

CUIDADO É FUNDAMENTAL

Escola de Enfermagem Alfredo Pinto – UNIRIO

ORIGINAL ARTICLE

DOI: 10.9789/2175-5361.rpcfo.v17.13478

IS CHRONIC POST-COVID SYNDROME ASSOCIATED WITH PHYSICAL ACTIVITY TIME IN ADOLESCENCE?

*A síndrome pós-covid crônica está associada ao tempo de atividade física na adolescência?**¿El síndrome crónico post-covid está asociado al tiempo de actividad física en la adolescencia?***Gustavo Baroni Araujo¹** **Michelle Moreira Abujamra Fillis²** **Helio Serassuelo Junior³** 

RESUMO

OBJETIVO: investigar a associação entre tempo de prática de atividade física e síndrome pós-covid crônica na adolescência. **Método:** estudo quantitativo transversal composto por 312 adolescentes com média da idade de 14,97±1,87 anos com diagnóstico confirmado da COVID-19. Utilizou-se o IPAQ versão curta para investigar o tempo de atividade física e o questionário “Manifestações clínicas de quadro prolongado”, para investigar a síndrome pós-covid crônica. Qui-quadrado e Regressão Logística Binária foram aplicados para verificar se atividade física, sexo e idade são previsores do desenvolvimento da síndrome pós-covid. Em todas as análises a significância adotada foi <0,05 e no software SPSS versão 27. **Resultados:** as variáveis preditoras para o desenvolvimento da síndrome foram: Ser do sexo feminino (OR= 4,76; IC 95%= 4,49 - 4,92, p<0,01); pós-púbere (OR=3,41; IC 95%= 3,15 - 3,57) e ser insuficientemente ativo (OR=4,68; IC 95%= 4,27 - 4,89). **Conclusão:** a síndrome pós-covid crônica apresentou associação com menor tempo de atividade física na adolescência.

DESCRIPTORES: Síndrome pós-covid; Atividade física; Adolescência.

¹ Universidade Estadual de Londrina, Londrina, Paraná, Brazil.

² Universidade Estadual do Norte do Paraná, Jacarezinho, Paraná, Brazil.

³ Universidade Estadual de Londrina, Londrina, Paraná, Brazil.

Received: 2024/08/06. **Accepted:** 2025/02/13.

AUTOR CORRESPONDENTE: Gustavo Baroni Araujo

E-mail: gustavo.araujo@uel.br

How to cite this article: Araujo GB, Fillis MMA, Serassuelo Junior H. Is chronic post-COVID syndrome associated with physical activity time in adolescence? *R Pesq Cuid Fundam (Online)*. [Internet]. 2025 [cited year month day];17:e13478. Available from: <https://doi.org/10.9789/2175-5361.rpcfo.v17.13478>.



ABSTRACT

OBJECTIVE: to investigate the association between physical activity duration and chronic post-COVID syndrome in adolescence. **Method:** a cross-sectional quantitative study comprising 312 adolescents with a mean age of 14.97 ± 1.87 years and a confirmed diagnosis of COVID-19. The short version of the IPAQ was used to assess physical activity duration, and the “Clinical Manifestations of Prolonged Condition” questionnaire was employed to investigate chronic post-COVID syndrome. Chi-square and Binary Logistic Regression analyses were applied to determine whether physical activity, sex, and age predict the development of post-COVID syndrome. A significance level of <0.05 was adopted in all analyses using SPSS version 27. **Results:** the predictive variables for syndrome development were: being female (OR=4.76; 95% CI=4.49 – 4.92, $p<0.01$); post-pubertal stage (OR=3.41; 95% CI=3.15 – 3.57); and being insufficiently active (OR=4.68; 95% CI=4.27 – 4.89). **Conclusion:** chronic post-COVID syndrome was associated with reduced physical activity duration in adolescence.

DESCRIPTORS: Post-COVID syndrome; Physical activity; Adolescence.

