



REVIEW ARTICLE

Physical activity and mental health during the covid-19 pandemic: a rapid review of Brazilian epidemiological studies

Atividade física e saúde mental durante a pandemia da COVID-19: uma revisão rápida de estudos epidemiológicos brasileiros

Actividad física y salud mental durante la pandemia del covid-19: una revisión rápida de los estudios epidemiológicos brasileños

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Abstract

Social distancing – one of the main strategies to minimize transmission and contagion by the new coronavirus – causes a sudden and substantial disruption in behaviors and daily life, leading to decreased levels of physical activity and worsening of depression and anxiety symptoms. This study aims to conduct a rapid review of Brazilian epidemiological studies that evaluated the relationship between physical activity and mental health, during the COVID-19 pandemic. The search for the studies was carried out in the Scielo, Scielo Preprints, and PubMed databases, until January 27, 2021. In total, six studies were included, evaluating a total of 64,473 Brazilians aged over 18 years, from all regions of the country. Among the studies analyzed, four showed that there is a relationship between physical activity, depression symptoms, and anxiety; one showed that there is an association between physical activity and depression; and one, that there is an association between physical activity and anxiety symptoms. Being physically inactive during the COVID-19 pandemic is associated with a 152% higher risk of depression and 118% higher risk of anxiety. Performing 30 minutes or more of moderate to vigorous physical activity per day is associated with a 29% reduction in the risk of depressive symptoms, 28% of anxiety, and 29% in the co-occurrence of symptoms of depression and anxiety. The practice of physical activity

is a significant public health strategy to mitigate the effect of the pandemic and social isolation measures on the mental health of the Brazilian population.

Keywords: Physical Activity; Mental Health; COVID-19

Resumo

O distanciamento social, uma das principais estratégias para minimizar a transmissão e o contágio pelo novo coronavírus, provoca um rompimento brusco e substancial nos comportamentos da vida diária, levando a diminuição dos níveis de atividade física e piora dos sintomas de depressão e ansiedade. O objetivo do estudo foi realizar uma revisão rápida de estudos epidemiológicos brasileiros que avaliaram a associação entre atividade física e saúde mental durante a pandemia de COVID-19. A busca pelos estudos foi realizada nas bases Scielo, Scielo Preprints e PubMed até o dia 27 de janeiro de 2021. Foram incluídos seis estudos que avaliaram um total de 64.473 brasileiros, com idades acima dos 18, de todas as regiões do país. Dos estudos analisados, quatro demonstraram que há uma associação entre atividade física e sintomas de depressão e ansiedade, um demonstrou que há associação entre atividade física e depressão e um que há associação entre atividade física e sintomas de ansiedade. Ser fisicamente inativo durante a pandemia da COVID-19 está associado a um risco 152% maior de apresentar depressão e 118% maior de ansiedade. Realizar 30 minutos ou mais de atividade física moderada a vigorosa por dia está associado a redução de 29% no risco de sintomas depressivos, 28% de ansiedade e 29% na co-ocorrência de sintomas de depressão e ansiedade. A prática de atividade física é uma estratégia importante de saúde pública para mitigar o impacto da pandemia e das medidas de isolamento social na saúde mental da população Brasileira.

Palavras-chaves: Atividade Física; Saúde Mental; COVID-19

Resumen

El distanciamiento social, una de las principales estrategias adoptadas para minimizar la transmisión y contagio por el nuevo coronavirus, provoca una alteración repentina y sustancial en el comportamiento y la vida diaria, lo que lleva a una disminución de los niveles de actividad física y al empeoramiento de los síntomas de depresión y ansiedad. El objetivo de este estudio fue realizar una revisión rápida de los estudios epidemiológicos brasileños que evaluaron la asociación entre la actividad física y la salud mental durante la pandemia del COVID-19. La búsqueda de los estudios se realizó en las bases de datos SciELO, SciELO Preprints y PubMed hasta el 27 de enero de 2021. Se incluyeron seis estudios que evaluaron a un total de 64.473 brasileños, mayores de 18 años de edad, de todas las regiones del país. De los estudios analizados, cuatro demostraron que existe una asociación entre actividad física y síntomas de depresión y ansiedad, uno demostró la asociación entre actividad física y depresión y uno reveló que existe asociación entre actividad física y ansiedad. El estar físicamente inactivo durante la pandemia de COVID-19 estuvo asociado al 152% más de riesgo de depresión y un 118% más de ansiedad. La práctica diaria de actividad física de moderada a intensa, de 30 minutos o más, estuvo

