication use survey, an adapted version of the questionnaire used for the Brazilian National

Survey on Access, Use, and Promotion of Rational Use of Medicines in Brazil (PNAUM)[10] was used (Chart 1). The questionnaire was applied in Portuguese.

Chart 1. Questions adapted from the National Survey on Access, Use, and Promotion of Rational Use of Medicines in Brazil (PNAUM). Brazil, 2021.

Question number	
1	What is your age?
2	What is your gender?
3	What is your educational level?
4	Have you ever tested positive for COVID-19?
5	In which city/state do you reside?
6	Did you used to engage in regular physical activity before the COVID-19 pandemic?
7	With the pandemic and the imposed quarantine, has the frequency at which you engage in physical activity changed?
8	How has this change been?
9	Has any doctor ever told you that you have hypertension or high blood pressure?
10	If you answered YES, please provide the age you were when the doctor first told you that you had high blood pressure?
11	What medication do you take for high blood pressure?
12	In the last 30 days, have you been without any of these medications for any period?
13	Please answer regarding how much high blood pressure interferes with your daily activities.
14	Has any doctor ever told you that you have diabetes or high blood sugar?
15	If you answered YES, please provide the age you were when the doctor first told you that you had diabetes?
16	What medication do you take to control diabetes?
17	Do you have a medical indication to use insulin?
18	Has any doctor ever told you that you have or have had a heart disease, such as a heart attack, angina, heart failure, arrhythmia or other?
19	Which heart diseases did the doctor say you have or have had?
20	Have you received any medical indication to take medication for these heart diseases? If YES, which one(s)?
21	Besides these medications, do you take any others?
22	Please list the names of all medications you have taken in the last 30 days.
23	In the last 12 months, have you needed to be treated in an emergency room?
24	Do you think your health has improved, worsened, or stayed the same since we entered quarantine or since the pandemic began?
25	How has the quality of your sleep been in the last month?
26	Do you have any additional comments about your health and physical activity practice?

The study was open to the adult public, aged ≥ 18 years, who agreed to participate in the research and provided their informed consent through a signed Free and Informed Consent Form.

The responses were analyzed by a statistician. In the statistical analysis, the Two Proportions Test was employed, which compares whether the proportion of responses of two variables and/or their levels is statistically significant. The significance level defined was 0.05, and the confidence intervals were constructed with 95% statistical confidence. The software programs used were SPSS V20, Minitab 16, and Excel Office 2010.

The caption shown above was followed throughout the study. Starting the analyses by characterizing (describing) the prevalence of all the main questions, the Test of Equality of Two Proportions was used. The percentages were always calculated for the total number of valid answers to each question, which was almost always cases.

For variables with only two response levels, the p-value corresponds directly to the comparison between them. For variables with three or more levels of response, the p-values have been presented for the comparison of each level of response in relation to the most prevalent, which is listed as "Ref".

Ethical aspects: this research protocol was approved by the CEP Pontifícia Universidade Católica de Campinas - PUC/ Campinas (CAAE: 44558921.4.0000.5481).

RESULTS

A total of 186 Brazilians adults who met the inclusion and exclusion criteria participated in the study. Participants (Table 1) were mostly women (138 volunteers), with a significant proportion in the age group of 18 to 29 years (38.04%).

Question 5 was used for the researchers to identify the municipality where the participants lived at the time. The answers were varied, and the majority were residents of the Southeastern region of Brazil. Questions 11, 16, 21 and 22 were useful for identifying which medicines were used regularly by the participants. The answers to question 12 were mostly negative, indicating that the majority of participants had access to medication in the 30 days prior to the survey. Question 13 asked whether high blood pressure was a factor that could affect the daily activities of the participants, who answered that they did not perceive any negative effect. Only five participants answered question 15, which made no relevant contribution. The same happened with questions 19 and 20, whose data was not significant. Question 26 brought negative reports such as: "I feel stressed and impatient" or "little physical activity compared to what I did before" although other participants said "I started physical activities less than 3 months ago" or "I started going for walks during quarantine ".

It was possible to check that there was statistical significance in the distribution of almost all the questions, with the exception of questions 6 and 21. Question 2 (gender) showed that the majority were women, with 75.3%, which is a statistically different percentage from the 24.7% of men (p-value <0.001). Another example is the age distribution (Question 1), where the majority are in the 18-29 age group with 44.6%, which is a statistically significant percentage compared to the other age groups.

An example of interpretation is the distribution of Question 25 (How has the quality of your sleep been in the last month), where 38.7% answered Fair, which is a statistically

significant percentage compared to the others. The second most prevalent answer was Good, with 29.0%.

