



## Original Article

## Physical activity and emotions in a period of social distancing due to the COVID-19 pandemic

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## ABSTRACT

Social distancing (SD) to prevent SARS-CoV-2 (COVID-19) transmission reduced practices of physical activities (PA) and changed emotional conditions, but the relationship between PA and the emotions has to be further studied. This study aimed to analyze PA and the intensity of basic emotions during a period of social distancing in the State of São Paulo, Brazil. Data collection was performed using the snowball system and an online survey with questions about the minimum weekly frequency of 30-min moderate and/or vigorous activities (MVPA), intensity of basic emotions, and sociodemographic profile. A total of 704 volunteers participated; mean age  $38.1 \pm 13.4$  years, 67.9% female, 82.0% insufficiently practiced MVPA, and 37.9% of the group reported no weekly PA. Anxiety/fear was the emotion with the highest intensity in the study period. A significant association was observed between PA and intensity of happiness ( $\rho = 0.125$ ;  $p < 0.01$ ) and a negative association between PA practice and intensity of anxiety/fear ( $\rho = -0.090$ ;  $p < 0.05$ ), sadness ( $\rho = -0.134$ ;  $p < 0.01$ ), and anger ( $\rho = -0.109$ ;  $p < 0.01$ ). Also, an association was observed between anxiety/fear and social isolation ( $\rho = 0.082$ ;  $p < 0.05$ ). These results suggest that public policies offering PA programs and psychological care are required to improve the quality of life of the population.

## Introduction

Due to the rapid transmission and high infection rate of the novel coronavirus 2 (SARS-CoV-2), the COVID-19 has been declared a pandemic in March 2020.<sup>1</sup> Measures to fight the disease, such as non-pharmacological interventions (NFI), which include social distancing<sup>2</sup> have been adopted. Social distancing (SD) limits community interactions by closing non-essential businesses and increasing individual protection measures such as wearing face masks.<sup>3</sup>

Although these measures are important to mitigate the virus transmission, they cause negative effects on society.<sup>4</sup> The combination of social isolation and other pandemic-related factors has negatively impacted the psychological dimensions of individuals,<sup>5</sup> leading to an increase in cases of anxiety, obsessive behaviors, fear, sadness and anger.<sup>6–8</sup> Tendency towards physical inactivity and sedentary behavior has been associated with poor psychological standing in the literature, which can

only be expected to be compounded by social isolation,<sup>9,10</sup> but it remains to be clarified.

Adults should do at least 150 min of moderate-intensity physical activity or at least 75 min of vigorous-intensity aerobic physical activity every week, or an equivalent combination of moderate with vigorous physical activity (MVPA).<sup>11</sup> A significant reduction of MVPA and walking has been observed, and this finding has been associated with poor outcomes in psychological aspects, such as reduced well-being and general quality of life,<sup>12</sup> which can affect the physical fitness conditions of individuals<sup>13</sup> and increase the risk of cardiovascular diseases.<sup>14</sup>

In addition, during the pandemic period, those infected by the virus may present an increase in cardiovascular, neurological, and muscular comorbidities, which can be aggravated by a sedentary lifestyle.<sup>15</sup>

On the other hand, Physical Activity (PA) has significant benefits in several fields, with physically active individuals presenting lower levels of stress and better sleep quality during the pandemic.<sup>16</sup> PA can be an ally for the improvement and maintenance of the functions of the innate

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### Abbreviations

SD	social distancing
PA	physical activities
MVPA	moderate and/or vigorous activities
NFI	non-pharmacological interventions
GDRP	General Data Protection Regulation
MW	minimum wages
IFE	incomplete fundamental education
CFE	completed fundamental education
IHS	incomplete high school
CHS	completed high school
IHE	incomplete higher education
CHE	completed higher education
SARS-CoV-2 (COVID-19)	novel coronavirus 2

immune system and may help protect individuals against viral infections.<sup>17</sup> PA can treat and prevent symptoms of depression and anxiety,<sup>18</sup> but little is known about the relationship between the MVPA and intensity of basic emotions, especially in times of SD.

