



# Exposure to insufficient levels of physical exercises among older adults during physical distancing as a result of covid-19

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## Abstract

**Objective:** To determine the prevalence of exposure to insufficient levels of physical exercise among older adults during the period of physical distancing because of covid-19 and analyse associated factors in the Federal District, Brazil. **Method:** This is an epidemiologic survey with cross-sectional design and sample representative of a Brazilian state (n=745 older adults). Data were collected through a computer-based questionnaire. The outcome variable was practice of physical exercises during physical distancing ( $\geq 2$ /week and  $\geq 30$  minutes). To analyse data, associative procedures (binary logistic regression) were used. **Results:** The prevalence of exposure to insufficient levels of physical exercise was 42.8%, which was associated to lack of physical activity prior to physical distancing ( $p < 0,001$ ), lack of online physical activity lessons ( $p < 0,001$ ) and exposure to sedentary behaviour during physical distancing ( $p = 0,005$ ). **Conclusion:** Physical distancing has resulted in high prevalence of exposure to insufficient levels of physical exercise among older people, which can have deleterious health effects. Measures are needed to guide this population on strategies to maintain active habits during similar periods.

**Keywords:** Physical exercise; Aged; Physical distancing; Covid-19.

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## INTRODUCTION

The new coronavirus (covid-19) was firstly reported in December 2019 in China (Wuhan), and, within only three months, the disease became a worldwide pandemic, with more than 353,000 confirmed cases and 15,000 deaths<sup>1</sup>. The evolution of the pandemic can be followed through several official websites, such as the interactive web-based panel to trace covid-19 in real time, developed by the Centre for Systems Science and Engineering at Johns Hopkins University (<https://www.eficiens.com/coronavirus-statistics/>). On September 5<sup>th</sup>, 2022, 604,636,131 cases had been registered, as well as 6,496,157 deaths.

Most epidemiology specialists agree that success in combating the virus in China and in other countries is due to quick measures taken by authorities to enforce physical distancing to the majority of the population<sup>2</sup>. After nineteen months of pandemic, Brazil had 21,644,464 covid-19 infection cases and 603,282 deaths<sup>3</sup>. Data reveal that this unprecedented health crisis has affected the entire population, especially those at higher risk, such as older adults and people with pre-existing conditions<sup>4</sup>.

Although physical distancing is recommended to interrupt the rapid spread of the new coronavirus until mass vaccination is reached, this can result in negative impacts on other health dimensions of older people, such as changes in lifestyle, especially regarding low levels of physical activity<sup>5</sup>.

However, it is consensus in the scientific literature that, to maintain adequate health status, to neutralize the negative consequences of certain diseases (diabetes, hypertension, cardiovascular, and respiratory diseases) and to ensure healthy aging, thus reducing risks of frailty, sarcopenia and dementia, older adults must engage in physical activities<sup>6</sup>. The American College of Sports Medicine (2020) recommends that, to maintain physical health during the period of physical distancing, older adults should accumulate 150-300 weekly minutes of moderate-intensity aerobic physical activity, and 2 weekly sessions of muscle training performed at home through technology, music, and mobile applications<sup>7</sup>. In addition, it is necessary to limit

sedentary behaviour (sitting time), and although there is no consensus in literature on the cut-off point for older adults, there is evidence that exposure should not exceed 4 hours daily<sup>8</sup>.

Although there are some physical (inadequate facilities) and psychological barriers (fear, laziness, tiredness) to the practice of regular and intentional physical activity such as physical exercises and sports among older adults in a situation of physical distancing, there are many possibilities to do exercises at home<sup>9</sup>. In this sense, online classes, supervised by professionals, have become especially essential for this population during physical distancing to maintain physiological function and especially mental health, reducing risk factors for anxiety and depression<sup>10</sup>.

However, despite the knowledge about the numerous benefits of physical activity and physical exercise, a high prevalence of insufficient levels worldwide with increasing trend is observed, as demonstrated in the study that included data from almost 2 million participants (96 % of the global population) in 2016, which revealed that more than a quarter of all adults were insufficiently active, with prevalence being twice as high in high-income countries (36.8%, 35.0–38.0) compared to low-income countries (16.2%, 14.2–17.9) and increasing over time in high-income countries (31.6%, 27.1–37.2, in 2001)<sup>11</sup>.