The scores for questions 6 and 7 (Table 2), which ask about physical activity before and during the Covid-19 pandemic, were compared. The Equality of Two Proportions test was used and it was showed that there was a statistically significant difference in the physical activity indices before and during the pandemic (p-value = 0.006). The No index decreased from 48.4% to 34.4% and the Yes index increased from 61.5% to 65.6%.

Table 1. Distribution of factors of PNAUM[10] adapted. Brazil, 2021.

Questions*		No.	%
Question 1	18 - 29 years	83	44.6%
	30 - 39 years	18	9.7%
	41 - 49 years	33	17.7%
	51 - 59 years	17	9.1%
	60 - 65 years	14	7.5%
	> 65 years	21	11.3%
Question 2	Female	140	75.3%
	Male	46	24.7%
Question 3	No education	1	0.5%
	Primary education	8	4.3%
	Secondary education	45	24.2%
	Higher education	107	57.5%
	Post-graduation	25	13.4%
Question 4	No	162	87.1%
	Yes	24	12.9%
Question 6	No	90	48.4%
	Yes	96	51.6%
Question 7	No	64	34.4%
	Yes	122	65.6%
Question 8	Increased	19	10.2%
	Decreased	65	34.9%
	I stopped	42	22.6%
	I started	20	10.8%
	No change	40	21.5%
Question 9	No	156	83.9%
	Yes	30	16.1%
Question 14	No	165	88.7%
	Yes	21	11.3%
Question 17	No	181	97.3%
	Yes	5	2.7%
Question 18	No	172	92.5%
	Yes	14	7.5%
Question 21	No	90	49.2%
	Yes	93	50.8%
Question 23	No	154	82.8%
	Yes	32	17.2%
Question 24	My health improved	26	14.0%
	My health worsened	47	25.3%
	My health worsened and I started using more medication	14	7.5%
	I didn't notice any change in my health	99	53.2%
Question 25	Excellent	15	8.1%
	Good	54	29.0%
	Fair	72	38.7%

Poor	45	24.2%

* The questions adapted from the National Survey on Access, Use, and Promotion of Rational Use of Medicines in Brazil (PNAUM)[10] for showed of Chart 1.

Table 2. Comparison of Physical Activity Distribution in pandemic context. Brazil, 2021.

Exercise	Before Covid-19 pandemic		During Covid-19 pandemic		P-value
	No.	%	No.	%	
No	90	48.4%	64	34.4%	0.006
Yes	96	51.6%	122	65.6%	

Figure 1 shows the relationship between sleep quality and age range and Figure 2 shows the relationship between sleep quality and changes in physical activity. It can be seen that 71.1% of the population aged 18-29 reported poor sleep quality; 53% of participants aged 30-39 reported excellent sleep quality and participants aged over 51 generally reported fair sleep quality. Participants who reduced their physical activity or did no activity reported poor or fair sleep.

Figure 1. Relationship between sleep quality and age range. Brazil, 2021.