Considering the above, this study aimed to assess the intensity of basic emotions and the frequency of MVPA during a period of social distancing, which was part of the public health measures to stop COVID-19 transmission.

## Materials and methods

### Study design and population

This is a field cross-sectional study that used non-probability sampling. It was conducted using an electronic web-based questionnaire named “Survey – Well-being during the COVID-19 pandemic”<sup>18</sup> available on the Survio® platform, which contains the ISO 27001:2013 Certification, OV SSL Certification and follows the Privacy Shield Framework and General Data Protection Regulation (GDRP) rules, in order to guarantee the security of the data processed. The interviewees' answers were blinded to the investigators. This platform has been used in remote studies related to COVID-19.<sup>20,21</sup>

### Data collection

Individuals included in the survey were recruited through social media platforms such as *Facebook*, *WhatsApp*, *Twitter*, and *Instagram*, using the snowball system.<sup>22</sup> The study researchers started the sampling process by disseminating the survey on their own social media pages<sup>23</sup> to their contacts over 18 years old, of different educational levels and occupations. An online survey study was conducted from June 27, 2020, to July 4, 2020; in a period of social distancing covering different phases in the State of São Paulo.

Volunteers who signed an informed consent form, aged 18 years and older, and who filled out the questionnaire were included in this study. The survey questions used in this study addressed MVPA practice, basic emotions experienced, SD level, and the sociodemographic profile of respondents.

In this way, weekly PA in the number of days (at least 30 min a day) was evaluated using the question: “Considering the last week, how many days did you do moderate/vigorous physical activity for 30 min a day?”. Respondents who answered at least five days a week ( $5 \times 30$  min day = 150 min per week) were considered sufficiently active.

The question addressing the respondent's emotions was: “Using a scale from 1 (very little) to 5 (very much), write the number that represents how deeply you have felt each of the feelings in the last 15 days.” This scale model was suggested by Likert<sup>24</sup> and has been widely used in

studies analyzing psychological aspects.<sup>25</sup> The basic emotions assessed in this study were: happiness, surprise, anxiety/fear, sadness, anger, and disgust.

SD was assessed as follows: “During the social isolation period, you: a) Were or are now in partial social isolation (goes out to buy food and medication); b) Were or are now in total isolation (does not leave home nor receives visitors); c) Were not or are not now in isolation”.

Informed consent was obtained from each participant, and this study was reviewed and approved by the Research Ethics Committee of a Methodist University of Piracicaba - UNIMEP, with received approval number 3.996.685, in accordance with Helsinki Declaration, which has provisions for the ethical aspects of the research with human beings.

### Statistical analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences – SPSS (IBM, Chicago, IL, USA). A descriptive analysis of data distribution was performed, with the calculation of the mean, the standard deviation for numerical data, and relative and absolute frequencies for categorical data. Bivariate statistics with Spearman's correlation test ( $\rho$ ) was used. The significance level was 5%.

## Results

Data from 704 participants were assessed in this study. The mean age was  $38.1 \pm 13.4$  years, 478 (67.9%) were female, 466 (66.2%) had completed higher education (CHE), 206 (29.3%) received a salary between 2 and 3 minimum wages (MW), and 352 (50.0%) were formal sector employees.

Most respondents, i.e. 557 (79.1%), remained in partial SD (went out to buy food and medication). Regarding the intensity of MVPA, 82.0% of individuals were considered insufficiently active, and of these, 267 (37.9%) reported not performing physical activity at all. [Table 1](#) shows the full data of participants.

The most frequent emotion felt with the greatest intensity was anxiety/fear (17.6%) and the least intense was anger (33.7%). [Table 2](#) shows data about emotions reported by respondents.

A significant association was found between the frequency of MVPA and happiness ( $\rho = 0.125$ ;  $p < 0.01$ ); anxiety/fear ( $\rho = -0.090$ ;  $p < 0.05$ ), sadness ( $\rho = -0.134$ ;  $p < 0.01$ ), and anger ( $\rho = -0.109$ ;  $p < 0.01$ ). Data also indicated a significant association between anxiety/fear and social isolation ( $\rho = 0.082$ ;  $p < 0.05$ ).

