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Home-based exercise during confinement in COVID-19 pandemic and mental health in adults: a cross-sectional comparative study

Exercício físico em casa durante o confinamento na pandemia COVID-19 e a saúde mental em adultos: um estudo comparativo transversal

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ABSTRACT

This study compared the quality of life, sleep quality, eating attitudes, and psychological aspects among adults (22.93 ± 2.58 years), whether physically inactive or not, before and during the COVID-19 pandemic. Participants were enrolled into: home-based exercise during the confinement (HBE group, n = 34), physically inactive during (PIDC group, n = 28), and before the confinement (PIBC group, n = 27). The depression, anxiety, and stress scale - Short Form, the Pittsburgh sleep quality index, the Eating Attitudes Test, and the quality of life questionnaire were used to assess variables. The covariance analysis (covariable - gender) was used to compare variables among the groups. The effect size was calculated by Cohen "d" (ESd). The HBE group presented a better quality of life compared to both PIDC (p = 0.002, ESd = 1.26) and PIBC (p = 0.008, ESd = 1.00) groups. Anxiety (p = 0.004, ESd = 0.96), depression (p = 0.02, ESd = 0.65) and stress (p = 0.02, ESd = 0.72) were significantly higher in the PIDC group when compared to HBE group. Self-reported sleep quality was better in the HBE group than in both other groups (p < 0.05). No group presented eating disorder symptoms; however, the HBE group has shown higher scores compared to both PIBC group (p = 0.01). In conclusion, adults who had exercised at home during the COVID-19 pandemic presented better quality of life, self-reported sleep quality, and reduced anxiety, depression, and stress levels than those physically inactive ones before and during the pandemic.

Keywords: Coronavirus; Health; Physical activity; Psychology.

RESUMO

Este estudo comparou a qualidade de vida, qualidade subjetiva do sono, atitudes alimentares e aspectos psicológicos em adultos (22,93 ± 2,58 anos), fisicamente inativos ou não, antes e durante a pandemia do COVID-19. Os participantes foram divididos em: exercícios domiciliares durante o confinamento (grupo EDDC, n = 34), fisicamente inativos durante (grupo FIDC, n = 28) e antes do confinamento (grupo FIAC, n = 27). A escala de depressão, ansiedade e estresse – versão curta, índice de qualidade do sono de Pittsburgh, teste de atitudes alimentares e o questionário de qualidade de vida foram utilizados para avaliar variáveis. A análise de covariância (covariável – gênero) foi utilizada para comparar os grupos. O tamanho do efeito foi calculado por Cohen "d" (ESd). O grupo EDDC apresentou uma melhor qualidade de vida em comparação aos grupos FIDC (p = 0,002, ESd = 1,26) e FIAC (p = 0,008, ESd = 1,00). Ansiedade (p = 0,004, ESd = 0,96), depressão (p = 0,02, ESd = 0,65) e estresse (p = 0,02, ESd = 0,72) foram significativamente maiores no grupo FIDC quando comparados ao EDDC. A qualidade do sono subjetiva foi melhor no EDDC do que nos outros grupos (p < 0,05). Nenhum grupo apresentou sintomas de transtorno alimentar; entretanto, o grupo EDDC mostrou escores maiores em comparação ao FIAC (p = 0,01). Em conclusão, adultos que se exercitaram em casa durante a pandemia do COVID-19 apresentaram melhor qualidade de vida, qualidade subjetiva de sono e níveis reduzidos de ansiedade, depressão e estresse do que aqueles fisicamente inativos.

Palavras-chave: *Coronavírus; Saúde; Atividade física; Psicologia.*

Introduction

Since later December 2019, the world has experienced significant lifestyle changes due to the COVID-19 pandemic[1]. The end of social isolation caused by the COVID-19 pandemic is still uncertain, which prevents the usual daily activities from coming back, and leads to uncertainties regarding psychological aspects in people worldwide in the post-pandemic period[2]. So, developing strategies during quarantine is necessary to reduce the impact of confinement on people's quality of life.

The World Health Organization (WHO) has recommended confinement to prevent the virus spread

out, so people around the world were forced to keep themselves at home and look for strategies to run their professional or leisure activities from home. However, confinement has led people to psychological issues, which may involve anxiety, depression, eating, and sleep disorders[3].

