Physical activity restriction in the pandemic is associated with lower pain self-efficacy in the population with musculoskeletal pain: cross-sectional study

Restrição à atividade física na pandemia está associada com menor autoeficácia para dor na população com dor musculoesquelética: um estudo transversal

La restricción de la actividad física en la pandemia se asocia con menor autoeficacia para el dolor en la población con dolor musculoesquelético: un estudio transversal

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ABSTRACT | During the COVID-19 pandemic, a lower level of physical activity was observed in the population, which may influence the level of pain self-efficacy in the population with musculoskeletal pain. In this context, this study sought to analyze whether there is an association between the time of physical activity practice and the level of pain self-efficacy in the population with pain during the COVID-19 pandemic in the state of São Paulo, controlled by biopsychosocial variables. This study was conducted via an online form with questions about sociodemographic aspects, weekly physical activity practice, stress and anxiety levels, pain intensity and pain self-efficacy (Pain Self-Efficacy Questionnaire – PSEQ-10). The analysis was determined by two models of multiple linear regression, with (Model A) and without (Model B) the control of data by psycho-emotional factors (anxiety and stress) in 150 subjects. An association was found between weekly physical activity practice time and pain self-efficacy level, Model A (p=0.0271, β=1.914) and Model B (p=0.0333, β=1.826). Pain intensity during the pandemic, body mass index (BMI) and sex, among the control variables, also were associated with the pain self-efficacy level. A higher time of physical activity practice was associated with a higher pain self-efficacy level in the population with musculoskeletal pain during the COVID-19 pandemic. Pain intensity during the pandemic, BMI and sex also were associated with pain self-efficacy level.

RESUMO | Durante a pandemia de COVID-19, observou-se um menor nível de prática de atividade física pela população, o que pode influenciar o nível de autoeficácia para dor na população com dor musculoesquelética. Neste contexto, o objetivo deste estudo foi analisar se existe associação entre o tempo de prática de atividade física e o nível de autoeficácia para dor na população com dor musculoesquelética durante a pandemia de COVID-19 no estado de São Paulo, controlada por variáveis biopsicossociais. Realizou-se um estudo através de um formulário online com questões sobre aspectos sociodemográficos, tempo semanal de prática de atividade física, níveis de estresse e ansiedade, intensidade de dor e autoeficácia para dor (PSEQ-10 – *Pain Self-Efficacy Questionnaire*). A análise estatística ocorreu por meio de dois modelos de regressão linear múltipla, com (modelo A) e sem (modelo B) o controle dos dados por fatores psicoemocionais (ansiedade e estresse) em 150 pessoas. Foi encontrada associação entre o tempo de prática de atividade física semanal e o nível de autoeficácia para dor no modelo A (p=0,0271, β=1,914) e no modelo B (p=0,0333, β=1,826). Intensidade de dor durante a pandemia, índice de massa corporal (IMC) e sexo, dentre as variáveis de controle, também foram associadas ao nível de autoeficácia

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para dor. Maior tempo de prática de atividade física foi associado a maior nível de autoeficácia para dor na população com dor musculoesquelética durante a pandemia de COVID-19. Intensidade de dor durante a pandemia, IMC e sexo também foram associados ao nível de autoeficácia para dor.

Descritores | Autoeficácia; Dor; Exercício Físico; COVID-19.

RESUMEN | Durante la pandemia del COVID-19 se observó un menor nivel de actividad física en la población, lo que puede influir en el nivel de autoeficacia para el dolor en la población con dolor musculoesquelético. En ese contexto, el objetivo de este estudio fue analizar si existe asociación entre el tiempo de práctica de actividad física y el nivel de autoeficacia para el dolor en la población con dolor musculoesquelético durante la pandemia del COVID-19 en el estado de São Paulo, controlado por variables biopsicosociales. Se realizó un estudio mediante un formulario por Internet con preguntas sobre los aspectos sociodemográficos, el tiempo semanal de actividad física, los niveles de estrés y ansiedad, la intensidad del dolor y la autoeficacia del dolor (PSEQ-10 – *Pain Self-Efficacy Questionnaire*). El análisis estadístico se realizó utilizando dos modelos de regresión lineal múltiple, con (modelo A) y sin (modelo B) control de datos para factores psicoemocionales (ansiedad y estrés) en 150 personas. Se encontró asociación entre el tiempo de práctica de actividad física semanal y el nivel de autoeficacia para el dolor en el modelo A (p=0,0271, β=1,914) y en el modelo B (p=0,0333, β=1,826). La intensidad del dolor durante la pandemia, el índice de masa corporal (IMC) y el sexo, entre las variables de control, también se asociaron con el nivel de autoeficacia para el dolor. La práctica de actividad física durante más tiempo se asoció con un mayor nivel de autoeficacia para el dolor en la población con dolor musculoesquelético durante la pandemia del COVID-19. La intensidad del dolor durante la pandemia, el IMC y el género también se asociaron con el nivel de autoeficacia para el dolor.