## Discussion

This study aimed to investigate the practice of MVPA and the intensity of basic emotions expressed during a period of SD, and possible associations between them.

A higher frequency of MVPA was related to a higher intensity of happiness and a lower frequency of MVPA was associated with higher intensity of anxiety/fear, sadness or anger. Although no study has associated MVPA with intensity of emotions the practice of vigorous PA contributed to mitigating undesirable emotions during SD related to the COVID-19 pandemic.<sup>26</sup> Also, reduced frequency of PA, which occurred due to SD, was associated with reduced psychological and emotional well-being.<sup>5</sup> Prior studies that assessed the impact of the pandemic on mental health indicated frequent anxiety as one of the greatest factors of the psychological impact.<sup>27,28</sup>

In our study, the weekly frequency of MVPA for at least 30 min a day was observed, requiring at least five days to achieve the amount of 150 min, as recommended by the WHO<sup>11</sup>; therefore, 82% of the individuals were classified as insufficiently active. Considering that 37.9% of respondents, i.e. one out of six participants, did not perform MVPA at all, a high risk for a sedentary lifestyle and associated diseases was observed.<sup>29</sup>

These data are alarming, as such physical inactivity may contribute to the increased chronic disease rates or aggravate existing cases and further

**Table 1**  
Absolute and relative distribution of the characteristics of participants (n = 704).

Characteristic	n	%
<b>Age</b>		
18–39	397	56.4
40–59	265	37.6
≥60	42	6.0
<b>Sex</b>		
Female	478	67.9
Male	226	32.1
<b>Education</b>		
IFE	6	0.9
CFE	14	2.0
IHS	15	2.1
CHS	85	12.1
IHE	118	16.8
CHE	466	66.2
<b>Income</b>		
Up to 1 MW	72	10.2
2–3 MW	206	29.3
3–4 MW	133	18.9
4–6 MW	140	19.9
≥ 6 MW	153	21.7
<b>Occupation</b>		
Unemployed	95	13.5
Informal work	167	23.7
Homemaker	40	5.7
Formal sector employee	352	50.0
Retired	50	7.1
<b>Social distancing</b>		
No social distancing	108	15.3
Partial social distancing	557	79.1
Full social distancing	39	5.5
<b>Weekly frequency of MVPA (30 min/day)</b>		
0	267	37.9
1	67	9.5
2	99	14.1
3	92	13.1
4	52	7.4
5	64	9.1
6	22	3.1
7	41	5.8

Abbreviations: n = absolute frequency; % = relative frequency; IFE=Incomplete fundamental education; CFE=Completed fundamental education; IHS=Incomplete high school; CHS=Completed high school; IHE=Incomplete higher education; CHE=Completed higher education; MW = minimum wage; MVPA = Moderate/vigorous physical activity.

complicate the condition of patients with COVID-19.<sup>30</sup> It requires a reformulation of SD measures and that MVPA possibilities are offered to the population, even in social isolation.<sup>31</sup>

Physical activity can contribute to the maintenance of innate immunity and help mitigate some negative impacts on health caused by SD, such as those related to mental health.<sup>17,32</sup> However, SD makes this practice difficult and increases the risk of a sedentary lifestyle.<sup>9,10</sup>

Despite evidence of the importance of SD measures as a strategy to mitigate the harmful effects of COVID-19,<sup>2</sup> SD also caused a negative impact on the mental health of the population. In our study, a significant positive association was found between the intensity of anxiety/fear and social isolation. In a study conducted by Shi *et al.*<sup>33</sup> those individuals in

**Table 2**  
Distribution of intensity for each emotion reported by the 704 participants.

Emotion	1		2		3		4		5	
	n	%	n	%	n	%	n	%	n	%
<b>Happiness</b>	61	8.7	89	12.6	267	37.9	182	25.9	105	14.9
<b>Surprise</b>	155	22.0	180	25.6	207	29.4	108	15.3	54	7.7
<b>Anxiety/fear</b>	156	22.2	123	17.5	142	20.2	159	22.6	124	17.6
<b>Sadness</b>	149	21.2	143	20.3	174	24.7	150	21.3	88	12.5
<b>Anger</b>	237	33.7	129	18.3	130	18.5	112	15.9	96	13.6

Abbreviations: n = absolute frequency; % = relative frequency.

quarantine at home or who did not return to their work routine presented the highest prevalence of stress, insomnia, and anxiety symptoms.