asociada con una reducción del 29% en el riesgo de síntomas depresivos, el 28% de ansiedad y el 29% en la coocurrencia de síntomas de depresión y ansiedad. La actividad física es una importante estrategia de salud pública para mitigar el impacto de la pandemia y las medidas de aislamiento social en la salud mental de la población brasileña.

Palabras clave: Actividad física; Salud mental; COVID-19

Introduction

In late 2019, the municipality of Wuhan, China, was the first to report a disease outbreak caused by the new acute respiratory syndrome coronavirus 2 (SARS-COV-2), named coronavirus disease-2019 (COVID-19). On March 11, 2020, the World Health Organization (WHO) officially declared the new Coronavirus (COVID-19) outbreak a pandemic, making way to a global health emergency and leading several countries to use preventive measures to minimize the contagion and transmission of the disease¹.

Among the preventive measures, one of the main recommendations made by the WHO was physical distancing, which consists in limiting individuals' movement in society, reducing their contact with other people¹. This measure aims to contain the spread of the disease and the consequent severe effect of the pandemic¹.

In Brazil, the measures adopted to reduce the transmission rate of the virus were respiratory etiquette, hand hygiene, and social distancing². Social distancing is an effective way to reduce coronavirus transmission, but it causes major changes in lifestyle and human behavior, altering the amount of physical activity and time spent on sedentary behavior at population levels^{3,4}. The impact of the pandemic and social isolation on physical activity levels may, however, differ between countries. In the United Kingdom, some studies suggest an increase in time spent in physical activity⁴, while in Brazil studies are more consistent in showing its reduction^{5,6,7}.

During the pandemic, due to both restrictive measures and pandemic fear⁸, an increase in depressive symptoms and anxiety in the population is expected^{9,10}. A cross-sectional study, conducted with 45,161 Brazilians, identified that 40.4% (95% CI=39.0–41.8) of them felt sad or depressed during social distancing, and that 52.6%(95% CI=51.2–54.1) reported feeling anxious always or almost always during isolation¹¹. In a longitudinal study, which followed 2,314 Brazilians, 51.3% of the participants reported worsening in anxiety symptoms, and one in three participants presented worsening of depressive symptoms during the period of social distancing¹².

Physical activity, in pre-pandemic periods, is a protective factor against the incidence of depression and anxiety^{13,14}. A meta-analysis of longitudinal studies, including data from over 260,000 subjects, identified that physical activity is associated with a risk reduction in the development of depression, and that people who have higher levels of physical activity are 17% less likely to have depression when compared to physically less active people¹³. Meta-analytical evidence from longitudinal studies, including information from more than 70,000 subjects, showed that people with higher levels of physical activity are 26% less likely to develop anxiety¹⁴.

In the pandemic context, in which there is a decrease in mental health and in the level of physical activity in the Brazilian population, it is still unclear if protective physical activity on mental health changes. This study aims to conduct a rapid review of Brazilian epidemiological studies that evaluated the relationship between physical activity and mental health during the COVID-19 pandemic.

Methodology

A search was conducted in the Scielo, Scielo Preprints and PubMed databases until January 27, 2021, for studies conducted in Brazil, which evaluated the relationship between physical activity, symptoms of depression and anxiety during the COVID-19 pandemic. For this, we used the following search strategy: ((physical activity OR exercise) AND (mental health OR depression OR anxiety) AND (covid-19 OR coronavirus) AND (Brazil OR Brazilians)), adapted according to the base. Manual searches were also performed in ResearchGate and Google Scholar, as well as in references to the included studies.

