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PHYSICAL TRAINING PROGRAMS IN INDIVIDUALS AFTER COVID-19: A SYSTEMATIC REVIEW

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ABSTRACT

Introduction: The coronavirus pandemic at the end of 2019 (COVID-19) impacted the entire world, exacerbating morbidity and mortality rates. Physical exercise is known to be of great importance for the immune system, aiming at physical and psychological improvement, which can help patients after COVID-19. Objective: To conduct a systematic review of the literature on the effects of physical training programs (strength, aerobic and respiratory fitness) in individuals after COVID-19, on symptoms of anxiety and depression, and on improved functionality. Materials and method: Searches were conducted in the Medline/Pubmed, Cochrane, Google Scholar, Lilacs, Embase, Scielo, and Scopus databases, using the Rayyan Artificial Intelligence (AI-Powered Systematic Review Management Platform). Studies that met the following criteria were included: (i) languages in Portuguese, English and Spanish; (ii) use of the PICO framework, including a population of men and women, aged between 18 and 65 years, post-COVID-19 individuals who were hospitalized or not, with an average time of one year after hospitalization, and with interventions of physical training programs with strength, aerobic and respiratory exercises. Results: After applying the filters, 616 studies were identified, of which only six were included in this review because they met the inclusion criteria. The efficiency of aerobic and strength physical exercise for the recovery of patients with sequelae of COVID-19 was demonstrated, and consequently, a noticeable improvement in respiratory rehabilitation and physical conditioning.

Key words: COVID-19. Physical training. Rehabilitation. Health.

RESUMO

Programas de treinamento físico em indivíduos pós-covid-19: uma revisão sistemática

Introdução: A pandemia do coronavírus no final de 2019 (COVID-19) impactou o mundo todo, exacerbando as taxas de morbidade e mortalidade. O exercício físico é conhecido por ser de grande importância para o sistema imunológico, visando à melhora física e psicológica, o que pode auxiliar pacientes após a COVID-19. Objetivo: Realizar uma revisão sistemática da literatura sobre os efeitos de programas de treinamento físico (força, aeróbico e respiratório) em indivíduos após a COVID-19, sobre os sintomas de ansiedade e depressão e sobre a melhora da funcionalidade. Materiais e métodos: Foram realizadas buscas nas bases de dados Medline/Pubmed, Cochrane, Google Scholar, Lilacs, Embase, Scielo, e Scopus, utilizando a plataforma de gerenciamento de revisões sistemáticas com inteligência artificial Rayyan. Foram incluídos estudos que atenderam aos seguintes critérios: (i) idiomas em português, inglês e espanhol; (ii) utilização da estrutura PICO, incluindo uma população de homens e mulheres, com idade entre 18 e 65 anos, indivíduos pós-COVID-19 que foram hospitalizados ou não, com tempo médio de um ano após a hospitalização, e com intervenções de programas de treinamento físico com exercícios de força, aeróbicos e respiratórios. Resultados: Após a aplicação dos filtros, foram identificados 616 estudos, dos quais apenas seis foram incluídos nesta revisão por atenderem aos critérios de inclusão. Foi demonstrada a eficiência do exercício físico aeróbico e de força para a recuperação de pacientes com sequelas da COVID-19 e, consequentemente, uma melhora perceptível na reabilitação respiratória e no condicionamento físico.

Palavras-chave: COVID-19. Treinamento físico. Reabilitação. Saúde.

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INTRODUCTION

According to the World Health Organization (WHO), the disease caused by the coronavirus (SARS-CoV-2), officially named COVID-19, emerged in mid-December 2019 in China and spread rapidly throughout the planet in March/April 2020, becoming a massive pandemic with a severe impact on various Public Health Systems at local, regional, national, and international levels (WHO, 2021).

As of November 19, 2021, the WHO had recorded more than 255 million confirmed cases of COVID-19 worldwide and, unfortunately, more than 25 million deaths to date (WHO, 2021). During this period, Brazil had more than 4.4 million confirmed cases and 154,000 deaths from COVID-19, facing its peak (WHO, 2021).