The literature has already shown a relationship between stress and sleep problems[4]. Some authors have also shown that chronic sleep deprivation can induce adverse psychological alterations to the human being[5,6], such as eating; as a consequence, those individuals with eating disorders often complain about sleep patterns changes[7]. Therefore, based on current data about exercise and its effects on psychological aspects, we believe that exercise, even when running at home, could induce significant improvements to sleep and eating patterns.

Physical inactivity and sedentary behavior may also be considered a pandemic around the world[8]. Despite coronavirus containment being a worldwide priority, according to WHO[1], the COVID-19 pandemic may increase the prevalence of physical inactivity and sedentary behavior. A previous study[9] has recommended the maintenance of home-based exercise to health benefits and improvements in the immune system; in this sense, exercises such as walking, climbing stairs, squats, push-ups, sit-ups, or yoga are suggested.

It is known that moderate-intensity exercise improves sleep quality[10], quality of life[11], and may reduce anxiety and depressive symptoms[12]. With that being said, we hypothesized that individuals who keep themselves physically active during the confinement caused by COVID-19 pandemic are going to present better levels of quality of life, sleep quality, eating patterns, stress and depressive symptoms, and anxiety.

So, we aimed to compare the sleep quality, quality of life, eating patterns, anxiety, depression, and stress symptoms among adults, whether physically active or not (i.e., those who exercise at home), during and before the confinement period caused by the COVID-19 pandemic.

Methods

This is an observational and cross-sectional study, which was designed to compare biopsychological and dietary patterns aspects among adults, physically active or not, before and during the confinement period caused by the COVID-19 pandemic. An online survey was conducted during the confinement period in adults (22.93 ± 2.58 years, 67.81 ± 15.16 kg, 167.38 ± 8.93 cm, and 24.00 ± 3.69 Kg/m^2) from the different States of Brazil (Ceará, Piauí, Goiás, Sergipe, Pernambuco and Espírito Santo).

The ethical approval (registration: 4.006.656) was granted by the Research Ethics Committee with humans of the *Vale do Acaraú* State University, and the study has carried for the bioethics principles according to the 510/16 resolution of the National Health Council. Also, all volunteers signed the Consent Form through an online link due to the pandemic period.

The G*Power software version 3.1.9 was used to calculate the sample size based on a statistical power (β error) of 0.80 and an effect size Cohen's d (ES_d) was defined (ES_d = 0.71); the global PSQI score was used as a parameter from the study of D'Aurea and colleagues[13] and the minimum size of the total sample was found to be 80 participants. The covariance analysis (ANCOVA) was run among the main biopsychological variables analyzed.

Participants were invited to enroll in the present study through social media ads (Instagram and WhatsApp) in May 2020. Those interested in being enrolled in the study got in contact with the researchers. Subjects aged between 18 and 30 years were included; however, were excluded those who had regular consumption of alcohol, were not being in confinement since March 2020, made use of psychoactive drugs, and had a history of psychiatric illnesses[13]; still, individuals who had their professional activities at night or who were not respecting the confinement were also excluded.

After screening by the researchers, from 115 participants, 89 (51 female) met the inclusion criteria and were assigned, not randomly, to their respective groups. All the variables analyzed in the present study (anthropometric and survey data) were reported through an online form available to the volunteers.

The physically inactive group during the confinement (n=28, 18 female) has reported being confined for 40.57 (± 6.73) days. We included in this group those adults who practiced physical exercise (resistance training), for at least three times a week in the last six months, before the COVID-19 outbreak, and stopped exercising immediately after the confinement onset.

The home-based exercise group (n=34, 18 female) has reported being confined for 39.60 (± 9.72) days. This group included participants who had been

exercising at home for at least three times a week since the beginning of confinement. Participants in this group have exercised (resistance training) at least three times a week in the last six months before the COVID-19 pandemic.

In the physically inactive group before the confinement, participants (n=27, 15 female) referred being isolated for 43.19 (±7.91) days. To be enrolled in this group, volunteers could not exercise for at least six months before the beginning of the confinement; still, they should remain without exercising after the pandemic outbreak.