The studies included were: 1) those that evaluated and/or reported levels of physical activity of the participants; 2) those that reported symptoms of depression and anxiety through instruments that had their psychometric characteristics tested and validated; 3) those that tested the association between physical activity and depression or anxiety using adjusted regression models, or not, by covariates, or that compared the difference between the means of symptoms of the most active and the least active participants; 4) those that were conducted with the Brazilian population (aged over 18 years) during the COVID-19 pandemic; 5) and those that were written in Portuguese or English. We excluded review studies, editorials, and opinion articles.

The following data were extracted from the studies: first author; year of publication; region of the country; sample size; and sample characteristics, such as mean age, gender, level of physical activity of participants, and information on symptoms of depression and anxiety. Furthermore, we analyzed the instruments used to assess physical activity and symptoms of depression and anxiety, and the ones used to assess the relationship of symptoms of depression and anxiety with physical activity.

After data collection, a qualitative synthesis of the studies was performed due to the heterogeneity in the presentation of the data and the impossibility of performing a meta-analysis.

Results

The search in the databases resulted in 79 articles and, after removing duplicates, 71 titles and/or abstracts were read; leaving for full-reading nine potentially eligible studies. Further manual searches identified 14 more potentially eligible studies. Out of the 23 potentially eligible studies, six were included in this review. The flowchart of the selected studies can be seen in Figure 1.

The six studies included evaluated a total of 64,473 Brazilians, aged over 18 years, from all regions of the country. Out of the six studies included, one was longitudinal type¹² and five were cross-sectional¹⁵⁻¹⁹. Physical activity levels were established by self-reported instruments or questionnaires; symptoms of depression and/

or anxiety through screening instruments. Four studies evaluated the association between physical activity and symptoms of depression and anxiety^{12,17-19}, one study evaluated the association between physical activity and depressive symptoms¹⁵, and one evaluated the association between physical activity and anxiety¹⁶, as shown in Table 1.

