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Return to activities of daily living in patients with long covid: a randomized clinical trial

Retorno às atividades de vida diária em pacientes com covid-longa: um ensaio clínico randomizado

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ABSTRACT

Introduction: Long covid is a concern due to persistent functional impairments. Physical exercise may mitigate these effects; however, it is still necessary to understand how these benefits are perceived in the return to activities of daily living (ADLs). Objective: To evaluate the return to impaired ADLs in survivors with long covid after a multicomponent physical training program. Methods: A randomized controlled clinical trial conducted over 24 weeks. The Intervention Group (IG) par-ticipated in a multicomponent training program, while the Control Group (CG) received physical activity recommendations. ADLs were assessed using the Patient-Specific Functional Scale (0 = worst performance; 10 = best performance) at baseline, 12, and 24 weeks. Means were analyzed using Generalized Estimating Equations (α = 0.05). Results: A total of 29 adults (16 women; 52.1 ± 13.9 years), previously hospitalized due to covid-19, participated, presenting persistent symptoms such as fatigue, dyspnea, myalgia, and memory loss, and reporting 2.8 ± 1.3 limited ADLs. Both groups showed improvement in ADLs over time (IG: baseline 15.0 ± 1.8 points; 12 weeks 20.7 ± 2.2 points; 24 weeks 22.5 ± 2.4 points | CG: baseline 10.7 ± 1.6 points; 12 weeks 17.6 ± 2.8 points; 24 weeks 20.8 ± 3.0 points), with no statistically significant differences between groups. Conclusion: Improvements in ADL performance were observed in both groups over time, suggesting benefits associated with both structured training and physical activity recommendations, as well as a possible influence of the natural course of recovery, reinforcing the relevance of physical activity guidance in the rehabilitation of this population and clinical context.

Keywords: Physical exercise; Covid-19; Rehabilitation; Health.

RESUMO

Introdução: A covid-longa preocupa devido aos prejuízos funcionais persistentes. O exercício físico pode mitigar esses efeitos; contudo, ainda é necessário compreender como esses benefícios são percebidos no retorno às atividades de vida diária (AVDs). Objetivo: Avaliar o retorno às AVDs percebidas como prejudicadas em sobreviventes com covid-longa após treinamento físico multicomponente. Métodos: Ensaio clínico randomizado controlado, conduzido por 24 semanas. O Grupo Intervenção (GI) participou de um programa de treinamento multicomponente, enquanto o Grupo Controle (GC) recebeu recomendações de atividade física. As AVDs foram avaliadas pela Escala Funcional Específica do Paciente (0 = pior execução; 10 = melhor execução) no pré-intervenção, 12 e 24 semanas. As médias foram analisadas por Equações de Estimativas Generalizadas (α = 0,05). Resultados: Participaram 29 adultos (16 mulheres; 52,1 ± 13,9 anos), previamente hospitalizados por covid-19, com sintomas persistentes como fadiga, dispneia, mialgia e perda de memória, relatando 2,8 ± 1,3 AVDs limitadas. Ambos os grupos apresentaram melhoras às AVDs ao longo do tempo (GI: pré 15,0 ± 1,8 pontos; 12 semanas 20,7 ± 2,2 pontos; 24 semanas 22,5 ± 2,4 pontos | GC: pré 10,7 ± 1,6; 12 semanas 17,6 ± 2,8 pontos; 24 semanas 20,8 ± 3,0 pontos), sem diferença estatisticamente significativa entre grupos. Conclusão: Observou-se melhora das AVDs em ambos os grupos ao longo do tempo, sugerindo benefícios do treinamento e das recomendações de atividade física, além da possível influência do curso natural da recuperação, reforçando a relevância das orientações de atividade física na reabilitação dessa população e contexto clínico.

Palavras-chave: *Exercício físico; Covid-19; Reabilitação; Saúde.*

Introduction

With the reduction in acute covid-19 cases and their decreased severity, a new challenge has emerged: the rehabilitation of individuals presenting with long covid[1]. Although this condition can affect people across different levels of disease severity, it is more prevalent among those who experienced severe acute illness, underwent prolonged hospitalization, had comorbidities, or already exhibited impaired physical function prior to infection[2,3].