Palabras clave | Autoeficacia; Dolor; Ejercicio Físico; COVID-19.

INTRODUCTION

Self-efficacy is a term that defines one's belief in its own ability to successfully perform a certain activity, considering the circumstances and the level of difficulty[1]. Thus, it is regarded a relevant psychological variable in the study of musculoskeletal pain[2], positively affecting the emotional well-being and the physical health of the population with this condition[3]. Pain self-efficacy is strongly linked to pain perception[4], especially regarding the way of dealing with it[2]. Such variable has shown to have a positive influence on postural stability and range of motion in individuals with low back pain[4], in addition to reducing disability in individuals with chronic pain[3] and improving function and quality of life[2]. As well as influencing pain perception, pain self-efficacy also interferes in the adherence to physical activity[5], since patients with higher levels tend to expose themselves more and perform more tasks[4,6].

The practice of physical activity is indicated by the International Association for the Study of Pain (Iasp) as a rehabilitation component that must be used in pain management[7] because it acts to reduce its severity and improve physical function in individuals with chronic musculoskeletal pain[8]. Additionally, physical activity and exercises (strengthening, stretching, endurance, and/or multimodal exercises) are recommended, with a high level of evidence, for the treatment of several musculoskeletal conditions, such as chronic low back pain[9] and shoulder impingement syndrome[10].

Physical activity is characterized as any occupational, sporting, conditioning, household, or other activity. Exercise is a subset of physical activity that is planned, structured, and repetitive, and has the objective of improving or maintaining physical fitness[11]. The World Health Organization (WHO) recommends that adult individuals should engage in at least 150 to 300 minutes of moderate activity or 75 to 150 minutes of vigorous activity per week[12]. The WHO also recommends including strengthening activities, such as weight training and exercises with external overload, on at least two days a week[12]. However, according to the 2019 Vigitel report[13], only a small portion of Brazilian society follows these recommendations, so that only 34.6% practiced more than 150 minutes of moderate activity per week, with the majority being male. Additionally, during the COVID-19 pandemic, a reduction in weekly physical activity[14] occurred, particularly among the population with musculoskeletal pain[15].

COVID-19 had several impacts in Brazil and in the world. The number of cases in Brazil increased during the pandemic period, with more than 21 million cases and 612,000 deaths from March 2020 to November 2021[16]. In the state of São Paulo, specifically, we observed more than 4 million cases and 153 thousand deaths[16]. During social distancing, people had their routines completely

changed, which brought about several changes in the life of the population, reflecting on the level of stress, on the quality of sleep[14], and on the practice of physical activity[15]. The reduction in the level of physical activity is a problem, since inactivity is a risk factor for chronic diseases, including pain[17]. Moreover, the reduction of this practice is also related to an increase in psycho-emotional symptoms, such as anxiety and depression[18]. The maintenance of physical activity is among the strategies to maintain a high level of self-efficacy for musculoskeletal pain[19].

Thefore, a better understanding of the impact of the time of weekly physical activity practice as a strategy to increase self-efficacy for musculoskeletal pain management during the COVID-19 pandemic must be effectively studied, since it can be an alternative to control the pain intensity in this population. Thus, the main objective of this study is to analyze if there is an association between the time of weekly physical activity practice and the level of pain self-efficacy in the population with musculoskeletal pain during the COVID-19 pandemic in the state of São Paulo. As a secondary objective, we sought to identify which of the other biopsychosocial control variables are associated with higher pain self-efficacy.

METHODOLOGY

Study design

This study is characterized as a cross-sectional study with a non-experimental quantitative approach. The guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE checklist) were considered for reporting the stages of this study.

Ethical aspects and sample characterization

Data collection was conducted using an electronic form with objective questions. Through the recommendation of at least 15 participants for each variable in analyses of this model, the sample size was set at a minimum of 120 individuals[20]. Those over 18 years, of all genders, residents in the state of São Paulo, and with a report of pain during social distancing were included. Repeated answers and those who disagreed with the informed consent form presented at the beginning of the questionnaire were excluded. This is a secondary data analysis, contemplating the respondents of the electronic form in the state of São Paulo.