In addition, there is evidence that physical distancing resulting from Covid-19 has resulted in significant decrease in levels of physical activity and increase in sedentary behaviour among older people worldwide, with harmful consequences for the physical and mental health of these individuals<sup>12-14</sup>. Physical inactivity, even in the short term (1-4 weeks) can cause rapid deterioration of the cardiovascular health and death in population with increased cardiovascular risk<sup>15</sup>. A nationwide cross-sectional survey (n=43,995 Brazilian adults) revealed that increases in physical inactivity and screen time during the Covid-19 pandemic were associated with worse mental health indicators, with individuals with depression and physical inactivity being the most likely groups to experience loneliness and sadness<sup>14</sup>.

Therefore, considering the practice of physical exercise at recommended levels as a challenge for health public policies to prevent diseases and their complications, and observing the importance of monitoring this behaviour among older adults in physical distancing during the covid-19 pandemic, the aim of this study was to determine the prevalence of exposure to insufficient levels of physical exercise during physical distancing and analyse associated factors.

## METHODS

This research is characterized as an epidemiologic survey, with cross-sectional design and sample representative of a Brazilian state about the practice of physical exercise by older adults during the period of physical distancing resulting from covid-19.

The study was conducted in the Federal District, located in the Mid-Western region of Brazil, with total area of 5,779,999 square kilometers<sup>16</sup>, and total population of 2,974,703, of which 447,957 are older adults<sup>17</sup>. Older adults are considered individuals aged 60 years or older, as established in the first paragraph of Law 10.741/2003, the “Estatuto do Idoso”.

To carry out the research sample planning, the population survey sampling process or descriptive study was used, with random sampling (non-cluster) through the Statcalc application of the Epi Info software version 7.2.2.6, considering: total population of older adults in the Federal District, with frequency of 50% as expected value, confidence level of 95%, tolerable error in sample of 1.5 percentage point and 80% power. The required sample size was  $n=350$  individuals. To avoid losing sample representativeness, sample size was increased by 20% for several reasons, such as: participant refusal, lower age than that established for this study and failure to respond to important questions in the questionnaire. The final minimum sample included 420 older adults.

Their participation in the project was voluntary, and the following criteria were used for insertion in the study: people aged 60 or older of both sexes, who agreed to participate by signing the Consent Form and adequately answered the online

questionnaire. On the other hand, questionnaires filled out by individuals who did not live in the Federal District, Brazil, were excluded from the study, as well as duplicates.

Aiming to answer the research question, a questionnaire was developed and sent to participants from the Federal District, Brazil, in the period between September 2020 and April 2021. The electronic questionnaire was sent through email and WhatsApp with link access generated using Google’s free tool, Google Forms. The questionnaire was available at the following URL: <https://forms.gle/SszeugAAAQZQBfVTA>.

Data collection was mainly chosen due to the physical distancing practices required during the covid-19 pandemic. Moreover, as the number of internet users increases every year across all ages, especially in the elderly, email has become a favourable method for collecting data for scientific research in the Health Sciences because it represents a cost-effective possibility that is also faster, more practical, and more convenient for the participants of the study, which may positively impact the number of answers obtained<sup>18</sup>.

The outcome variable was the practice of physical exercise during physical distancing because of the covid-19 pandemic, measured through the question, “During physical distancing, have you practised physical exercises regularly, repetitively, and intentionally (physical exercise or sport), twice a week or more, for at least 30 minutes? (yes/no)”

This study analysed demographic variables such as age (60-69 years / 70-79 years /  $\geq 80$  years), sex (male / female), socioeconomic variables such as education (did not attend school / incomplete Elementary School / complete Elementary School / High School / Higher Education), place of residence by Human Development Index (high HDI / very high HDI / No data), type of residence (apartment / house), how many people in the household (lives alone / lives with other people), including variables about risk behaviours prior and during the covid-19 pandemic, such as negative health self-perception, exposure to sedentary behaviour, and insufficient level of physical exercise.

Chart 1 shows the independent variables on risk behaviours related to the respective and objective question in the questionnaire, added by the categorisation applied to the model.

Descriptive analysis was performed through the calculation of prevalence and 95% confidence intervals (95%IC) for the variables of interest in this study. For the multivariable analysis, binary logistic regression was used, presenting the odds ratio as a measure of association. Variables with  $p < 0.20$  in the gross multivariable analysis were maintained for adjustment by sex, age, and education. Variables whose  $p$  value was below 0.05 were considered significantly associated to the outcome.

This project was approved by the Ethics Committee in Research with Human Beings at the Faculty of Health Sciences, University of Brasilia

(CEP/FS-UnB), under CAAE protocol number 33798220.3.0000.0030.