The Pittsburg Sleep Quality Index was developed by Buysse et al.[14], translated into Brazilian Portuguese, and validated by Bertolazi et al.[15]. The PSQI evaluates sleep quality in the last month regarding the components as follows: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disorders presence, and use of sleep medicines. A total score equal to or higher than 5 indicates poor sleep quality[16].

The Eating Attitudes Test (EAT-26) is a psychometric instrument developed by Garner et al.[17], and validated for Brazilian Portuguese by Fortes et al.[18] The EAT-26 is divided into three scales: the diet scale, the bulimia scale, and the oral control scale. The first one reflects a pathological refusal to caloric foods and concern for physical fitness; the second one worries about food, which refers to uncontrollable food intake episodes, followed by vomiting and other behaviors to prevent weight gain; still, the third one shows how self-control occurs with eating and eating habits within an environmental context[18]. The questionnaire includes 26 items (each item varies from 0 to 3 points), ranging from 0 to 78 total points. Global scores higher than 21 points indicate eating disorders symptoms. The Cronbach alpha coefficient for the subscales was: diet scale 0.80, the bulimia scale and food concern were 0.42 and, the oral control scale 0.64.

The Depression, Anxiety, and Stress Scale – Short Form (DASS-21) was developed by Lovibond and Lovibond[20] and validated and adapted to Portuguese by Vignola and Tucci[21]. For DASS-21, participants must indicate the degree to which they experience each of the symptoms described in the items during the last week (previous week). The Likert scale varies from 0 to 4 points. Scores for depression, anxiety, and stress are determined by the sum of the scores of the 21 items, and then the result is multiplied by two. Higher scores are related to high levels of depression, anxiety, and stress. However, scores above 7 for anxiety, 9 for depression, and 14 for stress are considered excessive for people without mental disorders[22]. After analyzing the Cronbach alpha coefficient, the scales of anxiety (0.81), depression (0.88), and stress (0.86) presented excellent reliability and internal consistency in the present study.

The WHOQOL-brief questionnaire was used to assess the quality of life. It is a tool that evaluates four fields, as follows: physical, psychological, social relations, and environment. The WHOQOL-Bref result is obtained by averaging the values of each field. The higher the scores, the better is the quality of life and its domains[24]. Cronbach's alpha test presents excellent reliability and internal consistency of the WHOQOL-Bref questionnaire (0.82) and its domains (0.82).

Descriptive statistics techniques were used to obtain data as a mean and standard deviation. Kolmogorov Smirnov and Levene tests evaluated normality, homogeneity of variances, respectively. Sex was used as a covariant for covariance analysis (ANCOVA) between the groups, followed by the Bonferroni post hoc test.

The SPSS 26.0 program was used to obtain data, adopting the significance of $p \leq 0.05$. Cohen's "d" effect sizes (ES_d) (1998) were calculated online calculators[25] according to the data distribution. ES_d were classified as 0.2-0.4 Small, 0.5-0.7 Medium, and ≥ 0.8 Large effects[25].

Results

The overall characteristics of the participants among the groups are described in Table 1, which shows no statistical differences for age ($F_{(2, 85)} = 1.37$, $p = 0.25$), weight ($F_{(2, 85)} = 1.31$, $p = 0.27$), height ($F_{(2, 85)} = 0.91$, $p = 0.40$) and body mass index ($F_{(2, 85)} = 1.12$, $p = 0.32$).

Table 2 describes the quality of life analysis. The overall quality of life score was better in the home-based exercise group when compared to the physically inactive group before ($F_{(2, 85)} = 7.56$, $p = 0.008$, $ES_d = 1.00$) and during ($F_{(2, 85)} = 7.56$, $p = 0.002$, $ES_d = 1.26$) the confinement. It was also observed that the physical domain was significantly lower in physically inactive group before ($F_{(2, 85)} = 10.17$, $p < 0.01$, $ES_d = 1.00$) and during ($F_{(2, 85)} = 10.15$, $p < 0.01$, $ES_d = 1.50$) the confinement compared to home-based exercise