Long covid is characterized by the persistence of physical, psychological, and cognitive symptoms for at least three months following the initial infection, constituting a continuous or progressive disease state with multisystem involvement[4]. The most frequently reported symptoms include fatigue, dyspnea, myalgia, sleep disturbances, cognitive impairment, anxiety, and depression. However, more than 200 clinical manifestations associated with long covid have already been documented[3,5]. Furthermore, its duration is highly variable, with reports in the literature describing symptoms persisting for up to two years after the acute phase of infection.

Consequently, there is a decline in functional capacity and independence in performing activities of daily living (ADLs), significantly compromising individuals' quality of life[6]. This impairment is particularly evident in daily activities; as observed in a systematic review, survivors demonstrated reduced performance in tasks such as dressing, toileting, and mobility between locations[8-10]. In this context, the need for rehabilitative therapeutic approaches aimed at restoring functional capacity becomes clear. Among these approaches, physical activity is widely recognized as an effective non-pharmacological strategy in the rehabilitation of chronic diseases and may help mitigate the impacts of long covid by promoting positive adaptations in the cardiovascular, respiratory, musculoskeletal, neurological, immunological, and psychological systems[11].

General guidelines on rehabilitation and physical activity have been developed and disseminated by researchers—primarily in the form of reports and perspective articles—as well as by institutions such as the World Health Organization, through documents like Support for Rehabilitation: Self-Management after covid-19-Related Illness[12,13]. However, considering the severity, heterogeneity, multisystemic nature, and still evolving understanding of covid-19 and long covid, it is essential that physical interventions be tailored to individual patient needs and conducted under close supervision to ensure safety and treatment efficacy in the context of such a novel and complex condition[1].

In this regard, supervised multicomponent physical training emerges as a promising strategy for improving physical capacities. Although studies have indicated important effects of this approach, further investigation is needed to determine whether these benefits translate into the recovery of ADLs perceived as impaired by survivors experiencing long covid symptoms[14,15]. Expanding scientific dissemination on this topic may contribute to the development of rehabilitation programs that are better aligned with survivors' real-world needs and more effective in practice.

Within this context, the present study aims to evaluate the return to ADLs perceived as impaired by survivors with long covid symptoms who participated in a supervised multicomponent physical training program.

Methods

Design

This study constitutes an analysis of secondary data derived from the Randomized Controlled Clinical Trial titled the COvid and REhabilitation Study (CORE-Study). The research received approval from the Research Ethics Committee with Human Beings (protocol no. 4,909,599) and was conducted at the Sports Center and the University Hospital of the Federal University of Santa Catarina, both situated in Florianópolis, Santa Catarina, Brazil. Additionally, the study is registered in the Brazilian Registry of Clinical Trials (ReBEC; RBR-10y6jhrs). For further details, the study protocol has been published in the journal Trials[16].

Participants

This study encompassed men and women aged 18 years or older who received treatment for covid-19 at hospitals located in the Greater Florianópolis area, specifically those presenting with moderate to severe cases during the acute phase of the disease. Additionally, individuals who did not necessitate hospitalization but reported chronic fatigue (Chalder scale score – physical domain > 4) as a symptom of long covid were also included[17]. The eligibility criteria mandated that participants be afebrile for a minimum of 72 hours without the administration of antipyretics, demonstrate stabilization of respiratory symptoms, and not require mechanical ventilation or tracheostomy. Furthermore, participants were required to exhibit the absence of hypersecretion combined with ineffective cough, severe dyspnea that was challenging to stabilize both at rest and during ADLs, and to maintain a peripheral oxygen saturation (SpO2) greater than 90%. Additional prerequisites included a normal resting electrocardiogram, controlled underlying diseases under medical supervision, the absence of open wounds, the capability to sit and stand unassisted, the ability to maintain balance in

a standing position, and a stable level of consciousness devoid of mental confusion.