Data collection

The recruitment of participants was done through social networks and electronic newspaper by publicizing the link to the questionnaire, along with a summary on the objectives of the study. The period of publication, follow-up, and data collection occurred from December 2020 to May 2021. The electronic form was composed of three stages: the first presented the informed consent form, the second contained a sociodemographic questionnaire, and the third was the questionnaire for assessing pain self-efficacy.

Sociodemographic questionnaire

The second stage of the form was composed of questions to characterize the sample regarding age (18 to 35 years; 36 to 65 years; over 65 years), body mass (kg), height (m), presence or absence of comorbidities (yes and no), use of medications, among others. The questionnaire also contained questions about the quality of sleep, compliance with social distancing (no; partially; totally), location of pain, levels of stress and anxiety (rated on a scale of 0 to 10 points, being 0=no anxiety/no perception of stress and 10=extremely stressed/anxious), practice of physical activity before and during the pandemic (with five options: did not practice physical activity; less than 30 minutes per week; 30 to 75 minutes per week; 75 to 150 minutes per week; more than 150 minutes per week), and level of pain self-efficacy before and during the social distancing caused by the COVID-19 pandemic. Pain was self-reported using a 0 to 10 point numeric pain scale (0=no pain; 10=worst pain imaginable). Subsequently, respondents were categorized into strata of mild (1-3), moderate (4-6), and severe (7-10) pain[21]. Body mass index (BMI) was calculated from weight and height responses (BMI=weight/height^2 – kg/m^2).

Pain self-efficacy

Quantification of pain self-efficacy was obtained by the Pain Self-Efficacy Questionnaire (PSEQ)[22], which contains 10 items regarding the performance of daily tasks assessed on a scale of 0 to 6, being 0=not at all confident and 6=totally confident. The total score ranges

from 0 to 60, with higher scores reflecting stronger pain self-efficacy beliefs. The questionnaire was translated and validated into Brazilian Portuguese and presents good psychometric properties for the analysis of this sample[23]. It also presents a good internal correlation coefficient (Cronbach's α=0.90), a split-half correlation coefficient=0.76, and had its concurrent and discriminant validity confirmed[23].

Statistical analysis

Data were organized in Microsoft Excel program and further processed by GraphPad Prism program, version 9.0. For the sample characterization, data were described in absolute and percentage frequency, when categorical. Numerical data were shown as mean and standard deviation. To identify the association between pain self-efficacy (dependent variable) and the different variables (time of physical activity, level of stress and anxiety, pain, BMI, presence of comorbidities, and gender) in the population with pain, a multiple linear regression was performed (model A).

The selection of variables for this model was conducted according to a directed acyclic graph (DAG)[24] built based on the following variables: time of weekly physical activity, gender, BMI, presence of comorbidities, pain intensity during the pandemic, stress level and anxiety level (Figure 1). A second multiple linear regression was conducted on the same model, but without the stress level and anxiety variables (model B). A comparison between the two models was also conducted to identify a model to be prioritized with the extra sum-of-squares F test. A significance level of 5% was determined for the proposed analyses.
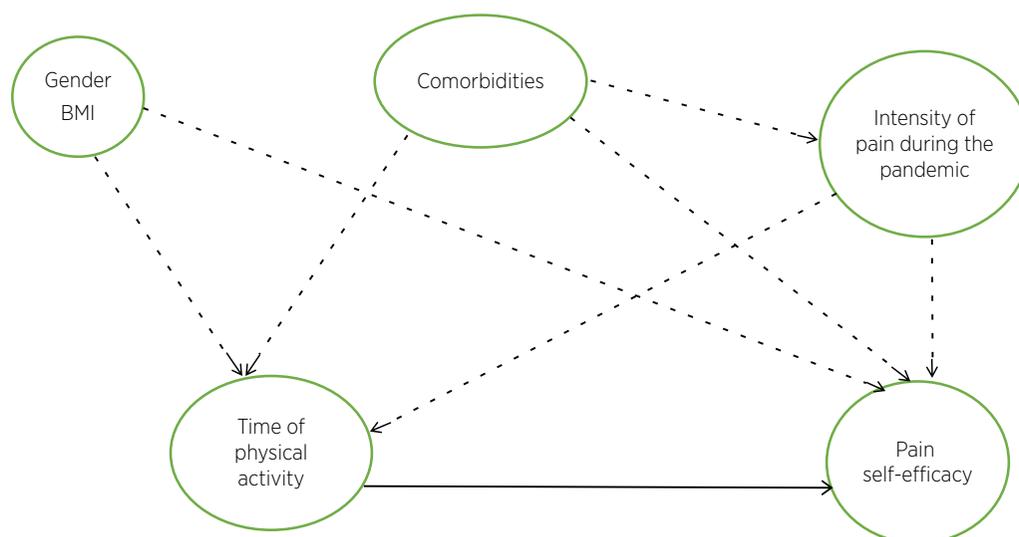

