



## Impacts of the first wave of the COVID-19 pandemic on leisure and transportation physical activity among healthcare workers

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### ABSTRACT

**Introduction:** The COVID-19 pandemic may lead to reduced physical activity (PA) in health care workers (HCWs). **Objective:** To evaluate leisure and transport-related PA in HCW of a COVID-19-dedicated hospital during the first wave of the COVID-19 pandemic.

**Methods:** This is a cross-sectional study with a sample of 1,527 HCWs. Socioeconomic aspects, occupational characteristics, and engagement in leisure and transport-related PA were investigated through an online survey administered in August of 2020.

**Results:** More than 80 % HCWs performed < 150 min/week of leisure-related PA, and 85 % performed ≤ 30 min/day transport-related PA. Being male was associated with more PA (OR: 1.93; 95 % CI:1.40–2.66) and transport-related PA; working in nursing, physical therapy, and cleaning/housekeeping services was associated with low PA (OR: 0.70; 95 % CI:0.51–0.95). Physicians and administrative staff were less active in transport-related PA.

**Conclusions:** HCWs working in a COVID-19 hospital had low levels of PA in the domains of leisure and transportation.

### 1. Introduction

COVID-19-related distress might have adverse psychological and physical consequences for healthcare workers (HCWs) (Salazar et al., 2020). Facing the pandemic, HCWs on the front line of the assistance may be vulnerable to hazards including pathogen exposure, extensive

working hours, psychological distress, fatigue, and occupational burnout (World Health Organization, 2020a).

Physical Activity (PA) is an effective intervention to prevent or counteract stress-induced clinical outcomes, as it is associated with improvements in mental health and quality of life (World Health Organization, 2018). The World Health Organization (WHO) recommends

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150–300 minutes weekly of moderate-intensity or 75–150 minutes of vigorous-intensity PA (World Health Organization, 2020b) per week. PA has four domains: occupational, transportation, household, and leisure time (2018 Physical Activity Guidelines Advisory Committee, 2018).

Despite the benefits of PA, poor levels have been observed worldwide (Althoff et al., 2017). The prevalence of insufficient PA reaches up to 47% of the Brazilian population (Guthold et al., 2018). In addition, there is good evidence that the COVID-19 pandemic exacerbated physical inactivity (Pinto et al., 2020). Nearly 80% of adults reported that measures to contain the epidemic interrupted or decreased their practices of PA in Brazil (Martinez et al., 2020).

Corroborating with it, insufficient PA amongst HCWs has been reported, even before the pandemic (Miron et al., 2019; Molina Aragonés et al., 2017; Saridi et al., 2019). Although HCWs may play a critical role in promoting healthy lifestyles, they are not more likely to participate in health-promotion activities in comparison to other populations (Jonsdottir et al., 2011).

Maintaining regular leisure PA is usually difficult for HCWs due to work shifts, demanding occupational tasks and personal issues (Saridi et al., 2019). On top of that, the conditions surrounding the COVID-19 pandemic, such as heavy workloads, negative emotions, depletion of material resources, and feelings of being inadequately supported (Chen et al., 2020) may have made it even more challenging.

Because it is assumed that occupational PA was, at least, kept constant in their workplaces, we intended to address the impact of the epidemic on other PA domains of HCWs' daily lives. Leisure-time PA is more easily modified than other PA domains, and changes in this type of activity are more likely to affect health because it holds a significant proportion of moderate-to-vigorous intensity activities (2018 Physical Activity Guidelines Advisory Committee, 2018). Moreover, the COVID-19 pandemic led to disruptions in transportation behaviors with declines in active transportation as a result of real and perceived risks of COVID-19 (Berrigan et al., 2021). It is known that the use of public transportation is generally related to increased active transportation (Berrigan et al., 2021).

Thus, this study aimed to assess leisure-time and transport-related PA among HCWs in a COVID-19 hospital during the first wave of the pandemic.

## 2. Methods

This is a cross-sectional study conducted in 2020 at the Hospital das Clínicas from Faculdade de Medicina da Universidade de São Paulo (HCFMUSP), which is a public teaching and a tertiary care hospital in São Paulo, Brazil with 2,200-beds spread across seven buildings. In 2020, the hospital had a dedicated building for COVID-19. Testing for anti-SARS-CoV-2 IgG antibodies (Lisboa Bastos et al., 2020) was offered to all HCWs, including contractors in cleaning and security. HCWs were requested to answer an online questionnaire on SurveyMonkey platform that addressed gender, age, occupation, hospital workplace, and self-perceived PA related to leisure and transportation. The questionnaire was made available using a quick response code that was sent by email or WhatsApp, placed on posters throughout the hospital, and at the site of blood collection. Response was voluntary. All HCWs who provided a blood sample and responded to the survey were included. HCWs were considered infected with SARS-CoV-2 if they had a positive RT-PCR or a positive serology before the survey or if they reported it. This study was approved by the HC Ethics Committee for Research (number: 3070192020000068).