Figura 1. Study selection

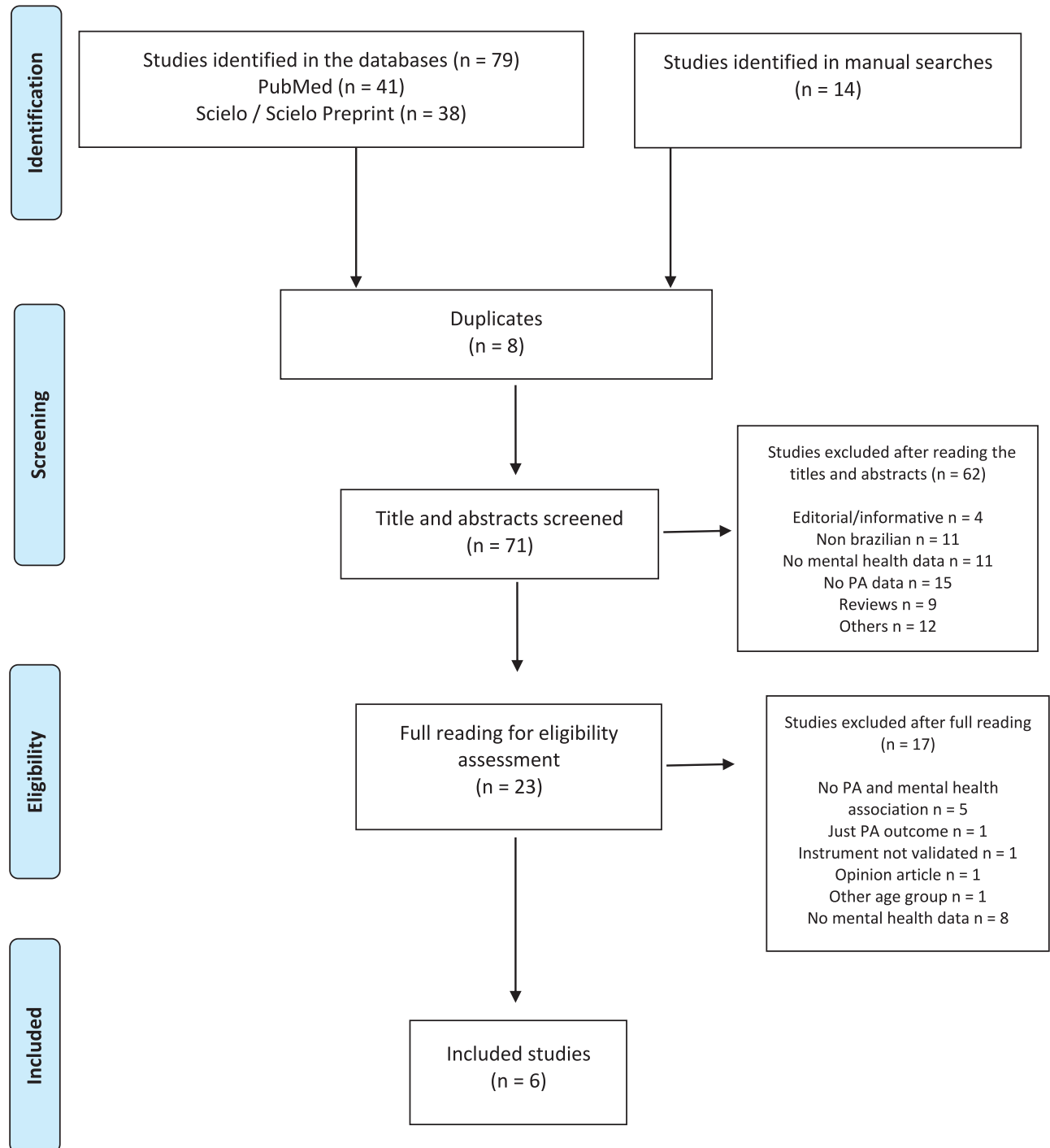


Table 1. Characterization of the included studies

AUTHOR/ YEAR	REGION OF THE COUNTRY	SAMPLE			PREVALENCE OF PHYSICAL ACTIVITY	INSTRUMENT PHYSICAL ACTIVITY	PREVALENCE OF DEPRESSION AND ANXIETY (D&A) SYMPTOMS	INSTRUMENT SYMPTOMS D&A	RESULTS
		N	Age	Sex (% female)					
Andrade- Lima et. al, 2020	All of Brazil	59,401 adults	Mean age 43.1 (95% CI=42.8 to 43.3) years	56,4%	Inactive ^① : 81.2% Active ^② : 18.8%	3 self-report questions	Risk of depression: 8.3%	PHQ-9	Inactive men without chronic condi- tion: OR=1.64 (95% CI=1.15–2.34) of increased depressive symptoms. Inactive women without chronic condi- tion: OR=1.16 (95% CI=0.87–1.54) of increased depressive symptoms.
Feter et. al, 2020	Southern Region	2,321 adults	31-59 years: 54,3%	76,6%	Before distancing Inactive ^① : 56.8% Active ^② : 43.2% With distancing Sustained inactive – 46.9% Became inactive – 26.6% Became active – 8.3%	Self-report with 4 questions.	Anxiety: No change – 44.9% Getting worse- 51.3% Getting better – 3.8% Depression: No change – 60.3% Getting worse- 35% Getting better – 4.7%	HADS	Those who kept active: PR=0.72 (95% CI=0.57–0.91) of depressive symptoms; Those who became active: PR=0.59 (95% CI=0.41-0.85) of depressive symp- toms; Those who kept active: PR=0.75 (95% CI=0.64-0.81) of anxiety symptoms; Those who became active: RP=0.62 (95% CI=0.47-0.81).
Meira Júnior et al., 2020	All of Brazil, especially the Southeast re- gion	571 adults	Mean age of 39 ± 14 years	65%	Before distancing PA ≥3x/week: 75.5% PA ≥40min/day: 86.9% PA ≥3x/week and ≥40min/day: 65.3% During distancing PA ≥3x/week: 67.9% PA ≥40min/day: 65.6% PA ≥3x/week and ≥40min/day: 47.2%	Self-report by VIGITEL, with 5 questions.	–	STAI-S-6	PA ≥40min/day: β=-1.04 (95% CI=-1.81 to -0.27); PA ≥3x/week: β=-1.57 (95% CI=-2.32 to -0.81); PA ≥3x/week and ≥40min/day: β= -1.78 (95% CI=-2.49 to -1.07).