It is important to highlight that more severe cases of COVID-19 have been associated with the persistence of symptoms such as dyspnea, myalgia, fatigue, and symptoms of anxiety and depression, thus making it difficult to perform daily activities that were easily carried out before hospitalization due to COVID-19.

Therefore, seeking strategies that can mitigate the prevalence of symptoms related to COVID-19 becomes a major challenge for healthcare professionals (CDC, 2020; Souza et al., 2020; Nielsen, Silva, 2020).

In this scenario, physical exercise emerges as a powerful therapeutic tool to counteract potential deleterious effects related to COVID-19. It is well established that a physical training program improves physical and functional parameters in different populations (Santana et al., 2021; Ferreira et al., 2020), but the effects of a physical training program on persistent symptoms related to COVID-19 are yet to be elucidated.

Thus, it is reasonable to speculate that a physical training program including strength, aerobic and respiratory exercises may maximize the recovery of individuals who have been hospitalized or at least mitigate the presence of symptoms related to COVID-19, promoting an improvement in functionality and daily activities.

Therefore, the aim of this study was to conduct a systematic review of the literature on the effects of physical training programs (strength, aerobic and respiratory fitness) in individuals after COVID-19, on symptoms of anxiety and depression, and on improved functionality.

MATERIALS AND METHODS

This is a systematic review study that used the Rayyan Artificial Intelligence (AI-Powered Systematic Review Management Platform) as a tool for searching and selecting articles, with the aim of identifying the effects of physical training programs in individuals after COVID-19.

Research Strategies

The research was conducted from July 2023 to January 2024, using articles published between 2019 and 2023. The search was conducted in the following databases: Medline, Pubmed, Cochrane, Google Scholar, Scielo, Scopus, Embase, and Lilacs. Articles in English, Spanish, and Portuguese were included from academic libraries and educational platforms. The following keywords were selected, combined and/or isolated: “pandemic”, “covid-19”, “physical training”, “rehabilitation”; and “pandemia”, “covid-19”, “entrenamiento físico”, “rehabilitacion”; and "pandemic", "covid-19", "physical training", "rehabilitation". Based on the chosen keywords and selected databases, the search was performed using the RAYYAN platform.

RAYYAN AI artificial intelligence is a powerful tool designed to help researchers save time during literature and systematic reviews. This tool also utilizes an advanced deduplication feature, which automatically identifies and removes duplicate references from the dataset, which is especially beneficial for literature and systematic reviews.

This mechanism increases the efficiency of the review process, improving accuracy and helping to keep review data clean and organized, allowing the researcher to focus on the most relevant and unique studies. It also offers customizable filters to quickly find important studies and bulk actions to efficiently manage multiple items.

In order to improve the research, the PICO acronym was used, structuring questions by Population, Intervention, Comparison, and Outcome. Using the PICO acronym, studies were sought involving a population of men and women aged between 18 and 65 years, individuals post-Covid-19 who were hospitalized or not, with an average time of one

year after hospitalization, and with interventions involving physical training programs including strength, aerobic, and respiratory exercises.

Inclusion and exclusion criteria

The selected studies underwent data processing that included reading the abstracts and the full articles. To select those most relevant in terms of the applied methodology, interventions related to physical exercises, objectives, and results obtained were used to synthesize a table summarizing the approaches of the selected studies and subsequent discussion based on the designs of each of them.

Furthermore, the following types of studies were used: randomized clinical trials, randomized controlled trials, and controlled trials. Studies were excluded when the methods and/or results did not clearly highlight the effectiveness of the training, and/or the objectives were not well defined; in addition to the availability of the full articles for review or with conclusive data.