Leisure-time PA is defined as when one is not working, transporting to a different location, and not doing household chores. Activities such as playing sports or exercising, walking, and playing games are examples of leisure-time PA (2018 Physical Activity Guidelines Advisory Committee, 2018). Transportation PA is defined as getting from one place to another. Examples include walking or bicycling to and from work or transportation hubs (2018 Physical Activity Guidelines Advisory

Committee, 2018). Although it may share similar features with leisure-time PA, this list does not necessarily involve destinations, a distinguishing aspect of transportation (Berrigan et al., 2021).

HCWs were categorized according to potential exposure to SARS-CoV-2. **High risk:** nurses, nursing assistants, physiotherapists, cleaning/housekeeping staff (Group 2). **Intermediate:** pharmacists, nutritionists, laboratory, pathology, radiology technicians, and psychologists (Group 3). **Low:** security, administration, and others (Group 4). **Physicians** were considered separately because they did not provide continuous patient care (Group1).

Questions adapted from the International Physical Activity Questionnaire (IPAQ) (World Health Organization, 2005) assessed the domains of leisure and transportation, considering these could be severely disrupted because of shelter-in-place restrictions. At the time of data collection, many jurisdictions were closed or restricted, limiting access to common indoor and outdoor places for PA. For question 1) "How many days a week do you exercise?", respondents reported the number of days/week they exercised. For question 2) "On the days that you exercise, for how long do you exercise?" answers were given in minutes. Questions 1 and 2 combined revealed how many minutes per week HCWs spent in leisure-time PA. Participants who did not answer questions 1 and 2 combined, were excluded. Participants reported their transport-related PA by answering the question: "On a typical weekday, for how long do you walk or ride a bicycle?". Answers were given in minutes.

Descriptive statistics based on relative frequencies (presented in percentage) were considered to describe the data and to help in interpretations. For inferential analysis, weekly leisure time PA was considered as a binary response: <150 minutes vs. ≥150 minutes. Daily transport-related PA was divided into 3 categories: 0–10 minutes, 30 minutes, and 45–60 minutes. For leisure-time PA, associations between adherence to <150 minutes of PA and explanatory variables were assessed using multivariate logistic regression models, with statistical significance based on the Wald test (Lemeshow and Hosmer, 2004). Associations between transport-related PA and explanatory variables were assessed using multivariate ordinal logistic regression models (Lemeshow and Hosmer, 2004) based on cumulative logits. Odds ratios and confidence intervals were computed based on the fitted logistic models. The proportionality of the odds for each variable separately was first checked using the score test and graphical methods. Statistical modeling was performed using the R software (R Core Team, 2017).

## 3. Results

A total of 1,527 HCWs participated in the survey. Age ranged from 19 to 71 years. Respondents were predominantly female (75%), the most common occupation was "nursing assistant" (22%), and the most prevalent working place was intensive care unit (ICU) (29%). Most (49%) reported spending 10 minutes on active transportation, and (82%) less than 150 minutes of leisure-time PA. Most participants had not been infected with SARS-CoV-2 (91%) (Table 1). HCWs reporting different amounts of leisure-PA share comparable mean ages, with 88% of female workers not doing 150 minutes of PA for leisure (Table 1).

The fit based on the multivariate logistic model showed that men were almost twice as likely to do at least 150 min of PA for leisure compared to women (OR (95% CI) = 1.93 (1.40–2.66)) (Table 2). For occupational group 2 (nursing, physical therapy, and cleaning staff) the odds were 70 % for group 1 (OR (95 % CI) = 0.70 (0.51–0.95)).

Based on the fit of the multivariate ordinal logistic regression, we concluded that men were almost twice as likely to engage in transport-related PA for ≥ 30 minutes and ≥ 45 minutes than their female co-workers (OR (95% CI) = 1.95 (1.53–2.48)). Physicians had 65% of the odds of non-physicians engaging in at least 30 minutes and at least 45 minutes (OR (95% CI) = 0.65 (0.51–0.84) of active transportation. Also, for the workplace, those in administrative offices were less likely to engage in transport PA for 45 minutes or more (OR (95% CI) = 0.35

**Table 1**  
Distribution of baseline characteristics of 1,527 HCWs from Hospital das Clínicas included in the survey on physical activity in August 2020.