## RESULTS

Data from 780 older adults were analysed, and 35 were excluded because they did not live in the Federal District, Brazil. The final sample was composed of 745 individuals (74.9% women, 25.1% men), aged 60 years or older and with the most frequent age ranging from 60 to 69 years old (60.9%).

Table 1 presents the demographic and socioeconomic characteristics of participants. The sample showed higher proportion of individuals with higher education (72.1%), who live in areas of very high HDI (83.0%), who live in apartments (50.2%) and those who live with other people (74.9%).

**Chart 1.** Independent variables on risk behaviours in relation to health, as analysed in the study.

Independent variable	Objective question	Category
Practice of physical exercises before PD	During physical distancing, have you practised physical exercises regularly, repetitively, and intentionally (physical exercise or sport), supervised by a professional, twice a week or more, for at least 30 minutes?	No (0) Yes (1)
Online practise of physical exercises during PD	During PD, have you practised physical exercises through online classes?	No (0) Yes (1)
Health self-perception before PD	In general, how would you rate your health?	Negative (0) = regular / poor / very poor Positive (1) = good / very good
Health self-perception during PD	When comparing your health today with that before PD, you would say that your health today is:	Negative (0) = worse Positive (1) = equal / better
Exposure to sedentary behaviour before PD	How long, in total, did you spend sitting during a normal weekday before PD?	Exposed (0) = $\geq 4$ hours daily Not exposed (1) = $< 4$ hours daily
Exposure to sedentary behaviour during PD	During PD, what would you say about the time you spend sitting during a normal weekday in comparison to the period before distancing?	Exposed (0) = increased Not exposed (1) = stable / lower

PD= Physical Distancing.

**Table 1.** Demographic and socioeconomic characteristics of participants, Federal District, Brazil, 2020-2021 (n=745).

Variables	Categories	n	%(95%CI)
Sex	Female	558	74.9 (71.8 – 78.0)
	Male	187	25.1 (22.0 – 28.2)
Age	60-69	454	60.9 (57.4 – 64.4)
	70-79	244	32.8 (29.4 – 36.2)
	≥ 80	47	6.3 (4.6 – 8.0)
Education	Did not attend school	02	0.3 (0.2 – 0.4)
	Incomplete ES	65	8.7 (6.7 – 10.7)
	Complete ES	120	16.1 (13.5 – 18.7)
	Complete HS	21	2.8 (1.6 – 4.0)
	Higher Education	537	72.1 (68.9 – 75.3)
Place of residence	High HDI	71	9.5 (7.4 – 11.6)
	Very high HDI	618	83.0 (80.3 – 85.7)
	No data	56	7.5 (5.6 – 9.4)
Type of residence	Apartment	374	50.2 (46.6 – 53.8)
	House	371	49.8 (46.2 – 53.4)
Lives alone	Yes	187	25.1 (22.0 – 28.2)
	No	558	74.9 (71.8 – 78.0)

ES=Elementary School; HS=High School; HDI=Human Development Index.

Higher proportion of participants who practised physical exercise before (77.7%; 95%CI 74.7-80.7) and during (57.2%; 95%CI 53.6-60.8) physical distancing (PD) was verified. However, it was possible to observe that there was a reduction of approximately 20% among individuals who practised it before in relation to those who kept exercising during PD. Likewise, the prevalence of health self-perception classified as “good” was observed in 51.0% (IC95% 47.4-54.6); “equal” health self-perception during PD, when compared to the previous period, was observed in 72.1% (IC95% 68.9-75.3). Higher proportion of individuals who did not practise physical exercises by following online classes during PD was also evidenced (63.1%; 95%CI 59.6-66.6), compared with individuals who were exposed to sedentary behaviour prior to PD (63.0%; 95%CI 59.5-66.5), and those who reported increase in exposure to sedentary behaviour during PD (56.1%; 95%CI 52.5-59.7). Results are shown in Table 2.

In the model obtained through gross logistic regression, variables for health risk behaviours

associated with the outcome were: practice of physical exercise before PD (No), practice of physical exercise through online classes (No), sedentary behaviour during PD (Exposed). On the other hand, exposure to sedentary behaviour prior to physical distancing was not associated to the outcome, and health self-perception before and during PD (Negative) was a protective factor (Table 3).

In the final model obtained through adjusted logistic regression, individuals who did not practise physical exercise before PD and those who did not practise exercises through online classes were, respectively, 4 to 6 times more likely to not exercising during PD when compared to their peers (OR=4.10; 95%CI 2.78-6.04) and (OR=6.22; 95%CI 4.30-9.00). Likewise, those exposed to sedentary behaviour during PD were 16% more likely to not practising physical exercise during PD. On the other hand, negative health self-perception both before and during PD was a protective factor for exposure to insufficient levels of physical exercise, when compared to their peers (Table 3).