Randomization and Allocation Confidentiality

Participant selection employed a non-probabilistic approach, whereby invitations were directly extended to potential participants utilizing a list obtained from University Hospital of the Federal University of Santa Catarina, in addition to the dissemination of the study via television media. Those who were recruited underwent a medical screening to obtain clearance. Among these individuals, those who satisfied the eligibility criteria were invited to participate in the research, receiving comprehensive explanations regarding the associated risks and benefits of the study, along with the Informed Consent Form for their endorsement. Subsequently, participants were referred for pre-intervention assessments and were subsequently allocated randomly and stratified by gender in a 1:1 ratio into two groups (intervention and control), which were conducted in parallel over a duration of 24 weeks. Enrollment occurred in blocks, typically comprising four to six participants, between December 2021 and April 2023. The randomization process was executed by a researcher who was not involved in the other phases of the study, utilizing the online software www.randomizer.org.

Intervention Group

Participants in the Intervention Group (IG) underwent a supervised multicomponent training program consisting of aerobic, strength, and balance exercises. The intervention was divided into two phases.

Phase one consisted of a one-week familiarization period with the exercises and with intensity and affect scales, followed by 10 weeks of training with two sessions per week and progressive volume increase. Each session lasted approximately 60 minutes and was structured as follows: joint warm-up (five minutes), followed by a balance session (10 minutes), aerobic training on treadmills (25 minutes), strength training using body weight and resistance bands (15 minutes), and final stretching (five minutes). At the end of the 12th week, participants were reassessed.

Phase two, which took place between weeks 13 and 24, was characterized by an increase in frequency to three weekly sessions, with progression in exercise intensity. In this phase, strength exercises were performed in the weight training room, while balance exercises were removed from the program. Throughout the entire program, the order of the main components (aerobic and strength) was alternated weekly to reduce monotony and avoid prioritizing one component over the other, considering the concurrent interference effect that these types of training may exert on each other. The temporal structure of the IG intervention can be seen in Chart 1. Detailed information about the full training program is available in the protocol article.

Control Group

Participants in the Control Group (CG) received a controlled procedure and, therefore, did not constitute a pure CG. They attended an in-person session with a member of the research team, during which they received physical activity recommendations based on the Brazilian Physical Activity Guidelines, along with printed excerpts of the document corresponding to their respective age group. Follow-up phone calls were also conducted at the 6th, 12th, 18th, and 24th weeks after the start of the intervention to maintain care and to administer a questionnaire regarding adverse events. The procedure carried out for the CG can be seen in Chart 1.

Outcome – Self-reported activities

To assess the outcome, the Patient-Specific Function-

Chart 1 – Group schedule.

	Macrocycle											
	Phase 1											
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
CG	I. P. S.			T. Calls				T. Calls				Reassessments +T. Calls
IG	Fam.	Mesocycle 1					Mesocycle 2					Reassessments
	Phase 2											
CG	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24
IG				T. Calls								T. Calls
	Mesocycle 3				Mesocycle 4				Mesocycle 5			

CG: Control Group; IG: Intervention Group; T. Calls: Telephone Calls; Fam: Familiarization I.P.S.: In-person session.

al Scale, developed by Stratford[18], was used. This is a self-report scale in which patients identify functional activities they perceive as affected after the onset of a health condition and rate their ability to perform them. Scores range from 0 ("unable to perform the activity"), representing the worst level of performance or clinical condition, to 10 ("able to perform the activity at the same level as before the injury"), indicating the best level of performance or clinical condition. The reported activities were subsequently grouped, according to their similarity, into five domains: mobility; sports or physical exercise; work and household activities; sleeping; and resting. The Patient-Specific Functional Scale has several advantages, including broad applicability, ease of administration, and adequate responsiveness for analyzing functional changes in heterogeneous populations.

The scale was administered as an individual questionnaire. Participants were instructed by a blinded interviewer to identify daily activities they were unable to perform or had difficulty performing due to their health condition—in this case, covid-19 involvement. The assessment was conducted at baseline (pre-intervention), and the activities were followed up at the 12th and 24th weeks after the start of the intervention, totaling three assessment points.