Characteristics			Workplace, n (%)	
Age in years (mean ± SD)	39.2 ± 11.4		ICU	431 (29)
<b>Gender, n (%)</b>			Medical unit	228 (15)
Female	1,147 (75)		Laboratory	174 (11)
Male	368 (24)		Emergency room	156 (10)
Data not available	12 (1)		Administrative office	89 (6)
			Other	434 (28)
			Data not available	15 (1)
<b>Occupation, n (%)</b>			<b>Does at least 150 min weekly of PA for leisure, n (%)</b>	
Assistant nurse	342 (22)		No	1,258 (82)
Physician	325 (21)		Yes	214 (15)
Nurse	217 (14)		Data not available	55 (3)
Physical therapist	120 (8)		<b>Transport-related PA, n (%)</b>	
Administrative staff	105 (7)		10 min	745 (49)
Lab. and radiology technician	50 (3)		30 min	585 (38)
Nutritionist	46 (3)		45 min	100 (7)
Pharmacist	30 (2)		60 min	82 (5)
Security	20 (1)		Data not available	15 (1)
Psychologist	8 (1)		<b>Infection by SARS-CoV-2, n (%)</b>	
Cleaning personnel	8 (1)		No	1390 (91)
Other	252 (17)		Yes	137 (9)
Data not available	4 (1)			

  

Characteristics	Does at least 150 min of PA for leisure ‡			Daily duration (in minutes) of transport-related PA #			
	n	Yes (n:214)	No (n:1258)	n	0–10 min (n:745)	30 min (n:585)	45–60 min (n:182)
<b>Gender, n (%)</b>	<b>1462</b>			<b>1500</b>			
Female	1114	134 (12)	980 (88)	1137	599 (53)	418 (37)	120 (11)
Male	348	79 (23)	269 (77)	363	142 (39)	160 (44)	61 (17)
<b>Occupation †, n (%)</b>	<b>1468</b>			<b>1510</b>			
Group 1	311	63 (20)	248 (80)	325	168 (52)	126 (39)	31 (9)
Group 2	667	74 (11)	593 (89)	681	361 (53)	234 (34)	86 (13)
Group 3	129	22 (17)	107 (83)	133	58 (44)	56 (42)	19 (14)
Group 4	361	55 (15)	306 (85)	371	157 (42)	168 (45)	46 (13)
<b>Workplace, n (%)</b>	<b>1457</b>			<b>1501</b>			
ICU	420	61 (15)	359 (85)	426	230 (54)	142 (33)	54 (13)
Medical unit	220	33 (15)	187 (85)	227	117 (52)	89 (39)	21 (9)
Laboratory	168	30 (18)	138 (82)	155	78 (50)	53 (34)	24 (16)
Emergency room	150	24 (16)	126 (84)	173	74 (43)	80 (46)	19 (11)
Administrative room	82	12 (15)	70 (85)	89	49 (55)	36 (41)	4 (4)
Other	417	52 (12)	365 (88)	431	192 (45)	181 (42)	58 (13)

Data are presented as numbers (%) unless otherwise specified. SD: standard deviation. Lab.: laboratory. ICU: Intensive care unit, PA: physical activity. Occupation groups†: 1: physicians; 2: nurses, assistant nurses, physical therapists, cleaning/housekeeping services, in units that provide direct patient assistance; 3: pharmacists, nutritionists, laboratory, pathology, and radiology technicians, and psychologists; 4: other (security, administration, and others).

‡ N = 1472; 55 (4 %) participants did not report complete answers on leisure-PA data.

# N = 1512; 15(1 %) participants did not report transport-related PA data.

(0.13–0.96)). The odds of administrative staff doing at least 45 minutes were 35% lower than that of an HCW providing direct patient assistance (OR (95% CI) = 0.35 (0.13–0.96)) (Table 2).

#### 4. Discussion

The majority of HCWs at a large COVID-19-dedicated hospital did < 150 minutes of PA weekly, and 85% did ≤ 30 minutes of transport-related PA daily. Doing 150 minutes or more of PA for leisure was associated with being male. HCWs providing direct assistance to patients care, except other than physicians, were likely to be less active during their leisure time. Nonetheless, physicians and administrative staff were less likely to do ≤ 45 minutes of transportation-related PA daily, whereas males were more likely to do it ≥ 30 minutes.

Overall, HCWs had poor PA, with the prevalence of physical inactivity higher than the national level, reported at 47% (Guthold et al., 2018). It raises concerns since Brazil leads the Latin America/Caribbean ranking for insufficient PA and has increasing levels of inactivity (Guthold et al., 2018).