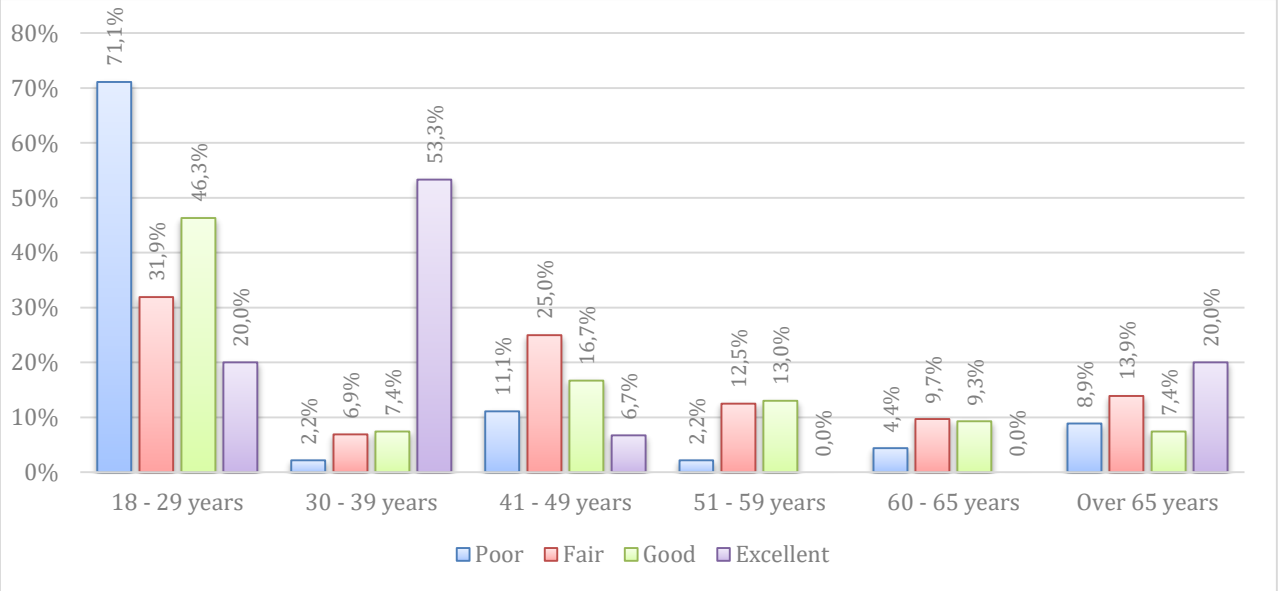

Figure 2. Relationship between sleep quality and "how was the change" in physical activity practice. Brazil, 2021.

The most used self-reported medications were Losartan potassium, Metformin hydrochloride and Levothyroxine sodium, as shown in Figure 3.

Figure 3. Main drugs self-reported by participants. Brazil, 2021.

	Self-reported users
Losartan potassium	14
Metformin hydrochloride	11
Levothyroxine sodium	5
Alprazolan	3
Hydrochlorothiazide	3
Insulin	3
Rosuvastatin	3
Simvastatin	3
Amiloride	2
Anlodipine Besylate	2
Clonazepan	2
Diazepam	2
Paroxetine	2
Ivermectin	2
Nitazoxanide	2
Azithromycin	2
Allopurinol	1
Atenolol	1
Atensin	1
Bupropion	1
Caffeine	1
Chlorthalidone	1
Dapagliflozin	1
Lisdexamfetamine	1
Enalapril Maleate	1
Nifedipine	1
Escitalopram oxalate	1
Pregabalin	1

DISCUSSION

Female participants, young adults, and those with a certain level of education were prevalent. Regarding the elderly, 35 people over 60 years of age answered the questionnaire, and they had a high educational level, corresponding to 19% of the participants. These results may be correlated with greater knowledge about health and the importance of physical activity. Regarding the participants' city of residence, most individuals were from the state of São Paulo, although the questionnaire was also answered by residents of other states, and 2 people were from other countries (United States and New Zealand).

When asked about their frequency of physical activity during the pandemic period, it was identified that there was a change, with the majority reporting a reduction or even interruption of their practice. Regarding the quality of the participants' health during the pandemic, responses varied greatly, although about half reported not noticing any change. From the responses obtained regarding health quality, it is noted that overall, women's health deteriorated more than men's.

Furthermore, the quality of sleep in the last month was also evaluated, with the minority reporting excellent sleep quality (7.1% of participants, p-value <0.001), and the majority reporting fair or poor sleep quality (38.7% and 24.2%, respectively), possibly reflecting the conditions imposed by the quarantine period, stress, and changes in daily routine. Figure 1 indicates that the sleep quality of most participants was not adequate, although a limitation of this research is that most participants were young adults, and there was not a good sample distribution among the various age groups. In Figure 2, it is possible to observe that, for people who stopped or reduced physical activity, they also presented poorer sleep quality, making it evident the importance of this practice.

Regarding the use of medications in the open-ended questions, it was noticed that although most participants were young women, there was a high number of responses indicating regular use of medications for various illnesses (Figure 3), in several different way. Since the questionnaire applied was based on PNAUM[10], it focused on systemic arterial hypertension (SAH), diabetes, hypothyroidism, and cardiovascular diseases. Losartan potassium was the most reported medication (it belongs to the class of angiotensin II receptor antagonists or ARA II). In second was Metformin hydrochloride (diabetes), followed by Levothyroxine sodium (hypothyroidism). The pathologies that stood out the most were arrhythmia, followed by heart failure and myocardial infarction (12, 3 and 3 reports, respectively). Psychiatric medication was also indicated by the participants, especially those over 50.

The data collection period corresponded to the second year of the pandemic. During the pandemic, a drug combination consisting of hydroxychloroquine or chloroquine, combined with azithromycin, ivermectin and nitazoxanide, as well as zinc supplements and vitamins C and D, became widespread in Brazil[11]. In this study, only a few of these drugs were reported (Figure 3): azithromycin, ivermectin and nitazoxanide, suggesting the practice of self-medication encouraged by the media and authorities.