RESUMEN

OBJETIVO: investigar la asociación entre la duración de la actividad física y el síndrome pos-COVID crónico en la adolescencia. **Método:** estudio cuantitativo transversal compuesto por 312 adolescentes con una edad media de 14.97 ± 1.87 años y diagnóstico confirmado de COVID-19. Se utilizó la versión corta del IPAQ para evaluar la duración de la actividad física y el cuestionario “Manifestaciones Clínicas de Cuadro Prolongado” para investigar el síndrome pos-COVID crónico. Se aplicaron análisis de Chi-cuadrado y Regresión Logística Binaria para verificar si la actividad física, el sexo y la edad son predictores del desarrollo del síndrome pos-COVID. En todos los análisis, se adoptó un nivel de significancia de $<0,05$ en el software SPSS versión 27. **Resultados:** las variables predictoras para el desarrollo del síndrome fueron: ser del sexo femenino (OR=4,76; IC 95%=4,49 - 4,92, $p<0,01$); etapa pospúber (OR=3,41; IC 95%=3,15 - 3,57); y ser insuficientemente activo (OR=4,68; IC 95%=4,27 - 4,89). **Conclusión:** el síndrome pos-COVID crónico presentó asociación con menor tiempo de actividad física en la adolescencia.

DESCRIPTORES: Síndrome pos-COVID; Actividad física; Adolescencia.

INTRODUCTION

Social isolation as a result of the outbreak of cases of the new coronavirus has led to sudden changes in the daily lives and routines of the entire population. As part of the safety protocols, the closure of public and private leisure, health and sports venues became mandatory, given the rapid spread of the virus in collective spaces. Given this scenario, some healthy habits have been reduced as a result of these preventive measures, including physical activity.^{1,2}

The consensus that physical activity is a fundamental habit for maintaining health, physical fitness, quality of life and well-being in adolescence has already been proven and well established in the scientific literature^{3,4} and by various health bodies. According to the World Health Organization (WHO), the recommendation is to do at least 60 minutes of moderate or vigorous intensity physical activity at least three days a week for better health outcomes.⁵

The benefits of physical activity include improving the cardiorespiratory system, strengthening the musculoskeletal system, strengthening bones, as well as making a positive contribution to mental health and social relationships⁶. In addition, physical activity helps to reduce body fat, improve

the lipid profile and control systolic blood pressure, acting as a protective factor against the development of chronic non-communicable diseases (CNCDs).⁷

In the context of the pandemic, the practice of physical activity has decreased dramatically due to the lack of conditions, causing the population to remain physically inactive for longer. Added to this, activities of daily living such as occupation and education began to be carried out from home, causing time spent in sedentary behavior to increase during social isolation. When we relate physical activity to the infection caused by SARS-CoV-2, we see that its benefits can be of great importance in mitigating the damage to health caused by the infection.⁸

New studies^{9,10,11} have sought to investigate the effects of post-COVID-19 on the physical and mental health of the population. Chronic post-COVID syndrome (or long COVID), which includes symptoms and abnormalities present beyond 12 weeks of the acute phase of COVID-19 and not attributable to alternative diagnoses. Because it is a recent disease, little is known about the long-term impacts of infection in adolescents, so monitoring these patients is essential to better understand the causes and consequences of the syndrome in this population.

Thus, analyzing the relationship between physical activity and chronic post-COVID syndrome is essential to better understand and measure the impact of this habit as a protective factor. Given this discussion, the aim of this study will be to investigate the association between weekly physical activity and chronic post-COVID syndrome in adolescents in relation to gender and age group.

METHOD

Design and sample

This is a cross-sectional study of a quantitative nature. The sample selected for convenience consisted of 312 adolescents aged between 11 and 17 (14.97 ± 1.87) who had a confirmed diagnosis of COVID-19 in the municipality of Londrina-PR, selected through access to the “Notifica-Covid” platform. The platform allowed access to patients’ personal information, such as: name, telephone number, name of companion, among others. Patients who required hospitalization were not included in this study, nor were laboratory materials or specific COVID-19 tests collected, given that the participants had previously tested positive in Primary Health Care services in the municipality of Londrina.

Data collection

As this was a study with minors, contact was initially made with the parents/guardians by telephone, at which point the researcher informed the guardian of the study’s objectives and justifications. Once the parent/guardian had agreed to the Free and Informed Consent Form, the adolescent was given the Free and Informed Consent Form. Once they had agreed, the adolescents were ready to answer the questionnaires. This study was accepted by the research ethics committee (CEP) of the State University of Londrina (CAAE: 58074422.6.0000.5231).