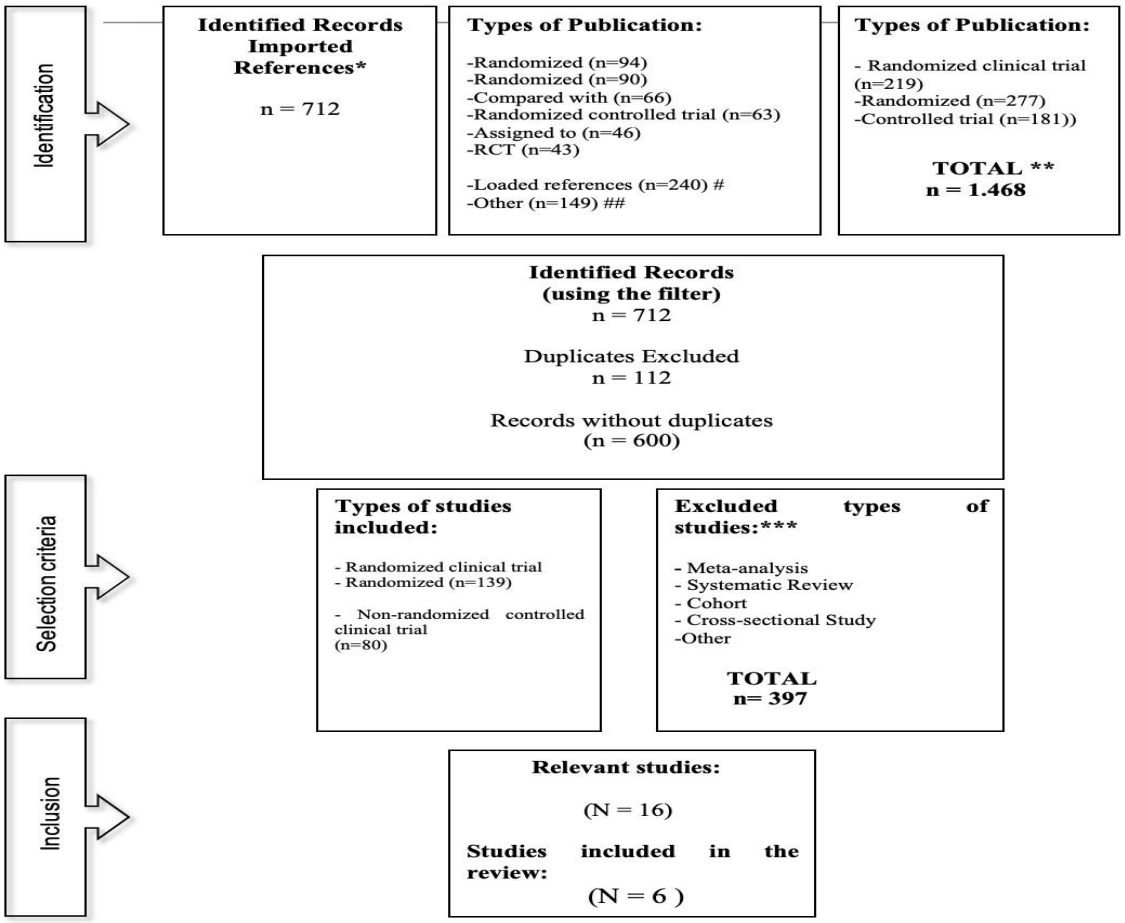

Figure 1. Description of the flowchart of the review results.

Figure 1 - Description of the stages of the flowchart of this review.

*References imported from the databases previously mentioned;
**Total quantitative number after the search and summation in Rayyan IA, excluding duplicates and applying other filters. A single study may include one or more filters (e.g., COVID-19 in bats);
***The exclusion of studies was based on the absence and/or inconsistency of results or conclusions, poorly discussed criteria and evaluative parameters, divergent methodologies, among others;
#References loaded that mention one of the keywords but do not align with the objective of the study;
##Others: Studies referring to COVID-19 in animals, children, or individuals with other comorbidities.

Data extraction

After applying the inclusion and exclusion criteria, duplicates were removed, i.e., articles that were repeated in the databases mentioned above.

The following data were extracted for the preparation of the results table: author's name; year of publication; sample size; characteristics of the participants (age, sex, training level); characteristics of the training; measured parameters (muscle strength, functional capacity, quality of life and fatigue); main results; limitations of the studies examined.

