

Effectiveness of Home Tele-Rehabilitation in Patients With Chronic Obstructive Pulmonary Disease: A Systematic Review of The Literature

Andrea Elizabeth Villarroel Quispe^{1*}, Alex Fernando Lara Álvarez², Verónica del Pilar Gavilanes Fray³, Lisbeth Reales Chacón⁴

¹*Instituto Superior Tecnológico España Physical Rehabilitation Program MSc. Respiratory and Cardiac Physiotherapist*

²*Universidad Estatal de Bolívar Faculty of Health and Human Sciences School of Physical Therapy*

³*Instituto Superior Tecnológico España Ph.D. in Health Sciences*

⁴*Universidad Nacional del Chimborazo*

KEYWORDS

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ABSTRACT

The aim of this systematic review is to analyze the published studies on the scientific evidence of the effectiveness of home telerehabilitation in patients with chronic obstructive pulmonary disease (COPD), in particular to determine whether its benefits are not inferior to those of classic outpatient or inpatient pulmonary rehabilitation. A systematic review of the electronic databases Medline, Cochrane Library, PEDro, BMJ Best Practice, BMC Pulmonary Medicine, LILACS, academic search and ScienceDirect was performed to identify randomized controlled clinical trials, a parallel non-inferiority trial and a pilot study. Reference lists of selected studies were also reviewed for additional eligible articles focusing on telerehabilitation via videoconferencing (n = 2), one study focusing on an online respiratory therapist-delivered exercise program (n = 1), and one study focusing on a mobile phone-based COPD exercise program (n = 1). The telerehabilitation programs showed that exercise capacity and quality of life were not inferior to those of a hospital-based outpatient pulmonary rehabilitation program. The level of scientific evidence is moderate. More high-quality studies are needed to evaluate the effectiveness of telerehabilitation in patients with COPD.

1. Introduction

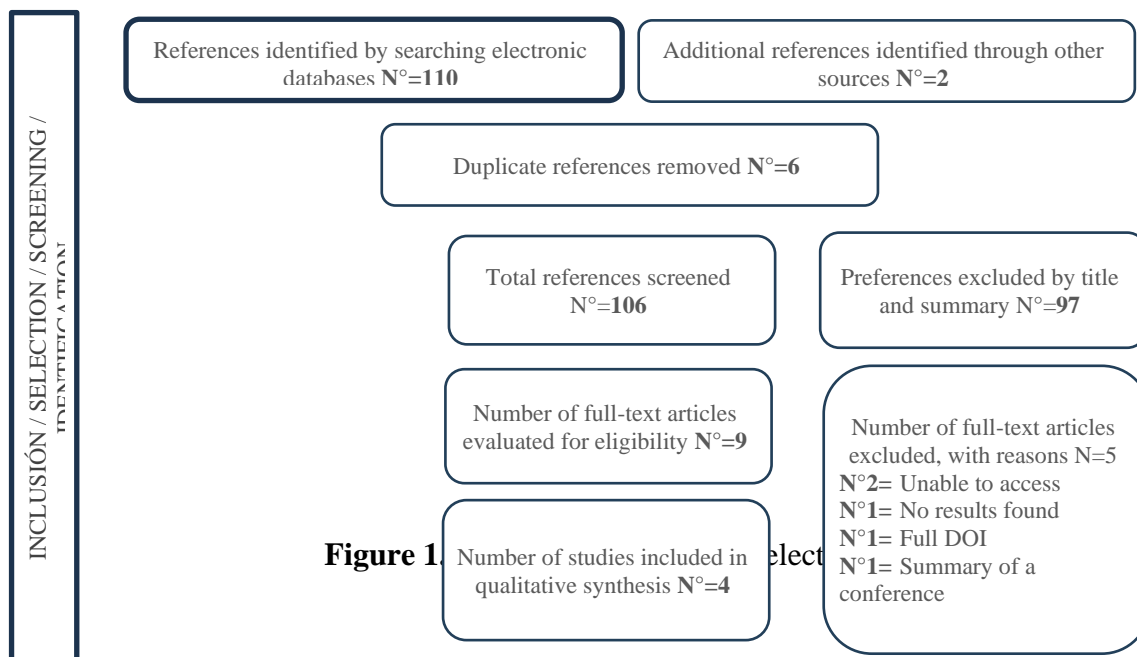
Pulmonary rehabilitation (PR) is an important and cost-effective component of the long-term management of chronic obstructive pulmonary disease (COPD) (1). PR is a safe and feasible multidisciplinary intervention for patients with moderate to advanced disease. It takes 6 weeks to achieve substantial effects, and physiological changes are observed after 2-4 weeks (2). PR improves functional exercise capacity, quality of life and functional aerobic capacity in COPD patients (3, 4), while reducing acute exacerbations, which are responsible for patient deterioration, hospital admissions and readmissions, and death (5), thereby reducing healthcare costs. PR has been placed at the center of non-pharmacological interventions for the treatment of COPD and its provision is required by the National Institute for Health and Care Excellence (NICE) as a key to comprehensive care (6), as stated in the 2021 update of the Spanish COPD guidelines (GesEPOC) (7).