Table 1 – Sample characterization by groups

Variables	PIDC group (n = 28)	HBE group (n = 34)	PIBC group (n = 27)
Age (years)	22.65±0.48	23.45±0.43	22.53±0.49
Weight (kg)	64.82±2.27	70.43±2.03	67.52±2.31
Height (cm)	166.04±1.18	168.18±1.05	167.71±1.20
BMI (kg/m^2)	23.44±0.65	24.67±0.58	23.70±0.66

PIDC group = physically inactive group during the confinement; HBE group = home-based exercise group; PIBC group = physically inactive group before the confinement; BMI = body mass index. Data are presented as mean ± standard deviation. Analysis of covariance (ANCOVA) = $p < 0.05$.

group. Similarly, the psychological domain assessment showed better scores in the home-based exercise group compared to both physically inactive groups (before confinement: $F_{(2, 85)} = 3.80$, $p = 0.03$, $ES_d = 1.26$; during confinement: $F_{(2, 85)} = 5.15$, $p = 0.01$, $ES_d = 1.26$) .

Figure 1 shows the comparison of anxiety, depression, and stress between groups. In this sense, the physically inactive during confinement group presented the scores of anxiety ($F_{(2, 85)} = 5.47$, $p = 0.004$, $ES_d = 0.96$), depression ($F_{(2, 85)} = 3.80$, $p = 0.02$, $ES_d = 0.65$), and stress ($F_{(2, 85)} = 3.61$, $p = 0.02$, $ES_d = 0.72$) higher than those in the home-based exercise group.

Table 3 summarizes the self-reported sleep quality results between the groups. Besides the significant differences observed in self-reported sleep quality between the home-based exercise group and both physically inactive groups, it was also verified a greater sleep efficiency in the home-based exercise group compared to the physically inactive group before the confinement ($F_{(2, 85)} = 4.01$, $p = 0.02$, $ES_d = 0.61$).

Figure 2 shows comparisons of the EAT-26 scales between the groups. Lower scores in diet scale were observed in the physically inactive group before the confinement compared to both home-based exercise group ($F_{(2, 85)} = 8.43$, $p < 0.01$, $ES_d = 1.10$) and physically inactive group during the confinement ($F_{(2, 85)} = 8.43$, $p = 0.02$, $ES_d = 0.66$). The bulimia scale and food concern also presented lower values in the physically inactive group before the confinement compared to both home-based exercise group ($F_{(2, 85)} = 4.26$, $p = 0.04$, $ES_d = 0.63$) and physically inactive group during the confinement ($F_{(2, 85)} = 4.26$, $p = 0.03$, $ES_d = 1.26$). Finally, it

Table 2 – Values of Domains and General Quality of Life between the groups

	PIDC group (n = 28)	HBE group (n = 34)	PIBC group (n = 27)
WHOQOL- Bref			
Physical	13.9±0.4 (13.0-14.8)	16.4±0.4* (15.6-17.2)	14.1±0.4 (13.2-15.0)
Psychological	13.6±0.3 (12.8-14.4)	15.2±0.3* (14.4-15.9)	13.7±0.4 (12.9-14.5)
Social	13.8±0.6 (12.6-15.1)	15.2±0.5 (14.1-16.3)	14.7±0.6 (13.5-16.0)
Environment	13.6±0.2 (13.0-14.2)	14.5±0.2 (14.0-15.1)	13.8±0.3 (13.2-14.4)
General	13.8±0.3 (13.2-14.5)	15.4±0.3* (14.8-16.0)	14±0.3 (13.3-14.6)

PIDC group = physically inactive group during the confinement; HBE group = home-based exercise group; PIBC group = physically inactive group before the confinement. Data are presented as mean± standard deviation (95% confidence interval). *$p < 0.05$ statistically significant in comparison with the PIDC and PIBC groups. Analysis of covariance (Using gender as a covariable).

