Short communication

Associations of moderate to vigorous physical activity and sedentary behavior with depressive and anxiety symptoms in self-isolating people during the COVID-19 pandemic: A cross-sectional survey in Brazil

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ABSTRACT

This is a cross-sectional study evaluating the associations of self-reported moderate to vigorous physical activity, and sedentary behavior with depressive, anxiety, and co-occurring depressive and anxiety symptoms (D&A) in self-isolating Brazilians during the COVID-19 pandemic. Depressive and anxiety symptoms were collected using the Beck Depression and Anxiety Inventories (BDI and BAI). Among the 937 participants (females = 72.3%), those performing ≥ 30 min/day of moderate to vigorous or ≥ 15 min/day of vigorous physical activity had lower odds of prevalent depressive, anxiety, and co-occurring D&A symptoms. Those spending ≥ 10 h/day sedentary were more likely to have depressive symptoms.

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic, is a global public health emergency. To slow the spread of the virus, federal governments recommended the adoption of social distancing measures, including self-isolation (World Health Organization, 2020). While self-isolation reduces the infection rate (Bedford et al., 2020), those measures, together with the "pandemic fear" (Ornell et al., 2020;

Silva et al., 2020) are linked to a negative burden on mental health, possibly increasing depressive and anxiety symptoms (Brooks et al., 2020; Wang et al., 2020). Therefore, strategies to mitigate this mental health burden are necessary (Holmes et al., 2020).

Physical activity is associated with a lower prevalence of and incidence of depression and anxiety (Schuch et al., 2019, 2018; Stubbs et al., 2016; Teychenne et al., 2020). On the other hand, sedentary behavior (SB) is associated with depressive (Hallgren et al., 2020; Zhai et al., 2015) and anxiety symptoms (Teychenne et al., 2015). However, it is seen that during self-isolation, physical activity levels decreases (Ammar et al., 2020; Lesser and Nienhuis, 2020; Meyer et al., 2020; Rogers et al., 2020; Smith et al., 2020; Stanton et al., 2020) while time spent in SB increases (Meyer et al., 2020; Qin et al., 2020; Rogers et al., 2020; Stanton et al., 2020).

Given the influence of the COVID-19 crisis on physical activity, SB, depressive, and anxiety symptoms, and the known relationship between physical activity, SB and depressive and anxiety symptoms pre COVID-19, it is essential to understand the relationship between MVPA and SB with depressive/anxiety symptoms in the context of COVID-19 in Brazil. The present study aimed to explore the associations between MVPA, VPA, MPA, and SB with depressive, anxiety, and comorbid depressive and anxiety (D&A) symptoms in self-isolating Brazilians.

2. Methods

This is a cross-sectional study collected via an online survey. The study was approved by the Federal University of Santa Maria Research Ethics Committee and by the National Commission of Ethics in Research [CONEP] (30,244,620.1.0000.5346).

2.1. Recruitment and inclusion criteria

Participants were recruited through social media (Facebook, Instagram, and Twitter) and by distributing an invitation to participate through existing researcher networks. Brazilians adults (≥18 years), currently residing in Brazil and in self-isolation due to the COVID-19 pandemic, were eligible to participate. By self-isolation, we mean those that decided to stay-at-home and only left for essential activities such as food shopping, visit the pharmacist or other health professionals.

2.2. Variables

2.2.1. Depressive symptoms

Depressive symptoms were assessed using the Beck Depression Inventory (BDI). The BDI is composed of 21 items with a score range from 0 to 63. For the study, depression was dichotomized into no depressive symptoms (0–9) or prevalent depressive symptoms (10–63) (Beck et al., 1961).

2.2.2. Anxiety symptoms

Anxiety symptoms were assessed using the Beck Anxiety Inventory (BAI). The BAI is composed of 21 items with a score range from 0 to 63. For the study purpose, anxiety was dichotomized into no anxiety symptoms (0–7) or prevalent anxiety symptoms (8–63) (Beck et al., 1988).

2.2.3. Co-occurring D&A symptoms

Those with prevalent depression and anxiety symptoms (BDI > 9 + BAI > 7) were classified as having co-occurring D&A symptoms. Co-occurring D&A symptoms was treated as a dichotomous variable.

2.2.4. Moderate to vigorous physical activity (MVPA)

Time spent in MVPA was assessed by two questions, as used in a previous study (Smith et al., 2020) : 1) "How much time on an average day have you spent in vigorous physical activity since self-isolating?"; and 2) "How much time on an average day have you spent in moderate physical activity since self-isolating?". For the logistic models, MVPA and MPA were dichotomized into 1 = <30 min per day, or 2 = ≥30 min/day, and VPA was dichotomized into 1 = <15 min/day, or 2 = ≥15 min of VPA/day. These cutoffs are in line with the public health recommendations of 150 min of MVPA, or 75 min of VPA per week (World Health Organization, 2010).