Statistical analysis

Only participants who, at the pre-intervention stage, reported at least one impaired activity of daily living were included in the analysis. The level of performance of these activities was tracked in subsequent assessments. If, in later evaluations, the activities initially reported were no longer mentioned, they were considered no longer limiting, and a score of "10" was assigned to them. Thus, in addition to the number of reported activities, the level of performance of each activity on the Patient-Specific Functional Scale was analyzed across three time points. Results were described using absolute and relative frequencies, with higher values indicating better clinical condition. For participants who did not attend data collection sessions, simple imputation using the last observed value was applied.

The characterization of continuous variables in the sample was performed after verifying normality and homogeneity using the Shapiro–Wilk and Levene tests, respectively. Continuous variables with normal distribution were described using mean and standard deviation. Categorical variables were described using absolute and relative frequencies. The statistical model used was Generalized Estimating Equations, with Bonferroni post hoc adjustment. A 95% confidence interval was adopted for intragroup differences, with a significance level of 0.05. Statistical data analysis was conducted using SPSS (Statistical Package for the Social Sciences), version 22.0.

Results

Of the 89 patients considered eligible for participation in the study, 40 (45%) were randomized into the groups. Of these, 29 (72.5%) were included in the analysis of this study, as they reported at least one activity perceived as limited after covid-19 infection at the pre-intervention stage (IG = 17; CG = 12). The participant flowchart and sample characterization data are presented in Figure 1 and Table 1, respectively.

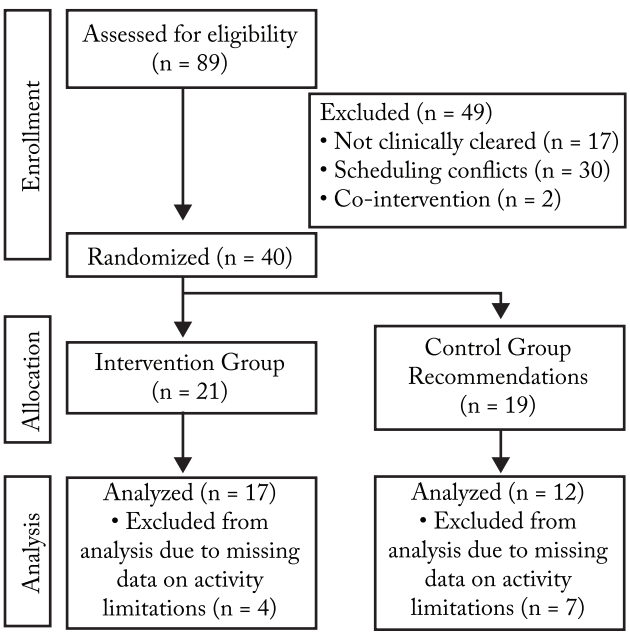

Figure 1 – Flowchart of study participants.

Regarding participant characteristics, most were women and middle-aged adults; all had a history of hospitalization during the acute phase of covid-19. The most prevalent non-communicable chronic disease was hypertension, and fatigue was the most frequently reported symptom after the acute phase. Contact with participants occurred, on average, 383.8 ± 174.4 days after the onset of initial covid-19 symptoms during the acute phase.

Among participants, five individuals reported only one limited activity (the minimum criterion for inclu-

Table 1 – Participant characteristics (n = 29).

	Intervention Group (n = 17)	Control Group (n = 12)	p value
Sociodemographic data			
Age (years)	51.8 ± 15.7	54.4 ± 11.5	0.622
Gender (male/female)	8/9	5/7	>0.999
Time post-acute phase (days)	413.2 ± 166.3	342.3 ± 184.3	0.288
	n (%)	n (%)	
Hospitalization			
Outpatient Clinic	4 (23.5)	5 (41.7)	0.427
Intensive Care Unit	9 (53.0)	6 (50.0)	0.427
Nursey	4 (23.5)	1 (8.3)	0.427
Clinical features			
Hipertension	5 (29.4)	4 (33.3)	0.999
Diabetes	4 (23.5)	0	0.121
Dyslipidemia	4 (23.5)	1 (8.3)	0.375
Pulmonary disease	4 (23.5)	1 (8.3)	0.375
Symptoms post-Acute Phase			
Fatigue	12 (70.6)	11 (91.7)	0.354
Dyspnea	12 (70.6)	9 (75.0)	0.999
Myalgia	9 (53.0)	8 (66.7)	0.703
Memory loss	11 (64.7)	7 (58.3)	0.999

The data are presented as mean and standard deviation, absolute and relative frequency (%).

sion in the analysis), while the maximum number reported was five activities, also by five participants. The average number of activities reported as limited after covid-19 was similar between groups, with a mean of 2.8 ± 1.3 (IG = 2.9 ± 1.2; CG = 2.7 ± 1.4; p = 0.710).