Figure 1. Directed acyclic graph to verify the association between weekly physical activity time and pain self-efficacy during the COVID-19 pandemic in the state of São Paulo, Brazil, 2021

BMI: body mass index.

The possible associations between the explored variables are dashed. The continuous line represents the main analyzed association.

RESULTS

A total of 150 individuals participated in this study, of which 73.3% were female, 48% were between 18 and 35 years old, 49.3% were between 36 and 65 years old, and 2.6% were older than 65 years. Regarding the practice of physical activity, 77.3% of them were physically active before the pandemic and 65.3% practiced physical activity during the pandemic. Before the pandemic, most of the population who reported pain had moderate intensity (48.9%). However, during the social distancing, most of the population that reported pain (58%) was in the severe pain stratum. Still regarding pain, 77 individuals (51.3%) reported pain for more than six months. Most of the sample (113 individuals) partially adhered to social distancing, going to essential services such as supermarkets, pharmacies, and work. The weekly time of physical activity varied among the participants as less than 30 minutes (10%), 30 to 75 minutes (22.6%), 75 to 150 minutes (20.6%), and more than 150 minutes (22%) (Table 1). The mean pain self-efficacy was 39.6 and standard deviation 17.0.

Table 1. Characterization of the sample and lifestyle habits of the population with pain in the state of São Paulo during the COVID-19 pandemic (N=150), Brazil, 2021

	No. of participants (%)
Gender	
Male	40 (26.7)
Female	110 (73.3)
Age	
18 to 35 years	72 (48)
36 to 65 years	74 (49.3)
Over 65 years	4 (2.6)
Schooling level	
Incomplete high school	1 (0.6)
Complete high school	31 (20.6)
Incomplete higher education	23 (15.3)
Complete higher education	41 (27.3)
Graduate studies	54 (36)
Alcohol consumption	
Does not consume alcoholic beverages	51 (34)
Less than once a week	53 (35.3)
Once or twice a week	35 (23.3)
Three or more times a week	11 (7.3)
Smoking	
Non-smoker	132 (88)
Less than twice a week	6 (4)
Daily	12 (8)
Have you adhered to social distancing in your state?	
No	16 (10.6)
Partially	113 (75.3)
Totally	21 (14)
Did you practice physical activity before the pandemic?	
Yes	116 (77.3)
No	34 (22.6)
How long have you been practicing physical activity before the pandemic?	
3 to 6 months	29 (19.3)
6 to 12 months	15 (10)
1 to 2 years	17 (11.3)
Over 2 years	51 (34)
Did you feel pain before social distancing?	
Yes	94 (62.6)
No	56 (37.4)

(continues)

Table 1. Continuation

	No. of participants (%)
Which grade do you attribute to this pain, on average, before the pandemic?	
Mild pain (1 to 3)	14 (9.3)
Moderate pain (4 to 6)	46 (30.6)
Severe pain (7 to 10)	34 (22.6)
How long had you been in pain before the pandemic?	
Less than 3 months	5 (3.3)
3 to 6 months	12 (8)
More than 6 months	77 (51.3)
Have you practiced physical activity since the beginning of social distancing?	
Yes	98 (65.3)
No	52 (34.6)
How much exercise time per week have you done, from the beginning of social distancing to today?	
Less than 30 minutes	15 (10)
30 to 75 minutes	34 (22.6)
75 to 150 minutes	31 (20.6)
More than 150 minutes	33 (22)
Which grade do you attribute to this pain, on average, during the pandemic?	
Mild pain (1 to 3)	10 (6.6)
Moderate pain (4 to 6)	53 (35.3)
Severe pain (7 to 10)	87 (58)

Table 2 shows the results of the two multiple linear regression models. However, even though models A and B were similar to each other (p=0.5732), each model was described separately. In model A, an association was found between the level of pain self-efficacy and the amount of time exercising per week during the pandemic (β=1.914; 95% CI 0.2197–3.609; p=0.0271). Additionally, the pain during pandemic (β=−1.912; 95% CI –3.215−−0.6103; p=0.0043), BMI (β=0.4692; 95% CI 0.2857–0.6527; p<0.0001) and gender of respondents (β=−5.828; 95% CI –10.71−−0.9476; p=0.0196) also showed association in this model. The analysis revealed that the level of stress, anxiety, and presence of comorbidities failed to associate with the level of pain self-efficacy during social distancing in model A.