2.2.5. Sedentary behavior (SB)

Time spent sitting, henceforth defined as SB, was assessed using the question: "Since self-isolating, how much time have you spent sitting daily?". SB was treated as a dichotomous variable for logistic models (1 = <10 h spent sitting/day; 2 = ≥10 h spent sitting/day). The cutoff is based on a previous study (Gibson et al., 2017) and the median of our study sample (equal to 10 h).

2.2.6. Covariates

Demographic data were collected, including sex, age, ethnicity, marital status, employment, and household income, and Brazilian state they lived in. Participants were asked whether they are in self-isolation and to report the number of days in self-isolation. Current smoking and alcohol consumption were evaluated. Self-reported previous diagnosis of chronic physical conditions and previous diagnosis of psychiatric conditions were also evaluated with a list with a series of conditions.

2.3. Statistical analyses

Descriptive data are shown using mean (standard deviation), or median and interquartile range (IQR) for continuous variables. Categoric variables are shown as absolute frequencies (%). The associations between time spent in MVPA, VPA, MPA, or SB with the prevalence of symptoms of mental health outcomes (depressive, anxiety, or D&A) were tested using logistic (using dichotomic variables) and linear (using continuous variables) regressions. First, the models were tested without adjustments (crude). Second, the models were adjusted for age, sex, ethnicity, marital status, employment, family income (adjusted 1). Third, the models were adjusted for age, sex, ethnicity, marital status, family income, days in self-isolation, current smoking, current alcohol consumption, lifetime diagnosis of chronic diseases, lifetime diagnosis of psychiatric disorders, time spent sitting (for MVPA, VPA and MPA models) or time spent in MVPA (for SB models) (adjusted 2). Regressions models were entered by blocks following the order: block 1 (crude), block 2 (adjusted 1), and block 3 (adjusted 2). Results from the logistic and linear regression models are presented as odds ratios (ORs) and beta coefficients together with their 95% confidence intervals (CIs), respectively. We adopted a statistical significance level at $p < 0.05$. The statistical analysis was performed with SPSS version 22.0 (IBM Corporation).

3. Results

A total of 937 adults were included in the study. The sample was predominantly composed of women (72.3%), and young adults aged 18–35 (52.6%). The full details of the overall sample, and stratified by the time spent in MVPA and SB, are detailed in supplementary Table 1.

In the most adjusted models (adjusted 2), those reporting ≥30 min in MVPA/day had a decreased odds of prevalent depressive (OR = 0.71, 95%CI = 0.53–0.96), anxiety (OR = 0.72, 95%CI = 0.54–0.96), and co-occurring D&A (OR = 0.71, 95%CI = 0.52–0.96) symptoms, and those spending ≥15 min in VPA/day had with lower odds of presenting depressive (OR = 0.60, 95%CI = 0.43–0.82), anxiety (OR = 0.70, 95%CI = 0.51–0.96), and co-occurring D&A (OR = 0.59, 95%CI = 0.41–0.83) symptoms. Spending ≥30 min MPA/day was associated with a lower prevalence of co-occurring D&A symptoms (OR = 0.72, 95%CI = 0.53–0.98). Those spending ≥10 h in SB/day were more likely to present depressive symptoms (OR = 1.39,

Table 1

Cross-sectional logistic associations of prevalent mental health outcomes with MVPA, VPA, MPA, and SB during COVID-19 pandemic in 2020 in Brazil.

	Crude				Adj. 1				Adj. 2			
	OR	95% CI		p	OR	95% CI		p	OR	95% CI		p
MVPA												
Depression	0.673	0.517	0.877	0.003	0.686	0.520	0.906	0.008	0.718	0.537	0.960	0.025
Anxiety	0.679	0.521	0.885	0.004	0.697	0.531	0.914	0.009	0.722	0.543	0.962	0.026
Depression and anxiety	0.657	0.496	0.870	0.003	0.678	0.507	0.907	0.009	0.712	0.524	0.969	0.031
VPA												
Depression	0.622	0.465	0.832	0.001	0.606	0.447	0.822	0.001	0.601	0.437	0.826	0.002
Anxiety	0.698	0.523	0.932	0.015	0.693	0.515	0.932	0.015	0.705	0.516	0.962	0.027
Depression and anxiety	0.608	0.443	0.834	0.002	0.581	0.418	0.807	0.001	0.591	0.418	0.835	0.003
MPA												
Depression	0.736	0.565	0.958	0.023	0.724	0.549	0.956	0.023	0.765	0.572	1.022	0.070
Anxiety	0.729	0.559	0.949	0.019	0.756	0.576	0.992	0.043	0.753	0.566	1.003	0.052
Depression and anxiety	0.689	0.520	0.914	0.010	0.712	0.531	0.954	0.023	0.726	0.533	0.989	0.042
SB												
Depression	1.613	1.221	2.131	<0.001	1.497	1.113	2.012	0.008	1.396	1.025	1.901	0.034
Anxiety	1.382	1.046	1.825	0.032	1.266	0.948	1.692	0.110	1.167	0.860	1.583	0.321
Depression and anxiety	1.639	1.225	2.192	0.001	1.482	1.092	2.013	0.012	1.340	0.971	1.185	0.075

Abbreviations: CI = confidence interval; MPA = moderate physical activity; MVPA = Moderate to vigorous physical activity; OR = odds ratio; SB = Sedentary behavior, VPA = vigorous physical activity.