A total of 84 activities were reported. A detailed description of these activities and the frequency with which they were reported by the 29 participants can be found in the study published by Rodrigues et al.[6]. Of the 84 mentions, 50 were reported by the IG and 34 by the CG. Thus, the best possible clinical scoring scenario (×10, representing the best score for each activity) was 500 for the IG and 340 for the CG.

In the IG, the 50 activities were distributed as follows: 35 in the mobility domain, 12 in sports or physical exercise, and three in work and household activities. The total score across all activities and domains was 251 at pre-intervention, 351 at week 12, and 391 at week 24, resulting in an average score per activity of 5, 7, and 8, respectively. All domains showed progressive improvement, with an overall increase of 40% at week 12 compared to pre-intervention and 11% at week 24 compared to week 12.Specifically, in the mobility domain, the values corresponded to 50%, 72%, and 77% of the maximum possible score (350); in sports and physical exercise, 52%, 62%, and 78% of the maximum (120); and in work and household activities, 47%, 83%, and 97% of the maximum (30). Figure 2 illustrates the progression of the IG.

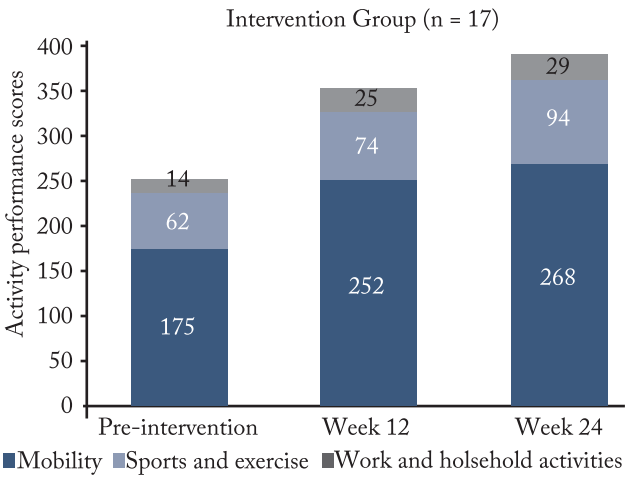

Figure 2 – Total score of the 50 activities reported by the Intervention Group.
The data represent the sum of the scores on the Patient Specific Functional Scale for the intervention group.

In the CG, the 34 activities were distributed as follows: 19 in the mobility domain, seven in sports or physical exercise, five in work and household activities, two in sleep, and one in rest. The total activity score was 128 at pre-intervention, 211 at week 12, and 249 at week 24, resulting in average scores per activity of 4, 6, and 7, respectively. There was an overall increase of 65% at week 12 compared to pre-intervention and 18% at week 24 compared to week 12. When analyzing the domains separately, in the mobility domain the values corresponded to 34%, 58%, and 65% of the maximum possible score (190); in sports and physical exercise, 34%, 61%, and 86% of the maximum (70); in work and household activities, 48%, 46%, and 86% of the maximum (50); in rest, 10%, 20%, and 60% of the maximum (10); and in sleep, 35%, 85%, and 80% of the maximum (20). Figure 3 illustrates the progression of the CG.

Finally, Table 2 presents the average number of activities reported individually and the progression in their performance across the three time points. In this analysis, a time effect was identified in both groups (IG: $p < 0.001$; CG: $p < 0.004$). In other words, even participants who followed the recommendations of the Brazilian Physical Activity Guidelines (CG) showed improvements in the performance of ADLs over time, reinforcing the potential of physical activity guidance to promote functional recovery.

Table 2 – Average number of individual activities and their scores over time.