Table 2. Association between pain, time of physical activity practice, stress and anxiety level, body mass index, presence of comorbidities, gender, and level of pain self-efficacy during social distancing by COVID-19 in the state of São Paulo, Brazil, 2021

	Model A			Model B		
	β	95%CI	p-value	β	95%CI	p-value
Pain self-efficacy (0–60 points)	-	-	-	-	-	-
Weekly exercise time	1.914	0.2197–3.609	0.0271	1.826	0.1465–3.505	0.0333
Level of anxiety (0–10 points)	0.6763	−0.9649–2.318	0.4167	-	-	-
Level of stress (0–10 points)	−0.09941	−1.819–1.620	0.9092	-	-	-
Pain during the pandemic (0–10 points)	−1.912	−3.215 a −0.6103	0.0043	−1.738	−2.963−−0.5129	0.0057
BMI (kg/m^2)	0.4692	0.2857–0.6527	<0.0001	0.478	0.2966–0.6594	<0.0001
Presence of comorbidities	−0.005076	−0.07861–0.06846	0.8917	−0.001574	−0.07458–0.07143	0.9661
Sex	−5.828	−10.71−−0.9476	0.0196	−6.026	−10.86−−1.197	0.0148
Adjusted R^2			0.2209			0.2257

In model B, without the stress and anxiety variables, an association was found between weekly time of physical activity and the level of pain self-efficacy during the pandemic (β=1.826; 95% CI 0.1465–3.505; p=0.0333). Other associations identified with pain self-efficacy were pain intensity during pandemic (β=−1.738; 95% CI −2.963−−0.5129; p=0.0057), BMI (β=0.478; 95% CI 0.2966–0.6594; p<0.0001), and participants' gender (β=−6.026; 95% CI −10.86−−1.197; p=0.0148). The analysis failed to find association between the presence of comorbidities and the level of pain self-efficacy (Table 2).

Regarding COVID-19 (Table 3), 33 individuals (22%) had a positive COVID-19 diagnosis. Two of them were hospitalized, one for less than seven days and the other for up to 14 days. Only one inpatient required mechanical ventilation, and 31 (20.6%) lived with someone who had COVID-19. Despite the number of positive diagnoses (33), 37 participants took medication for COVID-19.

Table 3. Sample characterization regarding COVID-19 (N=150), São Paulo, Brazil, 2021

	No. of participants (%)
Have you been diagnosed with COVID-19?	
Yes	33 (22)
When did you have it, or do you think you had?	
March-July (2020)	20 (13.3)
August-December (2020)	31 (20.6)
January-May (2021)	13 (8.6)
Have you taken any medication prescribed by your physician for treating COVID-19?	
Yes	37 (24.6)
Were you hospitalized because of COVID-19?	
Yes	2 (1.3)
If you were hospitalized, how long did you stay?	
Less than 7 days	1 (0.6)
7 to 14 days	1 (0.6)
If you were hospitalized, did you need mechanical ventilation (ventilator)?	
Yes	1 (0.6)
Has anyone living with you had COVID-19?	
Yes	31 (20.6)

Exploratory analyses

Some exploratory analyses were conducted regarding a comparison of pain intensity and the characterization of the population with COVID-19. Regarding musculoskeletal pain, a chi-square test (p=0.0002) revealed that before the pandemic, most of the population reporting musculoskeletal pain had moderate pain intensity (48.9%). However, during the COVID-19 pandemic, most of the population with pain reported being in the severe pain

stratum (58%). Furthermore, in an analysis comparing the changes before the pandemic versus the period during the pandemic, with the paired Wilcoxon test, changes were observed (p=0.0001) in the classification of pain strata (Figure 2).
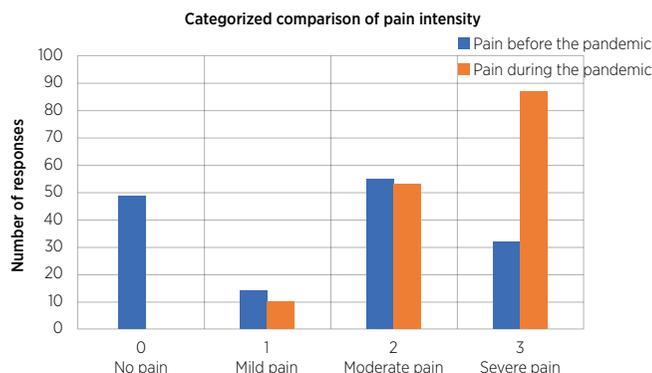