AUTHOR/ YEAR	REGION OF THE COUNTRY	SAMPLE			PREVALENCE OF PHYSICAL ACTIVITY	INSTRUMENT PHYSICAL ACTIVITY	PREVALENCE OF DEPRESSION AND ANXIETY (D&A) SYMPTOMS	INSTRUMENT SYMPTOMS D&A	RESULTS
		N	Age	Sex (% female)					
Schuch et al. 2020	All of Brazil	937 adults	52.6% of participants aged 18-35 years.	72,3%	–	2 self-reported questions	–	BDI and BAI	<p>≥30min MVPA/day: OR=0.71 (95% CI=0.53–0.96) for depression; OR=0.72 (95% CI=0.54–0.96) for anxiety, and OR=0.71 (95% CI=0.52–0.96) for co-occurrence of depression and anxiety symptoms;</p> <p>≥15min VPA/day: depression OR=0.60 (95% CI=0.43–0.82) for depression; OR=0.70 (95% CI=0.51–0.96) for anxiety, and OR=0.59 (95% CI=0.41–0.83) for co-occurrence of depression and anxiety symptoms.</p>
Silva et al, 2020	All of Brazil	1.154 adults	Mean age of 31.15 ± 9.68 years	69,8%	<p>Before distancing Inactive: 30.3% Active^③: 69.7%</p> <p>During distancing Inactive: 50.7% Active^③: 49.3%</p>	Questionnaire on physical exercise before and during COVID-19 outbreak, without specifying the number of questions.	<p>Depression: Mild: 14.1% Moderate 21.6% Severe 8.2% Very Severe: 10.6%</p> <p>Anxiety: Mild: 6.7% Moderate 16.9% Severe 6.4% Very Severe: 11.1%</p>	DASS-21	<p>Physically inactive and chance of depression: OR=2.525 (95% CI=1.991–3.205);</p> <p>Physically inactive and chance of increased anxiety symptoms: OR=2.183 (95% CI=1.717–2.775).</p>
Solon Júnior et al. 2020	Regions: North-east, Central-West, and Southeast	89 adults	Mean age of 22.93 ± 2.58 years	57,3%	<p>Inactive^④: 61.8% (PIBC and PIDC groups) Active^⑤: 38.2% (group HBE)</p>	Self-report, only reported whether or not they practiced PA	–	DASS-21	The PIBC and PIDC groups presented higher mean scores for depression (p=0.02, ESd=0.65) and anxiety (p=0.004, ESd=0.96) in relation to the HBE group.

PA: Physical Activity; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; β: Beta coefficient; DASS-21: Depression, Anxiety, and Stress Scale – Short Form; ES: effect size; ESd: Cohen’s “d” effect sizes; GAD-7: General Anxiety Disorder-7; CI: Confidence interval; HADS: Hospital Anxiety and Depression Scale; HBE group: home exercise group; IPAQ: International Physical Activity Questionnaire; PHQ-9: Patient Health Questionnaire-9; MVPA: Moderate to vigorous physical activity; PIDC group: physically inactive during confinement group; PIBC group: Physically inactive before confinement group; STAI-S-6: State and Trait Anxiety Inventory Brazilian short-version; VIGITEL ; Surveillance System of Risk and Protective Factors for Chronic Diseases by Telephone Survey; VPA: Vigorous physical activity; ^① <150 min/week; ^② ≥150min/sem; ^③ They only reported practicing some type of exercise; ^④ Only report not performing exercises during confinement; ^⑤ Only report exercising at home during confinement.