Group	Number of individual activities	Baseline	12-weeks	24-weeks
Intervention Group (17)	2.9 ± 1.2	15.0 ± 1.8a	20.7 ± 2.2b	22.5 ± 2.4c
Control Group (12)	2.7 ± 1.4	10.7 ± 1.6a	17.6 ± 2.8b	20.8 ± 3.0c

Data are presented as mean ± standard error; intra- and intergroup comparisons were performed using generalized estimating equations with Bonferroni post-hoc tests; different letters symbolize significant differences.

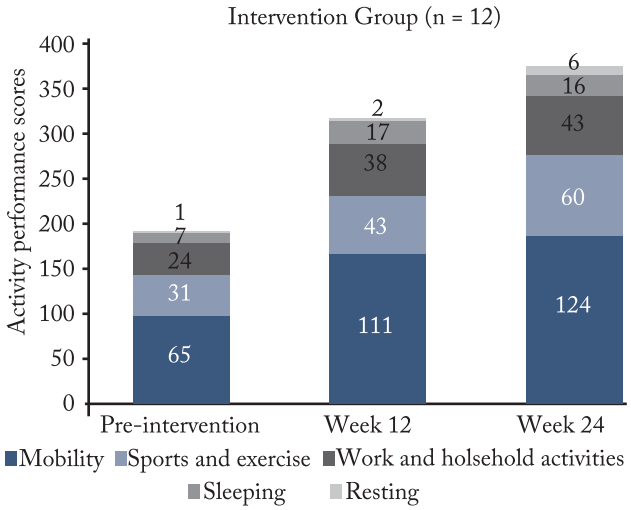

Figure 3 – Total score of the 34 activities reported by the Control Group
The data represent the sum of the scores on the Patient Specific Functional Scale of the Control Group.

Discussion

The present study aimed to evaluate the return to ADLs perceived as impaired by survivors with long covid symptoms who participated in a multicomponent physical training program. Overall, the results indicate improvement over time in the performance of activities perceived as limited after covid-19 in both groups, highlighting the benefits of both the training program and physical activity recommendations for returning to ADLs, although there is still room for further improvement.

Regarding the characteristics of the sample, the predominance of middle-aged and older adults with comorbidities is consistent with the literature, which identifies these groups as the most susceptible to severe covid-19. All participants had been hospitalized, with intensive care unit admission being the most prevalent. Long covid symptoms—fatigue, dyspnea, myalgia, and memory loss—were also widely reported, in line with other studies[3,5]. This demonstrates that even after, on average, one year since the acute phase, these symptoms remain present and continue to impact individuals' lives and should therefore be considered when prescribing physical activity[6,19].

The initial average score per activity was concerning, being 5 for the IG and 4 for the CG, indicating a substantial level of impairment in performing activities. However, both groups showed improvement over time, with no significant difference between them, ending with average scores of 8 and 7 per activity, respectively. The most pronounced improvement was observed at week 12 compared to baseline values. This result may be explained by the fact that greater initial functional impairment provides more room for improvement; subsequently, as functional stabilization is reached, gains tend to become more subtle.

Parallel to the improvement in clinical status observed in both groups in this study, the work by Oliveira Júnior et al.[20], referring to the same randomized controlled trial, identified a significant reduction in barriers to physical activity in both groups as well. Both outcomes showed significant improvement at all assessment time points; however, the progression followed different patterns. While in the present study the clinical improvement was more pronounced between baseline and week 12, in Oliveira Junior et al[20] study the reduction in barriers was more evident between weeks 12 and 24. Taken together, these findings suggest that functional improvement tends to occur initially, subsequently contributing to a reduced perceived impact of barriers to engaging in physical activity.

Regarding the domains, in the IG, work and household activities showed an increase, approaching the maximum performance level, indicating that they were no longer perceived as limiting by participants. Mobility and sports/physical exercise activities also improved, although they were still perceived as partially limited. It is possible that work and household activities require lower physical capacity compared to mobility and physical exercise, which demand greater effort or additional stimuli to achieve proportional improvement.

In the CG, sports/physical exercise activities as well as work and household activities also showed improvement, approaching values corresponding to the best clinical scenario. As observed in the IG, mobility, resting, and sleeping activities improved over time,

although they were still perceived as limited and with room for further progress. This perception may be associated with the persistence of symptoms such as fatigue, which can even hinder activities related to recovery, reinforcing the importance of considering these aspects when prescribing physical activity.