Figure 2. Pain strata before the pandemic in relation to the period during the COVID-19 pandemic in São Paulo, Brazil, 2021

DISCUSSION

This study aimed to analyze whether there is an association between the time of weekly physical activity and the level of pain self-efficacy in the population with musculoskeletal pain during the COVID-19 pandemic in the state of São Paulo. The results indicate that such association occurred. Furthermore, in the first regression model (model A), the association between weekly physical activity time and pain self-efficacy was greater than in model B, suggesting that although stress and anxiety failed to show an association with pain self-efficacy, these factors may interfere with the relationship between physical activity time and pain self-efficacy. Psycho-emotional elements, such as stress and anxiety, can be directly related to a higher level of pain perception[25]. Furthermore, social distancing may have affected the level of social support in the population with pain, since most of the sample adhered at least partially to social distancing, which may also have reflected in their perception of pain and practice of physical activity.

In this study, the weekly practice time of physical activity proved to be determinant for the level of pain self-efficacy. However, only 22% of the participants had a weekly practice in accordance with the American College of Sports Medicine recommendation[26], of more than 150 minutes, and of the WHO[12], of 150 to 300 minutes. The reduction in the duration of physical activity during social distancing has already been identified by several

authors during the COVID-19 pandemic[14]. The main factors for such reduction are the impediment to exercise in public places, gyms, and in groups of people, as well as the psychological issues involved in the emergency of the pandemic scenario[14]. Moreover, physical activity may be related to self-efficacy for musculoskeletal pain management[7]. Because of such relation, we highlight the importance of maintaining an adequate physical activity practice, which, in turn, generates a positive effect on the perceived pain intensity[6].

In this study, the self-reported pain intensity during the pandemic showed a negative association with the level of pain self-efficacy management. The literature states that individuals with higher levels of pain self-efficacy report less pain[4], which may suggest that the opposite is also true, as shown in this study. Additionally, gender and BMI were also associated with pain self-efficacy. Our study agrees with the literature[27] regarding men reporting higher levels of pain self-efficacy compared to women. However, our data may have been biased since we had more women respondents than men. We should also highlight that higher BMI values were related to a higher level of pain self-efficacy, which disagrees with the trend in the literature, according to wich the higher the BMI, the lower the level of self-efficacy[28]. However, we can interpret it by the fact that BMI does not distinguish fat from muscle mass. Thus, healthy individuals with large muscle mass in their composition present high BMI values[29] and are maybe the ones with higher levels of pain self-efficacy.

Limitations and strengths of the study

Collecting the data using an online form and disclosing it on the Internet is a limitation of our study. Since a quarter of the Brazilian population has no access to the Internet, according to the Brazilian Institute of Geography and Statistics (IBGE)[30], we can infer that the results may not be representative of the entire population. However, the state of São Paulo has one of the largest digital coverage in Brazil (83.4% of its population)[30].

Most of the respondents were women, failing to homogenize the sample between genders. Another limiting factor concerns the variety of musculoskeletal pain conditions included in the answers, which restricts the extrapolation of the current data to specific pain conditions.

Regarding the strengths, this study presents the relation between physical activity and level of pain self-efficacy in the population with pain during the period of the COVID-19 pandemic in the state of São Paulo, which is the first study confirming the relation between time of physical activity practice and higher level of pain self-efficacy during the pandemic scenario from data from inhabitants of the state of São Paulo. As for the implications of the study, a more detailed look at the time of exposure to exercise/physical activity of the population with pain during social distancing is needed, in order to promote higher levels of pain self-efficacy for this population to better manage their perception, intensity, and the impacts of pain in their routine.

CONCLUSION

The data from this study showed an association between longer weekly physical activity time during the pandemic with higher levels of pain self-efficacy in the population with musculoskeletal pain. In addition, we also found an association of lower self-reported pain intensity during the pandemic, male gender, and higher BMI with a higher level of pain self-efficacy during this period.

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