A cross-sectional study, which evaluated 1,154 subjects, identified that people who reported not exercising during social distancing had a twice-higher risk of depression (OR=2.525; 95% CI=1.991–3.205) and a twice-increased risk of anxiety symptoms (OR=2.183; 95% CI=1.717–2.775) compared to individuals who continued to exercise during distancing¹⁸. Also, women who reported not exercising had a twice-higher risk of depression (OR=2.363; 95% CI=1.771–3.154) and anxiety (OR=2.341; 95% CI=1.760–3.112); men who reported not exercising had a four-fold higher risk of depression (OR=4.045; 95% CI=2.657–6.155) and twice as high anxiety (OR=2.929; 95% CI=1.911–4.449)¹⁸.

The study by Schuch et al.¹⁷, which evaluated 937 adults, identified that participants who reported practicing 30 minutes or more of moderate to vigorous physical activity per day had a 29% risk of having depressive symptoms (OR=0.71; 95% CI=0.53–0.96), 28% anxiety (OR=0.72; 95% CI=0.54–0.96), and 29% in the co-occurrence of symptoms of depression and anxiety (OR=0.71; 95% CI=0.52–0.96). People who reported performing 15 minutes or more of vigorous activity per day were 40% less likely to have depression (OR=0.60; 95% CI=0.43–0.82), 30% less chance of anxiety (OR=0.70; 95% CI=0.51–0.96), and 41% less chance of co-occurrence of symptoms of depression and anxiety (OR=0.59, 95% CI=0.41–0.83)¹⁷.

Men and women are more likely to have elevated depressive symptoms when they have some chronic condition and are physically inactive, compared to those who do not have chronic conditions and are physically active¹⁵ (Andrade-Lima et al., 2020). In addition, inactive men without chronic conditions are more likely to have elevated depressive symptoms (OR=1.64, 95% CI=1.15–2.34), when compared to active men without chronic diseases¹⁵. Inactive women without any chronic condition are 30% to 40% more likely to present depressive symptoms (OR=1.16, 95% CI=0.87–1.54), when compared to active women without chronic conditions¹⁵.

The longitudinal study by Feter et al.¹², which followed 2,314 individuals, found a lower prevalence (prevalence ratio [PR]=0.72; 95% CI=0.57–0.91) of depressive symptoms in individuals who reported that they remained active (150 minutes or more per week) or who became active during the pandemic (PR=0.59; 95% CI=0.41–0.85), when compared to those who remained constantly inactive. Physical activity was associated with fewer symptoms of anxiety: individuals who remained physically active before and during social distancing had a 25% lower prevalence of anxiety (PR=0.75, 95% CI=0.64–0.81), and those who became physically active had a 38% lower prevalence (PR=0.62, 95% CI=0.47–0.81) of anxiety symptoms compared to individuals who remained inactive¹².

The study by Solon Júnior et al.¹⁹ identified that people who were physically inactive during social distancing had higher mean scores in the Depression, Anxiety, and Stress Scale – Short Form (DASS-21) for depression ($p=0.02$, Cohen's "d" effect sizes (ESd)=0.65) and anxiety ($p=0.004$, ESd=0.96), when compared to people who exercised at home during the pandemic.

In the cross-sectional study conducted by Meira Júnior et al.¹⁶, regarding the practice of leisure-time physical activity (considered as the physical activity performed by an individual not as an essential activity of daily living and that is performed at the discretion of the individual²⁰), showed that, for the anxiety outcome, there was no difference in the mean score of the STAI-S-6 between those who practiced once a week and those