Table 3 – Values of PSQI components and patterns between groups

PSQI	PIDC group (n = 28)	HBE group (n = 34)	PIBC group (n = 27)
Sleep quality	1.3±0.1* (1.0-1.6)	0.8±0.1 (0.5-1.1)	1.5±0.1* (1.2-1.8)
Sleep latency	1.7±0.1 (1.4-2.0)	1.7±0.1 (1.4-2.0)	1.3±0.1 (1.0-1.6)
The amount of sleep	1.0±0.1 (0.7-1.3)	0.9±0.1 (0.6-1.1)	1.2±0.1 (1.0-1.5)
Sleep efficiency	2.3±0.2* (1.8-2.8)	1.4±0.2 (0.9-1.8)	1.7±0.2 (1.2-2.2)
Sleep disorders	1.4±0.1 (1.2-1.6)	1.4±0.09 (1.2-1.6)	1.3±0.1 (1.1-1.5)
The hypnotic drug	0.3±0.1 (0.08-0.5)	0.1±0.09 (0.00-0.3)	0.07±0.1 (0.00-0.2)
Diurnal dysfunction	0.8±0.1 (0.5-1.2)	1.1±0.1 (0.8-1.4)	0.8±0.1 (0.5-1.2)
Global score (0-21)	9.4±0.5 (8.4-10.5)	8.7±0.4 (7.8-9.7)	8.2±0.5 (7.1-9.3)

PIDC group = physically inactive group during the confinement; HBE group = home-based exercise group; PIBC group = physically inactive group before the confinement; PSQI = Pittsburg Sleep Quality Index. Data are presented as mean ± standard deviation (95% confidence interval). *$p < 0.05$ statistically significant compared with HBE group. Analysis of covariance (Using gender as a covariable).

was observed that the total EAT-26 score was significantly higher in the home-based exercise group than in the physically inactive group before the confinement ($F_{(2, 85)}$ = 4.47, p = 0.01, ES_d = 0.78), and no eating disorder symptoms were verified in the groups.

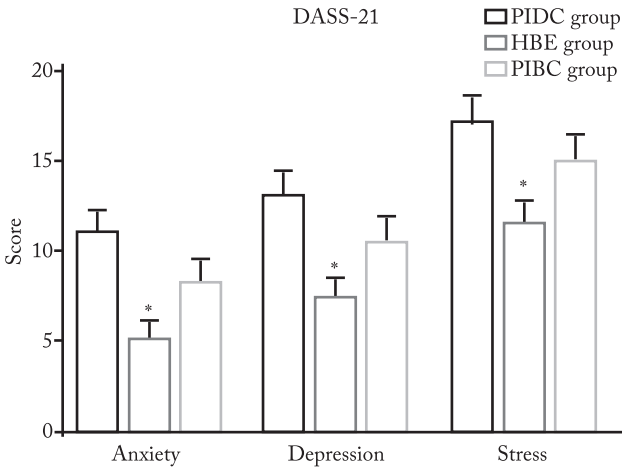

Figure 1 – Mean (with Standard Deviation) of anxiety, depression, and stress scores between the groups.
PIDC group = physically inactive group during the confinement; HBE group = home-based exercise group; PIBC group = physically inactive group before the confinement; DASS-21 = Depression, Anxiety, and Stress Scale – Short Form. *p < 0.05 statistically significant compared with the PIDC group. Analysis of covariance (Using gender as a covariable).

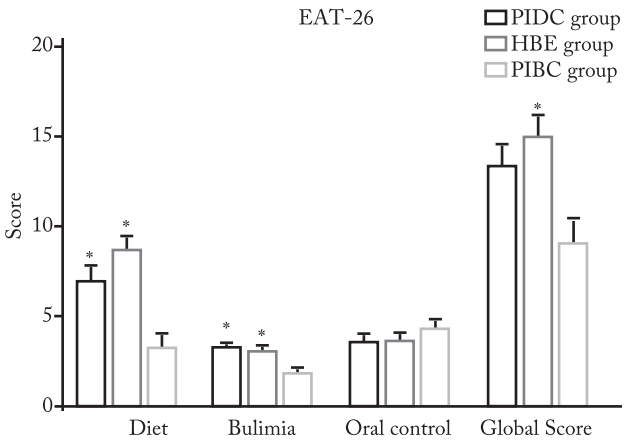

Figure 2 – Mean scores (with standard deviation) of the Scales and Global score between the groups.
*p < 0.05 statistically significant compared with PIBC group. PIDC group = physically inactive group during the confinement; HBE group = home-based exercise group; PIBC group = physically inactive group before the confinement; EAT-26 = Eating Attitudes Test. Analysis of covariance (Using gender as a covariable).