Data was collected using an online digital form created using the Google platform (Google Forms) and sent via WhatsApp after the consent of the minor and their guardian. Google Forms makes it possible to create multiple-choice, discursive and evaluative questions and answers on a numerical scale, among other options. The document contained all the information about the study’s objectives and justification, questions about the patient’s demographic characteristics (name, gender and age) and the questionnaire to assess physical activity and chronic post-COVID syndrome. Before the questionnaire was administered, the respondent was given instructions on how to complete it. The average time taken to complete the questionnaire was approximately ten minutes.

Physical activity time

The questionnaire used to investigate physical activity time was the International Physical Activity Questionnaire (IPAQ) - a short version which allows the energy expenditure of physical activities to be estimated, seeking to investigate the practice of physical activity in different contexts. It consists of eight open-ended questions which make it possible to estimate the time spent per week in different domains of physical activity (walking and physical effort of moderate and vigorous intensity) and sedentary behavior. To better organize and manage the data collected, they were categorized into two groups: 1) “Physically active” (those who meet the recommendations or practice more physical activity than the WHO recommendations of 180 minutes per week); and 2) “Insufficiently active” (those who do not meet the WHO recommendations of 180 minutes per week).

Chronic post-COVID syndrome

To investigate chronic post-COVID syndrome, we used the questionnaire “Clinical manifestations of a prolonged condition - Post-COVID Syndrome (PCS)”, structured with the main symptoms of long-term COVID in adolescents. The questionnaire was made available in a “tick box” format, allowing the respondent to select more than one option. The “Other” field was also included with the possibility of an open response, where the participant could include any other less common symptom not listed above.

Data analysis

Data analysis was carried out: Descriptive analysis to characterize the sample (age and number of adolescents by age, presence of post-COVID syndrome and main symptoms found). The numerical variables were tested for Gaussian distribution using the Shapiro-Wilk test.

When the distribution assumption was accepted, the variables were presented as mean and significance. The chi-square test (with or without Yates’ correction) or Fisher’s exact test were used to assess the association between categorical variables. Finally, Binary Logistic Regression was used to check whether physical activity and gender are predictors of the development of chronic post-COVID syndrome (CPS).

Initially, the assumption of multicollinearity for regression was tested, where PCS-C was the dependent variable and gender and classification of physical activity practice (Physically active or Insufficiently active) and age group as independent variables. Considering that the prerequisites were met, Binary Logistic Regression was used where the

dependent variable was SPC-C and the covariates were gender and age (categorized into three groups: G1: Pre-pubescent 11-12 years; G2: Pubescent 13-14 years); and G3: Post-pubescent) (TANNER, 1962). The Odds Ratio was adjusted and a 95% CI was used to express its magnitude. In all statistical analyses, significance was set at <0.05 .

The data was tabulated in the Excel spreadsheet editor of the Microsoft Office package and processed in the SPSS statistical program, version 27.0.

RESULTS

Of the 312 adolescents who took part in the study, 162 (51.9%) were female and 150 (48.1%) male. Of these, 75 (24%) had chronic post-COVID syndrome, 61 females (81.3%) and 14 males (18.7%). The median number of CPS symptoms was 1 [0-3]. Table 1 shows the presence of C-CPS by gender and age and Table 2 the prevalent symptoms of C-CPS.

Table 1 - Absolute and relative values for the presence of chronic post-covid syndrome according to gender and age.

Age	n= 312 (100%)	Gender (n)		SPC-C by gender		SPC-C by age
		F (♀)	M (♂)	F (♀)	M (♂)	
11	17 (5,5%)	7 (41,1%)	10 (58,9%)	0	0	0 (0%)
12	31 (9,9%)	15 (48,4%)	16 (51,6%)	4	1	5 (6,7%)
13	29 (9,4%)	17 (58,6%)	12 (41,4%)	4	1	5 (6,7%)
14	36 (11,5%)	19 (52,7%)	17 (47,3%)	6	1	7 (9,3%)
15	43 (13,7%)	15 (34,8%)	28 (65,2%)	5	4	9 (12%)
16	78 (25%)	40 (51,3%)	38 (48,7%)	15	2	17 (22,7%)
17	78 (25%)	49 (62,8%)	29 (37,2%)	28	4	32 (42,6%)

Note: SPC-C: Chronic post-COVID syndrome.