who did not (Practiced (P)= 15.11 ± 4 ; Did not practice (NP)= 15.93 ± 4.54 ; $p=0.198$). Significantly lower levels of anxiety was found in those who practiced 40 minutes or more per session, compared to those who practiced less than 40 minutes per session (P= 14.77 ± 4.03 ; NP= 15.82 ± 3.9 ; $p=0.005$); three or more days per week compared to those who practiced less than three days a week (P= 14.57 ± 3.94 ; NP= 16.33 ± 3.88 ; $p<0.0001$); in those who performed at least 40 minutes per session, on three or more days of the week, compared to those who practiced twice or less and did not practice anything (P= 15.87 ± 4.09 , NP= 14.3 ± 3.9 ; $p<0.0001$)¹⁶. No significant differences were found between those who practiced moderate physical activity and those who practiced moderate and vigorous physical activity (15.48 ± 4.19 ; 14.85 ± 3.85 ; $p=0.119$, respectively)¹⁶. Furthermore, based on regression models, anxiety-state during the pandemic can be predicted by the duration of physical activity (40 minutes or more per day: Beta Coefficient (β)= -1.04 ; 95% CI= -1.81 to -0.27), frequency (three or more days per week: $\beta=-1.57$; 95% CI= -2.32 to -0.81), and the combination of duration and frequency of physical activity (40 minutes or more per day, three times a week: $\beta= -1.78$; 95% CI= -2.49 to -1.07)¹⁶ (Meira Júnior et al., 2020). Furthermore, the more physical activity is performed, the fewer symptoms of anxiety are present, regardless of gender, age, level of education, trait anxiety, and physical activity before the pandemic¹⁶.

Discussion

Among the analyzed studies, four showed that there is a relationship between physical activity, depression symptoms, and anxiety; one showed that there is an association between physical activity and depression; and one, that there is an association between physical activity and anxiety symptoms. The findings of our study corroborate studies prior to the pandemic in which physical activity is shown to be a protective factor against the incidence of depression¹³ and anxiety¹⁴, as well as a therapeutic strategy for the reduction of depressive symptoms²¹ and anxiety²².

This review shows (with data from studies conducted in Brazil) that, even in a pandemic context—in which the incidence of mental disorders seems to increase—, the practice of physical activity is still associated with a lower presence of depression and anxiety symptoms. These findings suggest that the promotion of physical activity can be a safe and low-cost strategy for public health in mitigating the effect of the pandemic on the mental health of the Brazilian population²³. Mental health problems can present mainly among vulnerable people with risk factors, and many cases may be undiagnosed or untreated due to the closure and interruption of the activities of mental health services^{24,25}. Interestingly, prepandemic mendelian randomization studies suggest that physical activity seems to be protective even in people with genetic vulnerability to depression²⁶.

Physical activity may be associated with less symptoms of depression and anxiety possibly due to the increased expression of brain-derived neurotrophic factor (BDNF); increased availability of serotonin and norepinephrine; as well as the regulation of hypothalamus-pituitary-adrenal (HPA) activity; and the reduction of systemic inflammation^{27,28,29}. Furthermore, physical exercise, which is a structured and systematized physical activity, promotes structural changes in subcortical regions associated with depression, such as the hippocampus³⁰. There are also psychosocial benefits provided by physical activity that can reduce

depression and anxiety symptoms, such as the improvement of self-esteem, which can contribute to mood betterment; improvement of social support, considering that exercise can be a form of socialization; and also the improvement of self-efficacy, which is related to the self-confidence specific to a situation, that is, when the individual believes that he can perform a specific task³¹. Besides being a low cost and accessible strategy, physical activity contributes to the reduction in depression and anxiety symptom and in the prevention of its recurrences, as well as being beneficial for other comorbidities that the individual may present³².

Limitations

This study has some limitations. It was not possible to perform a meta-analysis due to the heterogeneity of the statistical treatments performed from the included studies. Moreover, most of the studies included are observational, so there is impossibility of performing causal interferences. Only one study used a representative sample of the Brazilian population; and, thus, lower economic classes, people with lower education level, and men may be underrepresented in the other studies included.

Conclusion

Brazilians who practiced physical activity during the period of social distancing were less likely to present symptoms of anxiety and depression, compared to people who did not perform physical activity during isolation. Performing physical exercises during periods of physical distancing can be a beneficial strategy for promoting both physical and mental health. It is worth mentioning that, in performing the exercises, the recommended measures should be respected: performing exercises individually or in pairs, maintaining social distancing, avoiding agglomerations, and maintaining hygienic habits individually (respiratory and hands) and of the environment (sanitization of commonly used equipment, presence of ventilation).

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