Discussion

This study aimed to compare the self-reported sleep quality, quality of life, eating attitudes, anxiety, depression, and stress symptoms among adults whether physically inactive or not, before and during the COVID-19 pandemic (i.e., who performed physical exercise at home) during the period of social confinement of the COVID-19 pandemic. The main findings suggest that the adults who remained physically actives during the COVID-19 pandemic presented better quality of life in both physical and psychological domains, lower scores on psychometric scales regarding anxiety, depression, and stress,better self-reported sleep quality, sleep efficiency, and greater eating attitudes scores than those who were physically inactive before the confinement and those who kept physically inactive during the confinement caused by the COVID-19 pandemic.

After the COVID-19 outbreak in China, the psychological, physical, and emotional factors, as well as overall quality of life, were negatively affected[26]. In this sense, once physical exercise promotes beneficial effects on physical and psychological aspects[27], and on the overall quality of life[11,28], it seems that continue exercising at home, even during the confinement, could be essential to stay healthy.

The present study shows that keep an exercise routine during the confinement period may attenuate anxiety, depression, and stress symptoms in adults; these symptoms commonly increase during a confinement period[3]. Therefore, by knowing that exercise leads to beneficial effects on psychological status, the population must be encouraged to keep their exercise routine at home during the confinement period.

Although the present study has shown poor sleep quality in individuals from all groups, those who remained exercising at home was pointed to present a better self-reported sleep quality than both physically inactive groups. Recent studies have shown the effects of exercise in sleep quality[10], so, considering that sleep quality and stress levels have been significantly affected during confinement[3], any type of home-based exercise must be encouraged to maintain or achieve a sleep quality better; even if it is only guided and not supervised.

Also, people who were considered physically inactive in the present study presented a worse sleep efficiency, which may harm several physiological pathways[6]. The poor sleep quality has been considered a global concern matter in public health, that is why the need to spread the sleep hygiene[29] strategies worldwide must be regarded as to attenuate the sleep issues.

The current pandemic is also influencing dietary habits worldwide[30]. Our results suggest higher scores in diet and bulimia scales in both home-based exercise

group and physically inactive group during the confinement compared to the physically inactive group before the confinement. Although all the groups have not presented eating disorders[19], the increased scores in diet and bulimia scales may suggest that the home-based exercise group and the physically inactive group during the confinement are more concerned about intake caloric foods and physical fitness to avoid excessive weight gain[18] compared to the physically inactive group before the confinement.

Home-based exercise has already been recommended as an effective strategy to improve health and the immune system[9]. Besides, the present study points out that this strategy may also induce improvements to determinants for good mental health such as quality of life, sleep quality, and attenuate anxiety, depression, and stress symptoms.

As limitation factors, although the sample size has attended the assumptions for the sample size calculation, further studies are needed to assess a higher number of volunteers, as well as a gender-matched analysis. Also, the present study did not use gold-standard instruments to analyze the primary outcomes; however, all instruments used are were assessed for validity and reproducibility.

In conclusion, our observational results showed that individuals who have performed exercise at home during the COVID-19 pandemic presented a better quality of life, self-reported sleep quality, and psychological status compared to those physically inactive. Thus, we suggest that the maintenance of home-based exercise, along with adequate nutrition, is an essential strategy to attenuate the adverse effects of confinement on both physical and psychological status during the COVID-19 pandemic.

Conflict of interests

The authors declare no conflict of interest.

Authors' Contributions

Solon Júnior LJF participated in all stages of the research, organization, and analysis of statistical data, as well as relevant critical review of the intellectual content and approval of the final version of the paper. Fortes LS participated in the interpretation of the data, writing, and relevant critical review of the article. Barbosa BT has contributed to data analysis interpretation, as well as a relevant critical review of the intellectual content and approval of the final version of the paper. Feitosa Júnior JVA participated in data collection and analysis. Ribeiro CHT participated in data collection and analysis. Silva Neto L participated in the data interpretation, writing, and critical review of the intellectual content and approval of the final version of the paper.

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