Source: prepared by the authors, 2024.

Table 2 - Prevalent symptoms of chronic post-COVID syndrome reported according to gender.

Sintomas da SPC-C				
Symptoms	n	Percentage (n total)	Female (n)	Male (n)
Fatigue and/or tiredness	47	62,6%	35 (74,4%)	12 (25,6%)
Irritability and/or mood swings	20	26,6%	15 (75%)	5 (25%)
Malaise	13	17,3%	13 (100%)	0 (0%)
Headache	8	10,6%	8 (100%)	0 (0%)
Dyspnea	6	8%	6 (100%)	0 (0%)
Difficulty sleeping	4	5,3%	3 (75%)	1 (25%)
Myalgia	3	4%	2 (66,7%)	1 (33,3%)

Note: SPC-C: Chronic post-COVID syndrome.

Source: prepared by the authors, 2024.

With regard to weekly physical activity, 213 (68.2%) of the 312 adolescents met the WHO recommendations for PA time and 99 (31.8%) did not. Table 4.3 shows the average PA time (min/week) by age.

Table 3 - Average weekly physical activity time (min/week) by gender and age in adolescents with and without chronic post-COVID syndrome.

Age	Gender		Average PA time (min/week) by age	Average PA time (min/week) by gender	
	F (♀)	M (♂)		F (♀)	M (♂)
11	7	10	253 minutes	221*	274
12	15	16	245 minutes	215*	268
13	17	12	231 minutes	202*	273
14	19	17	215 minutes	182*	241
15	15	28	207 minutes	175*	238
16	40	38	218 minutes	187*	249
17	49	29	226 minutes	196*	257
With SPC-C (n=75)			148 minutes	139*	156
Without SPC-C (n=237)			215 minutes	192*	237

Note: PA: Physical activity; SPC-C: Chronic post-COVID syndrome

*p<0.05 between sexes.

In all age groups, the minimum 180 minutes of physical activity per week recommended by the WHO was met. At the age of 11, the average weekly time was higher than at any other age. In both sexes, it can be seen that from the age of 11 to 15, the amount of physical activity per week decreases and increases again from the age of 16. At all ages, girls' weekly physical activity time was lower than boys' (p=0.01). Statistically significant differences were found in the weekly

PA time of adolescents who had at least one C-CPS symptom compared to adolescents without C-CPS (p<0.01). The average weekly PA time of adolescents with prolonged COVID-19 was 148 minutes, while those without CPS practiced an average of 215 minutes per week.

Table 4 shows the odds ratio of developing C-CPS according to the variables gender, age group and classification of physical activity time.

Table 4 - Odds ratios for developing SPC-C according to sex, age group and physical activity classification.

Variables	%	OR	IC 95%	p-value
Gender	-	-	-	-
Male	18,7%			
Female	81,3%	4,76	4,49 – 4,92	<0,01
Age Group	-	-	-	-
Pre-pubescent	15,5%			
Pubertal	20,8%			
Post-pubescent	63,7%	3,41	3,15 – 3,57	<0,01
Classification	-	-	-	-
Physically active	68,2%			
Insufficiently active	31,8%	4,68	4,27 – 4,89	<0,01

Note: OR: Odds ratio; CI: Confidence interval.

The Binary Logistic regression showed that the model containing the gender variable was significant [$X^2(1) = 102.880$; $p < 0.01$, $R^2 \text{Nagelkerke} = 0.42$], showing that females were more likely to develop PCS-C (OR= 4.76; 95% CI= 4.49 - 4.92, $p < 0.01$) than males. With regard to age groups, adolescents in the post-pubertal maturational stage (15 - 17 years) were more likely (OR=3.41; 95% CI= 3.15 - 3.57) to develop the syndrome compared to the other two groups. Finally, not meeting the recommendations for weekly physical activity time was a significant predictor (OR=4.68; 95% CI= 4.27- 4.89) for a C-CPS condition.

DISCUSSION

The aim of this study was to investigate the association between weekly physical activity time and chronic post-COVID syndrome in adolescents in relation to gender and age group. The findings showed that among the 312 adolescents, 75 (24%) reported having at least one symptom of chronic post-COVID syndrome. Similarly, a previous study¹² of 80,071 children and adolescents showed that 25% of children and adolescents infected with the SARS-CoV-2 virus developed the syndrome, even without hospitalization. In addition, the prevalence of post-covid syndrome in hospitalized patients reached 29.2%.