MVPA: odds of those who perform ≥30 min of MVPA/day compared to those that perform less than <30 min of MVPA (reference) of having prevalent depressive symptoms (BDI>9), anxiety symptoms (BAI>7), or co-occurring depressive and anxiety symptoms (BDI>9 & BAI>7).

MPA: odds of those who perform ≥30 min of MPA/day compared to those that perform less than <30 min of MPA (reference) of having prevalent depressive symptoms (BDI>9), anxiety symptoms (BAI>7), or co-occurring depressive and anxiety symptoms (BDI>9 & BAI>7).

VPA: odds of those who perform ≥15 min of VPA/day compared to those that perform less than <15 min of VPA (reference) of having prevalent depressive symptoms (BDI>9), anxiety symptoms (BAI>7), or co-occurring depressive and anxiety symptoms (BDI>9 & BAI>7).

SB: odds of those who spend ≥10 h sitting per day compared to those spending <10 h (reference) of having prevalent depressive symptoms (BDI>9), anxiety symptoms (BAI>7), or co-occurring depressive and anxiety symptoms (BDI>9 & BAI>7).

The models presented are: crude, no adjustments; Adjusted 1 (Adj. 1), adjusted for age, sex, ethnicity, marital status, employment, family income; and Adjusted 2 (Adj. 2), adjusted for age, sex, ethnicity, marital status, employment, family income, days in self-isolation, current smoking, current alcohol consumption, self-reported previous diagnosis of chronic diseases, self-reported previous diagnosis of psychiatric disorders, SB (continuous, for physical activity models) and MVPA (continuous, for SB models).

95%CI = 1.02–1.90). The results of the logistic regression models are presented in Table 1.

Linear regression models adjusting for relevant covariates (adjusted 2), testing the dose-response association, found that every 10 min spent in VPA is associated with 0.18 (95%CI = 0.04–0.33) points lower on the BDI, and 0.21 (95%CI = 0.03–0.40) points lower on the BAI scales, respectively. Also, each hour spent in SB is associated with 0.22 points higher on the BDI (95%CI = 0.10–0.33) and 0.16 points higher at the BAI (95%CI = 0.02–0.31). The linear models can be seen in supplementary Table 2.

4. Discussion

In the present study, participants reporting ≥30 min in MVPA/day were approximately 30% less likely to present depressive, anxiety, and D&A symptoms. Those reporting ≥15 min of VPA/day were approximately 40% less likely to present prevalent depressive and D&A symptoms, and 30% less likely to present prevalent anxiety symptoms. Those spending ≥10 h/day in SB were 39% more likely to present prevalent depressive symptoms.

Our findings are consistent with previous studies during the pandemic, suggesting that higher MVPA levels are associated with reduced depressive, anxiety and co-occurring D&A symptoms (Jacob et al., 2020; Meyer et al., 2020; Qin et al., 2020; Stanton et al., 2020). Interestingly, no associations were seen between MPA and depressive or anxiety symptoms. A potential explanation is that, during the pandemic, time spent in MPA might be heavily influenced by time spent in household activities that fall within the moderate-intensity range (Ainsworth et al., 2011), while VPA is more likely to reflect the leisure-time physical activity. It is well known that leisure-time physical activity is more closely associated with positive mental health outcomes than household activities (Teychenne et al., 2020).

Interestingly, those spending over 10 h in SB/day were more likely to present prevalent depressive, but not anxiety or co-occurring D&A symptoms (Hallgren et al., 2018; Zhai et al., 2015). It is possible that periods longer than 10 h/day of SB are needed to significantly increase anxiety symptoms (Hallgren et al., 2020).

The present study has some limitations. First, the cross-sectional design does not allow to draw any directionality in the relationship. Second, the sample was mostly composed of females and young adults recruited by social media (Facebook, Instagram, Twitter), living in three states (about 83% are from Rio Grande do Sul, Rio de Janeiro, or Ceará). Third, we could not rule out a sampling bias as those who are experiencing more depressive and anxiety symptoms might be more interested in participating in the study (self-selection bias). Fourth, all data was self-reported that might suffer from recall bias and social desirability.

5. Conclusion

People reporting over 30 min of MVPA/day or over 15 min of VPA/day are less likely to present depressive, anxiety, and D&A symptoms. However, those reporting higher levels of SB are more likely to present prevalent depressive symptoms.

Authors contributions

Study conception and design: Felipe Schuch, Lee Smith, Mark Tully. Acquisition of data: Felipe Schuch, Rugero Bulzing. Analysis and interpretation of data: Felipe Schuch, Davy Vancampfort, Jeroen Deenik, Brendon Stubbs, Peter Willeit. Drafting of manuscript: Felipe Schuch. Critical revision: All authors.

Declaration of Competing Interest

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113339.

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