Online consultation services in Brazil had an initial exponential increase, followed by a reduction in the use of these services over the course of the pandemic and post-pandemic period[12]. A study on self-medication conducted at the end of 2021 with 654 people indicated that 69.4% of them self-medicated, especially with over-the-counter medicines[13]. Continuous use medications prescribed before the pandemic period were kept in use by the population studied.

It was observed that only about 10% of the interviewees who already practiced physical activities before the pandemic increased their frequency, while about 13% started to practice physical activity during the pandemic, which shows the importance of this practice during this period. One study[14] emphasize this importance mainly during the pandemic due to the relationship between physical activity and improvement in immunity, which helps in combating SARS-CoV-2.

The findings of this research also corroborate a study carried out in several countries, including 2,171 Brazilians, to assess changes in eating habits and lifestyle during the period of confinement due to the first wave of the Covid-19 pandemic, Brazil and Argentina stood out with the highest proportion of changes towards a healthier pattern of food consumption. Most participants reported practicing physical activity at home, about half reported a perception of weight gain, and there were reports of changes in sleep patterns[15].

Research have associated moderate and/or intense physical activities with an improvement in immunity when compared to individuals who engage in light physical activity. The frequency and duration of physical activities also have a significant influence on immunity, as can be observed in patients who have contracted SARS-CoV-2[16]. It is observed that many individuals continue to experience symptoms after the 14-day period of infection, which may be associated with immune deficiency.

The practice of physical exercise before COVID-19 infection is of great importance in immunity, symptom development, and recovery. After exposure to the virus, the return to physical activity depends greatly on how symptoms developed during the infectious period and how the patient fared in the post-infection period. Typically, it is recommended that individuals

who developed severe symptoms and continued to experience them even after the 14-day infection period should return to physical activity 3 to 6 months after the symptoms have disappeared[17].

Another online survey conducted in Brazil involving 1726 individuals revealed that those who had COVID-19 symptoms had the lowest levels of physical activity, and the opposite was found for those who did not have symptoms. The authors conclude that regular physical activity can have a positive impact on health status and quality of life and be a tool in the field of public health[18].

Regarding the frequency of physical activity, 35.30% of all participants reported a decrease in this practice, followed by 27.70% who quit altogether. In terms of health quality, 53.3% did not notice any changes in their health, while 25.5% considered that their health was worse. Regarding individuals aged ≥60 years who responded to the questionnaire, 16 of them practiced physical activity before the pandemic, and only 4 of them did not change the frequency of physical activity during the pandemic period, while the rest reduced or stopped this habit. As for the perception of their health condition, about half of the participants in this age group said that their health had improved, while the other half said that it had worsened. Therefore, it is not possible to make any correlation with regular physical activity, especially since the number of elderly respondents was low.

The relationship between physical activity, health, and quality of life in the aging population is being increasingly discussed and scientifically analyzed[19]. There is evidence that suggests lower medication consumption and better health among more active individuals. The more inactive older adults are, the higher their medication consumption will be[20.] The evaluation of the contribution of physical activity to specific aspects of the health of the elderly aims to clarify the real benefits that may be associated with the adoption of this practice in the aging process of the population. Therefore, evaluating the monitoring of health indicators longitudinally, considering a feasible and sufficient time frame to assess possible changes, should be considered. The possibility of reducing the use of medication resulting from preventive actions such as regular physical activity can serve as an incentive for other communities.

When analyzing only the elderly, it can be showed that during the pandemic, just over half experienced a worsening in the performance of physical activities, although none increased the use of medication. It is noted that among them, there is a prevalence of some of the most common diseases for the age group, such as hypertension, diabetes mellitus, dyslipidemia, and cardiovascular diseases, as well as self-medication, especially during the pandemic. However,

in general, the period of isolation impacted the lives of the participants of this study both in terms of physical activity and health quality.

CONCLUSION

Based on the data obtained through this research, it is concluded that, during the COVID-19 pandemic, the practice of physical activity had a significant decrease that directly influenced the population's quality of life and health, emphasizing the importance of physical activity for immunity, quality of life, and health. Pharmacological treatments for diabetes and hypertension were the most self-reported. Although they were not the most prevalent in the population assessed, the use of psychiatric drugs was also self-reported. From this information, it is evident that health education actions and encouragement of the return to physical activity practices are essential for the maintenance of population health.

Two limitations can be mentioned. The age and gender of the participants, with a prevalence in responses from young adult women. In addition, most of the responses were from the interior of the state of São Paulo, one of the most developed in Brazil. Despite these limitations and the consequences of the pandemic, the study contributes by providing information that can be used to understand the population's habits when faced with challenging situations and the relationship with some pathologies. Studies in other regions of the country are necessary. We are still learning about the consequences of COVID-19.

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