Considering these data, it is possible to use them as a reference for the results of the present study, since all the adolescents who made up the sample used primary care health services in Londrina.

With regard to gender, of the 75 adolescents who had the syndrome, 61 (81.3%) were female. It is known that the negative consequences of the infection both in the acute phase (symptoms) and after recovery (symptoms of post-covid syndrome) were significantly greater in this gender. It

is believed that the main factor favoring these conditions is related to the differences in the function of the immune and physiological systems between men and women. In addition, it is worth highlighting the impact of the particular conditions of each individual which may or may not contribute to the development of prolonged symptoms of the infection, such as the existence of comorbidities, autoimmune diseases, habits and lifestyle.¹³⁻¹⁵

When comparing the age variable, the group of pre-pubertal adolescents (11 and 12 years old) were less susceptible to developing chronic post-covid syndrome than the pubertal and post-pubertal groups. The findings of the study¹⁶ carried out by sending a questionnaire to the guardians of children and adolescents to investigate the prevalence of long COVID at younger ages found that of the 10,997 guardians who took part in the survey, the prevalence of long COVID was 26.5% in children aged between 4 and 11, while in adolescents aged between 12 and 14 the prevalence was 32.5%. Thus, it is possible to identify that younger ages are less likely to develop prolonged cases of the infection. It is also worth reflecting on the possibility of children not reporting and informing their

guardians about possible prolonged symptoms of the infection, or even not understanding the symptoms, if they do feel them, contributing to the lower prevalence in this age group.

Various studies¹⁷⁻¹⁹ carried out in different countries around the world have shown that individuals in adulthood are more likely to develop post-COVID syndrome. Although the sample in this study was made up of adolescents, the findings corroborate what is in the literature, given that the prevalence of chronic post-COVID syndrome increased moderately during puberty and intensified in the post-pubertal phase, periods that mark the transition from adolescence to adulthood through physical and hormonal, psychological and social changes.²⁰

The presence of symptoms of post-COVID syndrome can vary in intensity and time, and can occur persistently or occasionally in different parts of the body or organs, compromising the body's functionality.²¹ It was also found that the most common symptoms after the acute phase of the infection were persistent cough, difficulty breathing and fatigue. In this study, the symptom with the highest prevalence was "fatigue" (62.6%), similar to the findings of Shen et al.²² where the prevalence of fatigue in the long covid varied considerably from 15 to 87%, results that were expected given the known damage caused by the infection, mainly affecting the respiratory tract.

It should also be noted that the consequences of post-COVID syndrome are not just limited to physical symptoms, but also psychological ones. The symptom "Irritability and mood swings" had a prevalence of 26.6% in this group of adolescents. The findings seem similar to those of a study²³ carried out with adults, where the prevalence of psychiatric or neurological problems was 34% and 17% of patients were diagnosed with anxiety and mood disorders six months after the acute phase of the infection, possibly as a result of the inflammatory response syndrome. When it comes to adolescence, this data seems alarming when we consider the damage done in this period of transition to adulthood, reinforcing the need to adopt specific therapeutic interventions so that psychological integrity is maintained.

With regard to physical activity time, at all ages the minimum recommendation of 180 minutes per week recommended by the WHO was met, however, when separating the groups of adolescents with C-CPS and without C-CPS, it can be seen that the average weekly physical activity time of adolescents with the syndrome is below the WHO recommendations. It is believed that these results in relation to age are associated with the higher weekly physical activity time in adolescents without C-CPS, in contrast to the lower time in

adolescents with C-CPS. It is possible that these findings can be justified considering the period in which this study was carried out in mid-2022, when spaces for practicing physical activity (clubs, courts, squares, gyms, spaces for collective classes) began to operate without restrictions after almost two years without full operation or strict safety protocols.

Thus, given the large amount of time spent in social isolation and the few opportunities for leisure, it is known that the habit of practicing physical activity, in addition to contributing to health, is also related to socialization, leisure time and improved mental health, factors of great relevance after the pandemic.²⁴

The group of pre-pubescent adolescents were more physically active than the group of pubescent and post-pubescent. It is believed that the greater time spent in physical activity at the age of 11 and 12 in both sexes is related to the end of childhood, where physical activity is naturally a more common habit due to the greater free time and fewer commitments, tasks and responsibilities assigned to them, which allows for a diversified practice (sports activities, school physical education, ballet, among others). Physical activity is very important at all stages of life, especially at a younger age, contributing to the overall health of children and adolescents.