**Table 2.** Prevalence of health risk behaviours for individuals in physical distancing due to the covid-19 pandemic, Federal District, Brazil, 2020-2021.

Variable	Category	n	% (95%CI)
Physical exercise before PD	Yes	579	77.7 (74.7-80.7)
	No	166	22.3 (19.3-25.3)
Physical exercise during PD	Yes	426	57.2 (53.6-60.8)
	No	319	42.8 (39.2-46.4)
Physical exercise through online classes during PD	Yes	275	36.9 (33.4-40.4)
	No	470	63.1 (59.6-66.6)
Health self-perception	Very good	232	31.1 (27.8-34.4)
	Good	380	51.0 (47.4-54.6)
	Regular	118	15.8 (13.2-18.4)
	Poor/Very poor	15	2.0 (1.0-3.0)
Health self-perception during PD	Better	57	7.7 (6.0-9.6)
	Equal	537	72.1 (68.9-75.3)
	Worse	151	20.3 (17.4-23.2)
Sedentary behaviour before PD	< 4 hours/day	469	63.0 (59.5-66.5)
	≥ 4 hours/day	276	37.0 (33.5-40.5)
Sedentary behaviour during PD	Reduced	82	11.0 (8.8-13.2)
	Stable	245	32.9 (29.5-36.3)
	Increased	418	56.1 (52.5-59.7)

PD= Physical Distancing; CI=Confidence interval.

**Table 3.** Crude and adjusted multivariable analysis of health risk behaviours associated with exposure to insufficient levels of physical exercise among participants during physical distancing due to the covid-19 pandemic, Federal District, Brazil, 2020-2021.

Variables/ Categories	Crude OR (95% CI)	<i>p</i>	Adjusted OR <sup>b</sup> (95% CI)	<i>p</i>
Practice of physical exercise before PD				
Yes	1	0.000	1	0.000
No	4.00 (2.76-5.79)		4.10 (2.78-6.04)	
Practice of physical exercise through online classes during PD				
Yes	1	0.000	1	0.000
No	5.64 (3.97-8.03)		6.22 (4.30-9.00)	
Health self-perception before PD				
Positive	1	0.000	1	0.000
Negative	0.36 (0.25-0.54)		0.41 (0.27-0.62)	
Health self-perception during PD				
Positive	1	0.000	1	0.000
Negative	0.25 (0.17-0.36)		0.25 (0.17-0.37)	
Sedentary behaviour before PD <sup>a</sup>				
Not exposed	1	0.344	-	-
Exposed	0.86 (0.64-1.17)		-	-
Sedentary behaviour during PD				
Not exposed	1	0.005	1	0.005
Exposed	1.64 (1.22-2.21)		1.55 (1.14-2.10)	

<sup>a</sup>*p*>0.20 in crude analysis; <sup>b</sup>Adjusted by age, sex, and education; PD= Physical Distancing; CI= Confidence interval; OR=Odds Ratio.

## DISCUSSION

The main findings of this study were: 1) increase in prevalence of exposure to insufficient levels of physical exercise during physical distancing in comparison to the previous period; 2) exposure to insufficient levels of physical exercise was associated to the lack of exercise before physical distancing, lack of exercise through online classes during physical distancing, and exposure to sedentary behaviours during physical distancing; 3) negative health self-perception prior to and during physical distancing was a protective factor for exposure to insufficient levels of physical exercise during physical distancing.

It was observed that exposure to insufficient levels of physical exercise among participants increased during physical distancing, and the results are similar to those obtained in studies conducted in Brazil and in other countries<sup>12,19-22</sup>. A cross-sectional study carried out in Brazil with data from the virtual health enquiry showed that, before covid-19, 30.4% (95%CI 27.2-33.8) of older adults practised exercises at sufficient level and, during the pandemic, values dropped to 14.2% (95%CI 11.9-16.9)<sup>19</sup>.

Likewise, a study carried out in Japan showed that, in only three months of pandemic, the total time of physical activity dropped significantly among older adults in the community<sup>20</sup>. An electronic investigation carried out by thirty-five research organisations in Europe, Northern Africa, Western Asia, and the Americas demonstrated that home confinement during covid-19 brought negative effects across all levels of physical activity intensity (vigorous, moderate, walking, and in general), for both adults and older adults<sup>12</sup>.