The searches were conducted by two researchers, following the inclusion and exclusion criteria to include or exclude the article in this review. In case of disagreement regarding the inclusion of one of the articles between the researchers (DL) and (EA), a third researcher (EC) made the final decision; in a clear and direct manner to avoid any type of bias in the inclusion or exclusion of that article.

Flowchart

The careful selection of articles based on the filters mentioned was carried out through the initial selection of studies, the use of the chosen study types, and the critical reading of the selected articles. In this way, it was possible to refine the selection according to quality criteria, retaining only those publications whose data were relevant to the present research, thus including them for final analysis.

After reading, the selected publications were subjected to data extraction. Figure 1 shows the flowchart for the selection and inclusion of articles in this review. Using the criteria mentioned, six publications were selected for analysis and development of the text, which can be seen below.

RESULTS

After the study identification phase (1,468 types of publications in total), and using a filter, 712 records were identified (96 duplicates excluded and 616 records without duplicates). Subsequently, after applying the inclusion and exclusion criteria, 16 articles were included; however, six studies were selected through the use of isolated and grouped keywords.

The selection of articles took into account those studies that presented the methodology regarding the physical rehabilitation of people after recovery from COVID-19 in more detail.

The characteristics of the aerobic, strength, and respiratory training interventions are reported in Table 1.

All articles describe, to varying degrees, the impact of aerobic, strength, and respiratory exercises on individuals recovering from COVID-19, highlighting the positive effects of these exercises.

Table 1 - Characteristics of aerobic, strength, and respiratory training interventions.

Author/title	Aim	Sample	Methods	results
Aguiar Junior (2020) Respiratory rehabilitation in COVID-19 survivors – a randomized clinical study.	To investigate the effects of a respiratory rehabilitation program in COVID-19 survivors.	41 adults of both sexes, 8 weeks of standardized daily sessions.	Outpatient rehabilitation group: The 41 patients performed 2 therapeutic exercise sessions per week, 60-90 min/day, for 8 weeks, monitored by physiotherapists, within a hospital environment with support. Patients were instructed to continue exercising on the other days of the week to ensure the training effect. Aerobic training was performed on a treadmill or stationary bicycle, with a 10-minute warm-up, followed by 30 minutes at an intensity of 75% of the maximum heart rate achieved in the walking test, and adjusted to 60-75% of the heart rate reserve, or by maintaining a perceived exertion of 4-6/10 on the modified Borg scale. Resistance training was performed in 3 sets of 10-15 repetitions, with a rest interval of 1-2 minutes, in the three major muscle groups of the upper	The respiratory rehabilitation program for COVID-19 survivors was effective in improving patients' respiratory conditions and physical fitness.