It is important to emphasize that although participants reported limitations in certain activities, such as mobility, this does not mean that their performance did not improve. In the six-minute walk test conducted in this randomized controlled trial, improvements were observed in both groups over time, as well as in the sit-to-stand test—findings that are also supported by other studies[21,22]. Thus, both the physical tests and the applied questionnaire indicate a similar pattern: improvement in activity performance, albeit with remaining room for functional progression.

Since both groups improved over time without showing differences between them, it can be inferred that the natural course of the disease over time contributes to improvements in these outcomes. However, it is important to highlight that, in other outcomes—especially those related to mental health—significant differences were observed. In the study by Sirydakis et al.[23], which analyzed results from the same randomized controlled trial regarding quality of life and sleep quality, the IG showed marked improvement, which was not observed in the CG.

Thus, these findings reinforce the importance of considering multiple outcomes in the recovery and rehabilitation process of individuals with long covid, taking into account the heterogeneity of complaints and needs in this population. This becomes even more relevant given the identification of activities perceived as limited across different domains and with varying levels of progression, including activities related to rest. Furthermore, the persistence of symptoms such as fatigue and dyspnea should be considered in rehabilitation planning, as they may hinder functional recovery. No adverse events were reported during the randomized controlled clinical trial.

The progression of clinical status may also be influenced by contextual factors affecting individuals with covid-19, such as level of education, income, occupation, and support from others during the rehabilitation process—factors not addressed in this study and therefore representing a limitation. In addition, the previously calculated sample size refers to the primary outcome of the randomized controlled trial, the Six-Minute Walk Test, which may have influenced the results of the study's secondary outcomes, such as those presented in this work. Furthermore, the study lacks a group without physical activity recommendations to better control for potential confounding factors.

Among the strengths of this study is the rehabilitation approach for individuals affected by covid-19 through a multicomponent training program, using a simple and accessible instrument capable of capturing participants' perceptions without compromising the ability to quantify and compare results. Moreover, the proposed training program uses simple and adaptable exercises, which may enhance its applicability in different rehabilitation contexts.

It can be concluded that individuals affected by covid-19 experience limitations in performing various ADLs across different domains. Improvement occurs slowly and gradually over time, regardless of intervention. However, it is important to consider the diversity of activities, the level of performance in each, and the additional demands presented by this population in order to make the most appropriate rehabilitation decisions. These findings also have implications for public policy, suggesting that expanding the dissemination and implementation of the recommendations from the Brazilian Physical Activity Guidelines may contribute to the return to daily activities in individuals with long covid.

Conflict of interest

The authors declare no conflict of interest.

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Author's contributions

Constantini MI: Conceptualization; Methodology; Software development, implementation, and testing; Data and experiment validation; Data analysis; Research; Tool provision; Data curation; Supervision; Project administration; Data presentation design; Funding acquisition; Original manuscript writing; Writing - revision and editing; Approval of the final manuscript version. Rodrigues J: Methodology; Research; Original manuscript writing; Approval of the final manuscript version. Benitez HO: Conceptualization; Methodology; Research; Original manuscript writing; Approval of the final manuscript version. Carminatti M: Conceptualization; Methodology; Original manuscript writing; Approval

of the final manuscript version. Sirydakis MEM: Conceptualization; Methodology; Data and experiment validation; Research; Tool provision; Data curation; Data presentation design; Writing - revision and editing; Approval of the final manuscript version. Freitas CLR: Conceptualization; Methodology; Data and experiment validation; Research; Tool provision; Data curation; Writing - revision and editing; Approval of the final manuscript version. Danielevicz A: Conceptualization; Methodology; Software development, implementation and testing; Data and experiment validation; Data analysis; Research; Tool provision; Data curation; Supervision; Writing of the original manuscript; Writing - revision and editing; Approval of the final manuscript version. Delevatti RS: Conceptualization; Methodology; Software development, implementation and testing; Data and experiment validation; Data analysis; Research; Tool provision; Data curation; Supervision; Project administration; Funding receipt; Writing - revision and editing; Approval of the final manuscript version.