At all ages, the average time spent in physical activity was higher among boys. The differences between the sexes are evident at all ages of adolescence and were already occurring even before the pandemic and SARS-CoV-2 infection. The study²⁶ carried out in 2019 with 1.6 million adolescents aged between 11 and 17 showed that in Brazil, 89.4% of girls do not meet the weekly recommendations. One possible explanation for this data may be related to the culture itself, where girls have more responsibilities and social demands, which may be a factor that reflects on the time available for physical activity.²⁷ These disparities tend to continue throughout life, with men practicing more physical activity during leisure time and women less due to excessive tasks, commitments and motherhood in addition to the occupational period.²⁸

The weekly physical activity time of adolescents who had a chronic post-COVID syndrome was 148 minutes, not meeting the WHO recommendation, confirming the hypothesis that physical activity is a protective factor for the development of prolonged COVID-19, in agreement with a study²⁹ of adults who had at least one persistent symptom of the infection had a 57% risk of being insufficiently active. In the context of disease prevention and health maintenance, physical activity has often been recommended by various health professionals, emphasizing the need to value physical activity after the pandemic and contamination by SARS-CoV-2.

In addition, the variables that predicted chronic post-COVID syndrome during adolescence were: being female, post-pubertal and insufficiently active. Female gender was shown to be a variable associated with chronic post-COVID syndrome ($p < 0.01$), so girls were 4.76 (4.49 - 4.92 95% CI) more likely to have the syndrome than boys. The group of adolescents with the highest risk of developing the syndrome were post-pubescent ($p < 0.01$), with 3.41 (3.15 - 3.57 95% CI) chances of developing the syndrome compared to the group of pre-pubescent and pubescent adolescents. The data reinforces the importance of developing strategies and interventions aimed at this population as a way of minimizing the long-term damage caused by the infection.

Finally, adolescents who do not meet physical activity recommendations are more exposed ($p < 0.01$) and have a 4.68 (4.27 - 4.89 95% CI) chance of presenting a chronic post-COVID syndrome. It should also be noted that an active lifestyle and the adoption of healthy habits contribute to improving quality of life, which is even more necessary after the pandemic and mass contamination by the SARS-CoV-2 virus.

As a limitation, the cross-sectional design of this study did not make it possible to monitor the symptoms of post-COVID syndrome from the subacute phase of the infection to investigate possible variability in the intensity and duration of these symptoms. In addition, the questionnaire used to measure physical activity time (IPAQ short version) in recall form is subject to bias (forgetfulness, underestimation or devaluation of information), however, at the time the research project was drawn up in mid-2021, it was not possible to use laboratory equipment or apply it in person due to safety protocols, for this reason, the sample was made up exclusively of adolescents who had access to the internet and familiarity with the digital form.

On the other hand, the quantitative study is highly relevant in terms of research into chronic post-COVID syndrome in adolescence, as it was made up of a large number of adolescents across a wide age range. In the field of Physical Education, studies involving post-COVID syndrome are still scarce, so the findings seem valuable for investigations into the impact of physical activity as a protective factor for prolonged COVID-19 conditions at a younger age, as well as promoting and broadening the possibilities for new debates and intervention studies in more exposed populations. It is also suggested that new experimental, longitudinal and quantitative and qualitative studies be carried out as a way of monitoring and measuring health outcomes after contamination by SARS-CoV-2.

CONCLUSION

Chronic post-COVID syndrome was associated with less physical activity during adolescence. The average time of physical activity of the group of adolescents who had the syndrome was 148 minutes, and they were classified as insufficiently active according to the recommendations proposed by the WHO. In addition, the predictors for developing the syndrome were: being female and post-pubertal.

The findings highlight the importance of physical activity as a protective factor against the adverse health effects of COVID-19 and reinforce the need for this habit to become increasingly frequent as a preventative, early and non-pharmacological treatment.