			and lower limbs. The load was determined from the 10-repetition maximum test.	
Santana, Fontana, Pitta (2021) Post-COVID-19 pulmonary rehabilitation.	To observe the effectiveness of hospital and post-discharge pulmonary rehabilitation in patients after COVID-19 infection.	The sampling method was not disclosed, but it involved 1-2 weeks in the hospital and 6-8 weeks at home.	Hospital Phase • Respiratory exercises and bronchial hygiene, if necessary, with expectoration into a closed container to avoid aerosolization. • Early mobilization in bed; body positioning management (sitting and upright position); ambulation and light aerobic exercise (walking or cycling). • Characteristics of the exercises/Intensity: Borg scale score ≤ 3 with progressive increase to 4-6; frequency: 1-2 times a day; and duration: 10-45 min. Post-hospital discharge phase (6-8 weeks) • Aerobic training: Light intensity with gradual increase; 3-5 sessions per week; duration of 20-30 min; and intermittent training for patients with marked fatigue. • Muscle strength training for lower and upper limbs: progressive resistance in 2-3 sessions per week with 8-12 repetitions. • Balance training, respiratory exercises and bronchial hygiene, if necessary. • Prioritize home-based rehabilitation.	Pulmonary rehabilitation is primarily recommended to promote the physical and functional recovery of post-COVID-19 patients during hospitalization and after hospital discharge. For this purpose, the needs of each individual must be carefully considered.
Tartibian et al., (2022) The effects of exercise training on recovery of biochemical and hematological outcomes in patients surviving COVID-19: A randomized controlled assessor-blinded trial.	To investigate the effect of 8 weeks of continuous moderate-intensity training (MICT) at home, resistance training (RT), and combined aerobic and resistance training (CET) on biochemical and hematological markers associated with COVID-19 symptoms and severity in COVID-19 survivors.	296 adults of both sexes, during 8 weeks of training, with a frequency of 3 times per week	A total of 547 male and female COVID-19 survivors were screened, and 296 (aged 20–93 years) were randomly assigned in a 1:1:1:1 ratio to one of four groups: MICT (n=74), TR (n=74), CET (n=74), or no exercise (NON-EX, n=74). Eight weeks of aerobic training, resistance training, or combined aerobic and resistance training significantly improved biochemical and hematological indicators associated with COVID-19 symptoms and severity. Blood samples were collected at baseline, at week 4, and at week 8 after training.	Overall, the study demonstrated that long-term MICT plus RT interventions had a synergistic effect in accelerating and improving recovery in patients who survived COVID-19.
Jimeno-Almazán et al., (2023). Effects of concurrent training, respiratory muscle exercises, and self-management recommendations on recovery from post-COVID-19 conditions.	To determine the effectiveness of physical exercise, respiratory muscle training, and the WHO self-management recommendations leaflet on the recovery of physical fitness, quality of life, and symptom status in people with post-COVID-19 conditions.	80 non-hospitalized adults of both sexes. They ere randomly assigned to one of four 8-wk parallel intervention groups: 1) multicomponent exercise program based on concurrent training (CT, number of subjects (n) = 20; 3 resistance and endurance supervised sessions per week at low-moderate intensity); 2) inspiratory muscle training (RM, n = 17; 2 standardized daily sessions); 3) a	Eight weeks of training with standardized daily sessions. Individualized and supervised CT with or without RM was safe and more effective than self-care recommendations and RM alone in restoring cardiovascular and muscular fitness, improving symptom severity, and health status in outpatients with post-COVID-19 conditions.	Only in the multicomponent training groups (CT and CTRM) and the RM group were there significant improvements in health-related quality of life, dyspnea (mMRC), and fatigue (FSS and CFS-Linkert) over time. Furthermore, the concurrent training strategy (CT and CTRM), alone or combined with respiratory muscle training, proved superior in reducing fatigue and depressive symptoms.

		combination of both of the above (CTRM, n = 23); and 4) control group (CON, n = 20).		
Patil, Patil (2023) Effect of Circuit Training on Fatigue in Pulmonary Rehabilitation in Post-COVID-19 Survivors.	To study the effect of circuit training on fatigue in pulmonary rehabilitation in post-COVID-19 survivors.	40 individuals who had recovered from COVID-19, aged between 20 and 50 years old, were selected for the study.	They were bounded in a single group. The pre and post-treatment outcome measure was the fatigue assessment scale, borg scale, and 6-minute walk distance test used. The circuit training program was given to the subject which included warm-up exercises, specific exercises, strengthening exercises, and cool-down exercises for four weeks.	In a conducted study, fatigue assessment score, Borg score, and 6 min walk distance test showed statistically significant difference between pre- and post-treatment values.
Sahin et al., (2023) Effects of a home-based pulmonary rehabilitation program with and without telecoaching on health-related outcomes in COVID-19 survivors: a randomized controlled clinical study.	To compare the effects of a home-based pulmonary rehabilitation (PR) program with and without telecoaching on health-related outcomes in COVID-19 survivors.	A total of 42 COVID-19 patients who completed medical treatment were randomly divided into two groups: the study (telecoaching) group (n = 21) and the control (no telecoaching) group (n = 21).	Both groups participated in an 8-week home-based PR program including education, breathing exercises, strength training, and regular walking. The study group received phone calls from a physiotherapist once a week. Both groups of patients were assessed before and after the program by means of the following: pulmonary function tests; the modified Medical Research Council dyspnea scale; the six-minute walk test; extremity muscle strength measurement; the Saint George's Respiratory Questionnaire (to assess disease-related quality of life); the Medical Outcomes Study 36-item Short-Form Health Survey (SF-36, to assess overall quality of life); and the Hospital Anxiety and Depression Scale.	In both groups, there were significant improvements in the following: respiratory function parameter (FVC); the six-minute walk distance; right and left deltoid muscle strength; Saint George's Respiratory Questionnaire activity domain, impact domain, and total scores; and SF-36 social functioning, role-physical, role-emotional, and bodily pain domain scores ($p < 0.05$). Decreases in daily-life dyspnea, exertional dyspnea, and exertional fatigue were significant in the study group ($p < 0.05$), and the improvement in SF-36 social functioning domain scores was greater in the study group ($p < 0.05$).