This study also observed that older adults who did not exercise before physical distancing were more likely to not do exercises during it. This result corroborates an online survey carried out in Canada, in which 40.5% of adults and older adults were inactive, and 22.4% of those who were active became less physically engaged. Moreover, 33% of inactive individuals and 40.3% of active ones became more physically active<sup>23</sup>.

Even though evidence on the relationship between physical exercise and viral respiratory infections is scarce, especially regarding a highly contagious virus such as SARS-CoV-2<sup>24</sup>, studies have shown that not adhering to the recommended levels of physical exercise can negatively impact the health in older adults during a pandemic<sup>25,26</sup> because, among the several benefits of regular practice of physical exercise during the aging process, control and protection against cardiovascular diseases and mortality, cancer, fractures, recurring falls, functional incapacity, cognitive decline, and depression can be highlighted<sup>13,27</sup>.

Another behaviour that seems to be associated to the outcome was the exposure to sedentary behaviours. Despite being different and independent constructs, this study observed that exposure to sedentary behaviour increased the likelihood of older adults not practising physical exercises during physical distancing. This result suggests that not practising exercises during the isolation period can lead to other risky behaviours, such as prolonged sitting periods using screens such as smartphones, computers, or TV<sup>12,19,28</sup>.

Moreover, a study carried out in China showed that, during the national lockdown, more than half of all Chinese adults temporarily adopted a sedentary lifestyle, with insufficient physical activity, more screen time, and lowered emotional state; on the other hand, individuals who engaged in vigorous physical activity (physical exercise or sports) presented improved emotional state and shorter screen time compared to those with light physical activity<sup>21</sup>.

The reduction in levels of general physical activity and the increase in exposure to sedentary behaviour during physical distancing may represent health risks for older adults in several dimensions, especially decline of functional capacity due to a period of skeletal muscle disuse and reduction in neuromuscular skills. Therefore, practising physical exercises at home became a strategy to mitigate physical inactivity and improve or maintain muscle function and functional performance during physical distancing due to the covid-19 pandemic<sup>28</sup>.

This investigation also revealed that older adults who did not practise physical exercises through online classes were more likely to be exposed to insufficient levels of physical exercise during physical distancing. Likewise, study carried out in France showed that the covid-19 pandemic affected the number of individuals who attended programs of group physical activities, and that older adults expressed their need of remaining physically active by practising home exercises<sup>22</sup>.

Therefore, among barriers for the practice of physical exercises during physical distancing, environmental factors stand out, because places destined to the practice of exercises, either in open environments such as parks and squares, or indoor spaces, such as gym complexes, were prevented from operating by health authorities as a measure for containing SARS-CoV-2. Despite being widely recommended, physical activity through online classes and through videos, websites, and applications<sup>25</sup> are not accessible to the general population, especially those with low socioeconomic status<sup>29</sup>.

In this study, it was also observed that negative health self-perception, before and during physical distancing, was linked to the outcome, but as a protective factor. This shows that older adults who perceive their health as “regular,” “poor,” or “very poor” were less likely to be exposed to low levels of physical exercise during physical distancing. This result diverges from other studies, which suggested a relationship between practice of physical exercise and higher prevalence of positive health self-perception, or between less practice of physical activity and negative health self-perception<sup>30,31</sup>.

A possible explanation for this result is the socioeconomic profile of participants, with high education level and income. Studies have shown association between low education and income with negative health self-perception<sup>31-33</sup>. Moreover, low prevalence of negative health self-perception (17.8%)

was observed with only 2% of perceptions classified as “poor” and “very poor.”

The present study has some limitations that should be highlighted, among them the use of cross-sectional design, which does not allow inferring cause and effect relationships involving independent variables with the outcome; data collection through the internet may not reach lower-income individuals, since not everyone has access to this means of communication and/or has difficulties with technology, making data generalization for all older adults living in the Federal District impossible; and the difficulty in helping participants when they did not understand a given question. However, this limitation was minimized by the considerable increase in the sample size and care in sample selection and dimensioning

## CONCLUSION

It could be concluded that physical distancing resulted in significant changes in the lifestyle of the elderly population, especially with regard to exposure to low levels of physical exercises, which can result in deleterious health effects in the near future. Therefore, not interrupting or even starting a physical exercise program during the period of physical distancing and adopting other healthy behaviours is particularly important to maintain or improve the health of these individuals, as they are considered a risk group for many diseases, including Covid-19.

In this sense, measures are needed to guide the elderly population on strategies to maintain active habits during the period of physical distancing. Public policies aimed at promoting physical exercises for older adults in similar situations are suggested, such as online training, considering accessibility for low-socioeconomic individuals and/or with limitations in the use of technologies.

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