REFERENCES

1. Pereira MD, Oliveira LC, Costa CFT, Bezerra MCO, Pereira MD, Santos CKA, et al. A pandemia de COVID-19, o isolamento social, consequências na saúde mental e estratégias de enfrentamento: uma revisão integrativa. *Res Soc Dev*. [Internet]. 2020 [acesso em 13 de fevereiro 2024];7:e652974548-8. Disponível em: <https://doi.org/10.33448/rsd-v9i7.4548>.
2. Mattos SM, Pereira DS, Moreira TMM, Cesari VRF, Gonzalez RH. Recomendações de atividade física e exercício físico durante a pandemia Covid-19: revisão de escopo sobre publicações no Brasil. *Rev Bras Ativ Fís Saúde*. [Internet]. 2020 [acesso em 13 de fevereiro 2024];25. Disponível em: <https://doi.org/10.12820/rbafs.25e0176>.
3. Menezes GRS, Silva AC, Silvério LC, Medeiro ACT. Impacto da atividade física na qualidade de vida de idosos: uma revisão integrativa. *Braz J Health Ver*. [Internet]. 2020 [acesso em 13 de fevereiro 2024];3(2). Disponível em: <https://doi.org/10.34119/bjhrv3n2-097>.
4. Dumith SC. Atividade física e qualidade de vida de professores universitários. *Cad Saúde Colet*. [Internet]. 2020 [acesso em 13 de fevereiro 2024];28(3). Disponível em: <https://doi.org/10.1590/1414-462X202028030593>.
5. Organização Mundial da Saúde. Diretrizes da OMS para atividade física e comportamento sedentário num piscar de olhos [Internet]. Disponível em: <https://iris.who.int/bitstream/handle/10665/337001/9789240014886-por.pdf>.
6. Faustino AM, Neves R. Benefícios da prática de atividade física em pessoas idosas: revisão de literatura. *Rev Eletr Acervo Saúde*. [Internet]. 2020 [acesso em 13 de fevereiro 2024];12(5):e3012-2. Disponível em: <https://doi.org/10.25248/reas.e3012.2020>.