DISCUSSION

The main findings of this study highlighted the importance of physical exercise for improving the health and quality of life of people, especially those who were in a recovery period after contracting COVID-19.

The efficiency of aerobic and strength training exercises was demonstrated for the recovery of patients with sequelae from COVID-19, and consequently, a noticeable improvement in respiratory condition and physical fitness.

Studies concerning health and physical and mental well-being were very frequent and important during this period of the COVID-19 pandemic and post-pandemic, so that some publications reflected the need to study the physical condition of people affected by this disease who experienced a reduction in their physical fitness as a post-COVID sequela, and these individuals needed multiprofessional support for physical rehabilitation, as highlighted by Santos et al., (2022).

The practice of physical exercise plays an important role in the rehabilitation of various diseases, promoting numerous benefits for the physical and mental health of patients during the recovery period. Its importance stems from the fact that aerobic exercise can strengthen the heart and lungs, improving cardiorespiratory capacity, especially for the rehabilitation of diseases that affect these functions, such as in the recovery of adults after COVID-19 (Vieira et al., 2023).

Rehabilitation programs for post-COVID-19 subjects should be based on aerobic and strength exercises, with constant monitoring of the sessions, and additional interventions by a multidisciplinary team if necessary (Prado et al., 2022).

Post-COVID-19 rehabilitation has undergone constant transformations, with much

research since 2020 in the search for better physical exercise practices.

Therefore, it is important that health professionals working in this area stay up-to-date with the latest evidence. Effective results have been observed in training sessions lasting eight or more weeks, approximately 40 minutes per session, four to five times a week in post-COVID-19 situations (Vieira et al., 2023).

In this scenario, physical exercise is gaining ground in society, within a social context that is insufficient in terms of health care and quality of life, and the relevance of these practices for the population becomes evident, enabling them to become active people with health and quality of life (Menezes et al., 2021).

The appreciation of regular physical exercise proves to be very efficient and present in people's lives in relation to better physical and mental health, a fact that could be observed during the pandemic period due to its potential benefits in relation to immunity, chronic diseases, and mental health (Santos et al., 2022).

During this period, many people stopped exercising due to the need for social isolation, staying away from gyms and training centers, thus impacting their physical fitness. In the case of people affected by this disease, this situation was aggravated by the fact that their physical health conditions were compromised, further negatively impacting their physical fitness.

Therefore, the practice of physical exercise during the pandemic reduced the health impacts and also contributed to the improvement of physical health and well-being of patients recovered from COVID-19 after resuming regular physical exercise (Nogueira et al., 2021).

Physical training improves cardiovascular endurance and physical fitness by increasing oxygen circulation in the body, which favors functional capacity and assists in daily living activities. Circuit training is an effective way to improve cardiovascular endurance and maintain functional quality of life related to pulmonary rehabilitation in post-COVID-19 survivors (Patil, Patil, 2023).

According to Jimeno-Almazán et al., (2023), improvements in physical condition regarding health-related quality of life and symptom intensity were observed after a concurrent training strategy, either isolated or associated with respiratory muscle training, reducing fatigue and depressive symptoms in individuals with COVID-19 pneumonia undergoing multicomponent cardiopulmonary rehabilitation.