Women make up most hospital staff. They are less physically active than men (Hallal et al., 2012). A study by Hoang and collaborators on the well-being of HCWs during the pandemic showed that female gender

was associated with poorer well-being (Hoang et al., 2021). Another study addressing impacts of the pandemic on gender inequality across six countries endorsed women are socially and economically in disadvantage (Dang and Nguyen, 2021). In Brazil, even though leisure-time PA increased from 2013 to 2019 at a national level, there were no improvements in gender inequalities, and women still showed the poorest prevalence for this type of activity (Wendt et al., 2021). Additionally, female HCWs are likely to have an increased burden during the pandemic, given their role in childcare, household costs, and housework (The Lancet, 2020), which directly affects the free time for leisure or transport-related activities. It is important to mention that the standard working shift in our hospital was 12 hours.

Physicians reported the lowest levels of transport-related PA and were likely to schedule time for leisure-time PA outside of working hours. The low adherence to walking or cycling among our HCWs may be related to poor infrastructure in the city’s urban areas (Cockerham et al., 2017) combined with restricted circulation due to the pandemic.

A limitation of our study is that not all aspects of the IPAQ were addressed because we assessed the domains most affected by the pandemic, such as leisure and transportation-related PA. Second, respondents may have misreported their PA. Finally, confounding factors were not accounted for. However, despite these limitations, our survey

**Table 2**  
Survey among HCWs at a COVID-19 dedicated building in the Hospital das Clínicas (August 2020).

Variables independently associated with performing at least 150 min of leisure-time PA weekly.		
Characteristics	OR (95 % CI)	p
<b>Gender</b>		
Male vs. female	1.93 (1.40–2.66)	<0.001 <sup>b</sup>
<b>Occupation</b> (group 2 vs. groups 1, 3 and 4)	0.70 (0.51–0.95)	0.02 <sup>b</sup>
Variables independently associated with engaging in transport-related PA for at least 30 min daily, and at least 45 min daily.		
Characteristics	OR (95 % CI)	OR (95 % CI)
	30 min or less	At least 45 min
<b>Gender</b>		
Male vs. female	1.95 (1.53–2.48)	
<b>Occupation</b>		
Non-physicians vs. Physicians	0.65 (0.51–0.84)	
<b>Workplace</b>		
Medical unit, laboratory, emergency room, and ICU vs. administrative office.	0.86 (0.55–1.34)	0.35 (0.13–0.96)
Medical unit, laboratory, emergency room, and ICU vs. other places.	1.25 (1.00–1.58)	1.08 (0.77–1.52)

ICU: Intensive care unit, PA: physical activity, OR: odds ratio, CI: confidence interval. Occupation groups: 1 = physicians; 2 = nurses, assistant nurses, physical therapists, cleaning/housekeeping services; in units that provide direct patient assistance; 3 = pharmacists, nutritionists, laboratory, pathology and radiology technicians, and psychologists; 4 = other (security, administration, and others). b Wald test was used to determine p values. Total values for valid data.

still revealed important characteristics and indicated which occupational categories tend to be more active.

Overall, HCWs working in a COVID-19 hospital reported low levels of PA in the domains of leisure and transportation. To our knowledge, this is the first study of PA in HCWs on the frontline of the pandemic. Our study calls for interventions to promote active behaviors among HCWs in hospitals during and after the pandemic, with particular attention to women, administrative staff, and nursing staff.

#### CRedit authorship contribution statement

**Aline Rachel Bezerra Gurgel:** Questionnaire data, Writing – original draft preparation, Final writing, reviewing, and editing. **Jean Augusto Coelho Guimarães:** Visualization, Writing – original draft. **Patricia Chakur Brum:** Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Antonio Carlos Pedroso de Lima:** Data curation, Formal analysis, Investigation, Methodology, Software, Writing – original draft, Writing – review & editing. **Pedro Giavina-Bianchi:** Formal analysis. **Carlos Henrique Mesquita Peres:** Resources. **Maria Cristina Peres Braido Francisco:** Resources. **Lanuse Garcia Neves dos Santos:** Resources. **Rita de Cassia Cezar Santos:** Resources. **Roseli Eliana Besegio Santos:** Resources. **Aline Corá:** Resources. **Alberto José da Silva Duarte:** Resources. **Carolina dos Santos Lazari:** Resources. **Antonio Jose Pereira:** Funding acquisition, Resources. **Ester Cerdeira Sabino:** Conceptualization. **Felipe Corchs:** Writing – original draft, Conceptualization. **Aluísio Cotrim Segurado:** Writing – original draft. **Silvia Figueiredo Costa:** Formal analysis, Methodology, Writing – original draft. **Anna S. Levin:** Methodology, Supervision, Writing – original draft, Writing – review & editing.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Data availability

Data will be made available on request.

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