7. Veloso JC. Benefícios e riscos da atividade física em doenças crônicas não transmissíveis (DCNT) como diabetes, hipertensão hipercolesterolêmica e síndrome metabólica. [Internet]. 2024. Disponível em: <https://pesquisa.bvsalud.org/portal/resource/pt/una-9968>.
8. Araujo GB, Barros SP, Santos JG, Ferreira BR, Lima LWH, Lopes LG, et al. Atividade física e exercício físico pós COVID-19: o que diz a literatura? Concilium. [Internet]. 2022 [acesso em 13 de fevereiro 2024];22(6). Disponível em: <http://dx.doi.org/10.53660/CLM-542-626>.
9. Gerônimo AMM, Comassetto I, Andrade CRAG, Silva RRS, et al. Além do SARS-CoV-2, as implicações da Síndrome Pós-COVID-19: o que estamos produzindo? Res Soc Dev. [Internet]. 2021 [acesso em 13 de fevereiro 2024];10(15):e336101522738. Disponível em: <https://doi.org/10.33448/rsd-v10i15.22738>.
10. Batista KBC, Fernandez MZ, Barbeira LG, Silva ET, Pedi Vd, Pontes BMLM, et al. Overview of long COVID in Brazil: a preliminary analysis of a survey to think about health policies. Cad Saúde Pública. [Internet]. 2024 [cited 2025 feb 11];40(4):e00094623-3. Available from: <https://doi.org/10.1590/0102-311XPT094623>.
11. Lobo LAC, Rieth CA. Saúde mental e Covid-19: uma revisão integrativa da literatura. Saúde Debate. [Internet]. 2021 [acesso em 13 de fevereiro 2024];45(130). Disponível em: <https://doi.org/10.1590/0103-1104202113024>.
12. Lopez-Leon S, Ostrosky TW, Del Vale NCA, Perelman C, Sepúlveda R, Rebolledo PA, et al. Long-COVID in children and adolescents: a systematic review and meta-analyses. Sci Rep. [Internet]. 2022 [cited 2025 feb 11];12(1). Disponível em: <https://doi.org/10.1038/s41598-022-13495-5>.
13. Fillis MMA, Laskovski L, Felcar JM, Trelha CS, et al. Prevalência de sintomas persistentes em indivíduos infectados pelo novo coronavírus após 30 dias de diagnóstico. Rev Saúde Pública Paraná. [Internet]. 2021 [acesso em 13 de fevereiro 2024];4(4). Disponível em: <https://doi.org/10.32811/25954482-2021v4n4p44>.
14. Wu M. Síndrome pós-Covid-19 - Revisão de Literatura. Rev Biociências. [Internet]. 2021 [acesso em 13 de fevereiro 2024];27(1). Disponível em: <https://periodicos.unitau.br/biociencias/article/view/3313>.
15. Bragatto MG, Almeida BM, Sousa GC, Silva GA, Pessoa LSG, Silva LK, et al. Estudo das sequelas neuroanatômicas associadas à Síndrome Pós-COVID-19. Rev Eletr Acervo Saúde. [Internet]. 2021 [acesso em 13 de fevereiro 2024];13(12):e8759-9. Disponível em: <https://doi.org/10.25248/reas.e8759.2021>.
16. Berg SK, Nielsen SB, Nygaard U, Bundgaard H, Pernille P, Rotvig C, et al. Long COVID symptoms in SARS-CoV-2-positive adolescents and matched controls (LongCOVIDKidsDK): a national, cross-sectional study. Lancet Child Adolesc Health. [Internet]. 2022 [cited 2025 feb 11];6(4). Disponível em: [https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642\(22\)00004-9/fulltext](https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642(22)00004-9/fulltext).
17. Willi S, Luthold R, Adão C, Hanggi NV, Sejdiu D, Scaff C, et al. COVID-19 sequelae in adults aged less than 50 years: A systematic review. Travel Med Infect Dis. [Internet]. 2021 [cited 2025 feb 11];40:101995. Available from: <https://doi.org/10.1016/j.tmaid.2021.101995>.
18. Leviner S. Recognizing the Clinical Sequelae of COVID-19 in Adults: COVID-19 Long-Haulers. J Nurse Pract [Internet]. 2021 [cited 2025 feb 11];17(8). Available from: <https://doi.org/10.1016/j.nurpra.2021.05.003>.
19. Perlis RH, Santillana M, Ognyanova K. Prevalence and correlates of long COVID symptoms among US adults. JAMA Netw Open. [Internet]. 2022 [cited 2025 feb 11];5(10):e2238804. Available from: <https://doi.org/10.1001/jamanetworkopen.2022.38804>.
20. Brêtas JRS, Moreno RS, Eugenio DS, Sala DCP, Vieira TF, Bruno PR. Os rituais de passagem segundo adolescentes. Acta Paul Enferm. [Internet]. 2008 [acesso em 11 de fevereiro 2025];21(3). Disponível em: <https://doi.org/10.1590/S0103-21002008000300004>.
21. Miranda DAP, Gomes SVC, Filgueiras PS, Corsini SA, Almeida NBF, Silva RA, et al. Long COVID-19 syndrome: a 14-month longitudinal study during the two first epidemic peaks in Southeast Brazil. Trans R Soc Trop Med Hyg. [Internet]. 2022 [cited 2025 feb 11];116(11). Available from: <https://doi.org/10.1093/trstmh/trac030>.
22. Shen Q, Joyce EE, Ebrahimi OV, Didriksen M, Lovik A, Sævarsdóttir KS, et al. COVID-19 illness severity and 2-year prevalence of physical symptoms: an observational study in Iceland, Sweden, Norway and Denmark. Lancet Reg Health Eur. [Internet]. 2023 [cited 2025 feb 11];35:100756. Disponível em: <https://doi.org/10.1016/j.lanepe.2023.100756>.
23. Taquet M, Sillett R, Zhu L, Mendel J, Camplisson I, Dercon Q, et al. Neurological and psychiatric risk trajectories after SARS-CoV-2 infection: an analysis of 2-year retrospective cohort studies. Lancet Psychiatry. [Internet]. 2022 [cited 2025 feb 11];9(10). Available from: <https://doi.org/10.1016/>.

24. Dutra AS, Araujo RAS, Silva AP. A prática de atividade física em tempos de pandemia de COVID-19 no IFMA. Res Soc Dev. [Internet]. 2022 [acesso em 11 de fevereiro 2025];11(3):e23411326452. Disponível em: <https://doi.org/10.33448/rsd-v11i3.26452>.