The respiratory rehabilitation program for COVID-19 survivors proposed by Aguiar Junior (2020) was effective in improving the respiratory conditions and physical fitness of the subjects, allowing them to return to their routines more quickly.

Pulmonary rehabilitation can help prevent respiratory disorders and physical inactivity that can lead to diseases such as apraxia syndrome and lung infections.

The training protocols adopted by Jorge (2023) demonstrated improvements in parameters related to physical health, such as pain, spinal flexibility, chest expansion, peripheral muscle strength, ventilatory muscle strength, lung capacity and volume, functional capacity, and physical fitness.

The study by Ramírez-Vélez et al., (2022) investigated the changes in immunological parameters, inflammatory profile, physical condition, and alterations in perceived persistent symptoms (fatigue/tiredness, musculoskeletal pain, shortness of breath) after six weeks of supervised, multicomponent physical exercise, in addition to standard medical treatment in individuals with persistent symptoms of COVID-19.

The beneficial role of physical exercise as a complementary treatment for these individuals was observed, having a protective effect on the immune system, whose optimal state is crucial for an appropriate response to the threat of this disease, strengthening and improving immune function and reducing the risk of viral and/or chronic degenerative diseases.

The results of the study by Tartibian et al., (2022) demonstrated the effectiveness of home-based pulmonary rehabilitation training interventions in accelerating and improving recovery in individuals surviving COVID-19. In detail, biochemical and hematological markers linked to COVID-19 symptoms and severity improved significantly after eight weeks of the program, demonstrating the feasibility and acceptance of home-based exercise regimens among COVID-19 survivors, which can be used to develop future interventions.

The study by Daynes et al., (2023) highlighted that rehabilitation (in-person or digital) can improve exercise capacity in people with ongoing COVID-19 symptoms compared to

usual care alone without follow-up, impacting symptom reduction and health-related quality of life.

Telemonitoring and telerehabilitation interventions had a positive effect on subject outcomes and appeared to be as effective as standard treatment.

Home-based pulmonary rehabilitation programs with tele-coaching can contribute to the improvement of COVID-19 symptoms, as highlighted by Sahin et al., (2023).

The authors observed improvements in social aspects, dyspnea in daily life, dyspnea during exertion, and fatigue during exertion in COVID-19 survivors compared to a program of this nature without tele-coaching support.

Respiratory and strength exercise programs through telerehabilitation in people with COVID-19 were effective in significantly improving fatigue, dyspnea, perceived exertion, and physical condition, compared to the control group, although the greatest benefits were found for dyspnea and aerobic capacity in the respiratory exercise group (Rodríguez-Blanco et al., 2022).

Pulmonary rehabilitation is primarily recommended to promote the physical and functional recovery of post-COVID-19 patients during hospitalization and after hospital discharge.

After the end of the hospital phase in the COVID-19 recovery process, the practice of telerehabilitation has proven effective in improving symptoms and sequelae of the disease (Santana et al., 2021).

When telerehabilitation is compared to other formats, most studies on this program reported clinical improvements in favor of telerehabilitation, being similar in effectiveness in terms of improving quality of life, as well as clinical improvements in cardiorespiratory, musculoskeletal, and neurological physical condition variables, even comparable to individuals with conventional in-person rehabilitation practices (Carpallo-Porcar et al., 2022).

Carpallo-Porcar et al., (2025), in a pilot study, highlight a multimodal rehabilitation program that used asynchronous telerehabilitation, observing substantial benefits in terms of relief from psychological distress and improved social support in individuals recently discharged from hospital due to COVID-19; given that social isolation caused emotional and psychosocial symptoms as severe as the sequelae of the disease itself, helping people in three ways: cardiorespiratory, muscular, and emotional recovery.

The platform used for conducting the training via telerehabilitation allowed the physiotherapist to adjust the number of sets, repetitions, speed, and observations for each individual.

The program was presented in the form of animated educational videos (Powtoon videos) in which health and emotional tips to improve quality of life were conveyed to the participants.

Tele-rehabilitation leads to greater adherence and healthy habits in individuals and is well-accepted in terms of overall user experience and satisfaction, including studies conducted with COVID-19 patients and subjects already discharged (Carpallo-Porcar et al., 2024).