A relevant aspect of the prevalence of stress, insomnia, and anxiety symptoms during the COVID-19 pandemic is the correlation between the incidence rate and the mortality rate of COVID-19, i.e., it means that a progressive increase in the number of new cases of infection is followed by an increase in the number of deaths, which can expose the population to fear of infection, hospitalization and death.<sup>34</sup>

Higher levels of anxiety are related to a general concern about COVID-19 and, in younger women, higher chances of catching the disease,<sup>35</sup> poor job security, and a high risk of poverty and being unable to fulfill their basic living needs.<sup>7</sup>

The feeling of anxiety/fear has increased with the COVID-19 pandemic due to the consequences of the new daily routine and the concern about getting infected.<sup>6,8,28,29,36,37</sup>

Bezerra *et al.*<sup>16</sup> observed that most individuals consider social distancing as an important factor to reduce the number of COVID-19 victims, but social interactions, the financial life, and mental health have been largely impacted.<sup>16</sup>

In our study, more than half of the participants reported partial SD – when an individual leaves home only to buy essential items. This finding is consistent with a previous study conducted with the Brazilian population, in which most individuals reported partial SD, leaving home only for essential supplies.<sup>16</sup>

Considering the above, a collective effort involving the academic community, the organized civil society, and the government is suggested to provide studies that may increase the awareness about this subject and promote practical actions. Such actions would include democratized access to regular PA and psychological treatment for individuals who need it in view of the chaotic moment of the pandemic.

Other studies had already called for changes in public policies during pandemic situations so that it will not lead to an increase in sedentary life style, our study added a methodology to evaluated the intensity of emotions that may help to get more data about the relationship between intensity emotional state and PA.

This way, the general population could benefit from these actions and the government may have a reduction in health spending related to physical inactivity, allowing the system to use these resources in other health areas, such as research. The development of public policies that offer programs to improve the quality of life of the population during the pandemic is desirable.

## Conclusions

Low frequency of MVPA, intense fear/anxiety and a significant association between MVPA and the intensity of basic emotions were found in the study population. One out of six individuals did not practice PA at all, increasing the risk of a sedentary lifestyle and aggravating emotional problems.

Limitations for this present study include the method of data collection by the snowball system, which does not guarantee a balanced extraction of the population. However, given the very nature of SD during the COVID-19 pandemic this was a viable option for research. However, for the pandemic period, it was a viable option for research.

Another limitation of the study refers to the lack of differentiation between moderate and vigorous intensity exercises for data analysis. Such differentiation was not included to facilitate self-reported data from study participants, who may not be able to discern true differences in intensity.

The moment of social distancing chosen for the evaluation of emotion and MVPA, in general, was important to observe due to the lack of studies in this field during pandemic situations. Then, the data found have the potential to indicate the need for new studies so that public policies related to the area of PA and SD may be carried out.

### Ethical approval statement

Informed consent was obtained from each participant, and the study was reviewed by the author's institution and received approval to implement the study and include any institutional approval numbers given by the institution review committee.

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### Authors' contributions

Raphaella E. Corrêa participated in the design of the study; contributed to data collection and data reduction/analysis; contributed to data analysis and interpretation of results. Paulo Eduardo N.F. Velho contributed to data reduction/analysis; contributed to data analysis and interpretation of results. Rafael P. Calazans participated in the design of the study; contributed to data collection. Calvino Camargo contributed to data reduction/analysis; contributed to data analysis and interpretation of results. Rute E. Tolocka participated in the design of the study; contributed to data collection and data reduction/analysis; contributed to data analysis and interpretation of results and reviewed this article. All authors read and approved the final version of the manuscript.

### Submission statement

All authors have read and agree with manuscript content. The manuscript has not been published and is not under consideration for publication elsewhere.

### Conflict of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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