Declaration regarding the use of artificial intelligence tools in the article writing process

The authors used ChatGPT artificial intelligence tools to assist in the translation process of the manuscript.

Availability of research data and other materials

Data available upon request from the authors.

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Reviewers' assessment

The reviews of this article were originally conducted in Portuguese. This version has been translated using ChatGPT and subsequently reviewed by the Chief Editors.

Reviewer A

Anonymous

Dear Authors,

I would like to congratulate the team on conducting the overall project and on the present study. The study is important; however, I would like to contribute with some comments.

Abstract

- In the objective, there is some confusion: it refers to return to activities of daily living (ADL) among COVID-19 survivors; however, the title refers to return to ADL in patients with long COVID. Long-term COVID-19 symptoms may occur in anyone who has had COVID-19, but not all survivors necessarily experience long-term symptoms. I suggest standardizing the term long COVID throughout the manuscript.
- Both physical activity and exercise interventions were conducted. Please ensure that throughout the text, physical activity (PA) and exercise (EX) are properly distinguished and not used as synonyms.
- The introduction + objective in the abstract occupy 8 lines, while the results are condensed into a small space. I suggest shortening the introduction and expanding the main findings of the study in the abstract.
- Page 1, Line 20: I think I understood it, but it is unclear what "16F" means. I suggest rephrasing.
- In the abstract conclusion, I believe it would be important to highlight both the benefits of the exercise program and the recommendation of PA. I will address this again later, but if both groups improved, this is a positive point for the Brazilian PA guidelines.

Introduction

- Some sentences in the introduction lack references; I suggest reviewing them.
- Page 4, Line 11: I suggest emphasizing that these are survivors with long COVID symptoms.

Methods

- Please complete the information regarding the Ethics Committee and clinical trial registration. It may have been overlooked.
- Was a sample size calculation performed for this specific outcome? If so, describe it in the methods; if not, report it as a limitation.

Results

- Page 7, Line 29: "all with a history of hospitalization." Please clarify whether this refers to COVID-19 or any other cause.
- Page 8, Line 2: "total." Does this refer to the mean?
- Page 8, Lines 3–7: I suggest describing in the methods how the activities were grouped and removing this information from the results section.

Discussion

- Page 9, Lines 3–5: "The present study aimed to evaluate the return to activities of daily living considered impaired among COVID-19 survivors who participated in a multicomponent physical training program." There seems to be some confusion between the objective of the broader project (which evaluated survivors) and that of the present article (which evaluated survivors with long COVID). I suggest reviewing this throughout the text to align it with the actual objective of this article.
- Page 9, Lines 6–9: Highlight the main finding of the study. As a suggestion, I understand that the main finding is that even among those who followed the recommended activities from the Brazilian physical activity guidelines (control group), return to ADL improved over time. This underscores the importance of the national PA plan.
- Still in the first paragraph of the discussion, revise previously abbreviated terms and use the corresponding abbreviations. I also suggest reviewing the entire text in this regard.
- Overall, in the discussion, I strongly suggest adopting a more positive tone, emphasizing the benefits that both training and PA recommendations had on the return to ADL in these patients. Consider restructuring the discussion accordingly.
- Conversely, I suggest expanding the discussion of the study's limitations. For example, the sample size

calculation, if not performed for this specific outcome. Another important limitation is the absence of a group that did not receive any instruction on physical activity or exercise, which prevents determining how much of the improvement may be explained by time elapsed since COVID-19.

-
- How can public policies benefit from the findings of this study? For example, adherence to the Brazilian physical activity guidelines could be more widely promoted in public policies, potentially improving return to ADL among thousands of individuals with long COVID.

Final decision

- Major revisions required.

Reviewer B

Anonymous

- The manuscript is aligned with the scope of the journal. The text is clear and shows good articulation between objective, methods, results, and conclusion.
- The discussion presents the main findings at the beginning, engages with the literature, highlights strengths and limitations, and discusses implications for long COVID rehabilitation.
- It was suggested in the manuscript to include captions for Figures 2 and 3.
- After revisions, I recommend the manuscript for publication in RBAFS.

Final decision

- Major revisions required.