Other studies have demonstrated the effectiveness of synchronous tele-rehabilitation compared to the absence of rehabilitation and concluded that a physical exercise program offered through tele-rehabilitation can improve functional capacity and lower limb performance (Carpallo-Porcar et al., 2024).

In the study developed by Morrow et al., (2022) on the effects of physical training on the exercise capacity of post-COVID subjects, significant improvements were observed in fatigue symptoms, cognition, and respiratory symptoms based on walking test performance, respiratory/aerobic exercises, and corroborated previous work that reported that physical training did not result in the worsening of persistent post-COVID symptoms.

The beneficial effects of the physical training program showed improvement in the development of symptoms and the clinical course of COVID-19.

The use of home-based physical exercise as an adjunct treatment option to improve functional abilities and quality of life of participants can enhance the clinical effects of therapeutic management and improve the quality of care for them (Wojciuk, Ciolkiewicz, 2022).

The proposed intervention provided positive results in terms of neuromuscular, respiratory, cardiorespiratory, vascular, behavioral and psychosocial parameters, functional capacity and autonomy, and quality of life of those people who did not fully recover from COVID-19 after the acute phase of the disease (Delevatti et al., 2023).

Oliveira et al., (2022) found that multicomponent rehabilitation was not effective in the treatment of post-COVID-19, as a decline in dynamic balance and increased oscillation during static posture were observed in individuals severely affected in the acute phase of the disease.

However, hospitalization can result in balance problems and muscle weakness that are not necessarily related to COVID-19. Given the challenges faced in investigating this population, further studies are needed to contribute clinically to this disease after the improvement of the most severe symptoms. Cattadori et al., (2022) developed a new combined exercise protocol adapted for post-COVID-19 individuals, designed for frail individuals with interstitial lung disease, likely complicated by cardiac and vascular diseases, as preliminarily assessed. Preliminary results were promising, but further studies are needed to confirm the safety and efficacy of this combined exercise program as a promising strategy for the treatment of these individuals with COVID-19.

Studies related to health, physical and mental well-being were very frequent and important during this period of the COVID-19 pandemic and post-pandemic, so that some published works reflected the need to study the physical condition of people affected by this disease who experienced a reduction in their physical fitness as a post-COVID-19 sequela.

These individuals required multidisciplinary support for physical rehabilitation, as highlighted in the study by Santos et al., (2022).

CONCLUSION

This systematic review highlighted the relevance of physical rehabilitation programs for individuals affected by COVID-19, encompassing different forms and environments of intervention and contributing to the understanding of the beneficial effects of these practices in mitigating sequelae and symptoms resulting from the disease. It was observed that aerobic, strength, and respiratory training, properly supervised by qualified professionals, are effective in promoting physical conditioning, reducing symptoms of anxiety and depression, and improving the functionality of individuals with post-COVID-19 sequelae.

The reviewed studies demonstrated that supervised protocols, applied in a hospital or home environment, contribute significantly to rehabilitation and to improving the quality of life, using effective programs, verifying their effects, and highlighting their importance in this context.

Furthermore, the fundamental role of physiotherapy and physical education professionals in the planning, execution, and monitoring of physical training programs aimed at functional recovery and improving the quality of life of patients is emphasized. In addition, the evidence gathered reinforces the relevance of individualized rehabilitation strategies, whether in-person or mediated by telerehabilitation, as safe and effective alternatives to enhance functional and psychosocial recovery. The exercises implemented in rehabilitation programs, both in hospital and home settings, proved effective on different scales in promoting the health of individuals recovering from COVID-19.

Future Perspectives

It is noteworthy that the recently developed academic production has been essential to elucidate and substantiate the benefits of these practices, reinforcing their applicability in addressing the consequences generated by the disease.

However, future research with larger, controlled samples and longer treatment periods could help to elucidate the role of rehabilitation interventions in reducing the negative functional outcomes of COVID-19, thus mitigating the potential increase in disability and medical care costs related to COVID-19.

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