The mainstay of PR is a physical and personal training program conducted in a supervised setting and focused on an established protocol of at least 6 weeks (4). RP combines exercise training with other interventions aimed at modifying aspects of the disease, such as education, exacerbation management, smoking cessation, nutrition, and psychological approaches, among others. However, compliance and acceptance of regular hospital or clinic visits are major barriers to the success of these programs (5). Of patients referred to PR, 8-50% never attend, while 10-32% of those who start do not complete the program (6); most PR programs are located in urban centers, with limited access for rural patients; barriers to attendance and program completion include poor mobility, lack of transportation, and travel costs (8). Therefore, an alternative approach is self-administered, home-based rehabilitation programs that are closely supervised or monitored (9, 10). Thus, the British Thoracic Society (BTS) PR guidelines (4) recognize that "technology has potential to be used as an adjunct to rehabilitation", and in 2015, 86% of patients with chronic cardiopulmonary disease had access to the internet (11, 12). This systematic review aims to examine the available evidence on the effects of telerehabilitation in patients with chronic obstructive pulmonary disease (COPD) and

whether its benefits are not inferior to those of classical outpatient or inpatient pulmonary rehabilitation.

Method

The design applied was the Systematic Review and Protocols Meta-analysis (PRISMA) (13). The search in electronic databases PubMed, Cochrane Library, PEDro, BMJ Best Practice, BMC Pulmonary Medicine, LILACS, Académica, and ScienceDirect. The terms employed were *home, domicile, telerehabilitation, telemedicine, videoconference, chronic obstructive pulmonary disease* and those studies where *tolerance, dyspnea* and *quality of life* were measured. A total of 110 papers were identified in the computerized databases. After eliminating duplicates in the database, 106 articles were analyzed, 97 were excluded according to titles and abstract selection, and 4 articles were considered eligible for full-text analysis (Figure 1).



Results

Table 1 shows the reference details in the literature on the subject.

Table 1. References and characteristics of the studies included in this systematic review.

First author [ref.]	Year	Study design	SubjectsN	Type Intervention of	Measures for results
Ling Ling Y. (15)	2016	ECA.	36	Real-time tele-rehabilitation VS standard medical treatment.	Exercise capacity: 6MWT, ISWT and ESWT. Dyspnea: MMRC. Quality of life: CRDQ.
Simon Bourne (16)	2017	ECA.	90	Online RP exercise program through 'myPR' VS Exercise program at the local Rehabilitation Center.	Exercise capacity: 6MWT. Dyspnea: MMRC. Quality of life: SGRQ.

Michael K. Stickland (17)	2011	Parallel, non-inferiority test.	409	Telehealth PR was performed in a local health center or local community through a real-time video VS Standard-PR was performed in the hospital with the respiratory physiotherapist.	Exercise capacity: 12-minute walk test. Quality of life: CRDQ.
Liu WT (18)	2008	Pilot study.	48	Group of cellular phones that will perform daily endurance walks following the rhythm of the music of a program installed on a cell phone VS Walking at home.	Exercise capacity: ISWT Dyspnea: Borg Scale Quality of life: SF-12 Health Questionnaire
RCT: Randomized Controlled Trial; 6MWT: 6-minute walk test; ISWT: incremental walk test or shuttle test; ESWT: endurance walk test; MMRC: Modified Medical Research Council Dyspnea Scale; CRDQ Chronic Respiratory Disease Questionnaire; SGRQ: St Georges Respiratory Questionnaire.					

The final result improves exercise capacity in Figure 2 shows that a Tele-rehabilitation program is not inferior to face-to-face Pulmonary Rehabilitation.

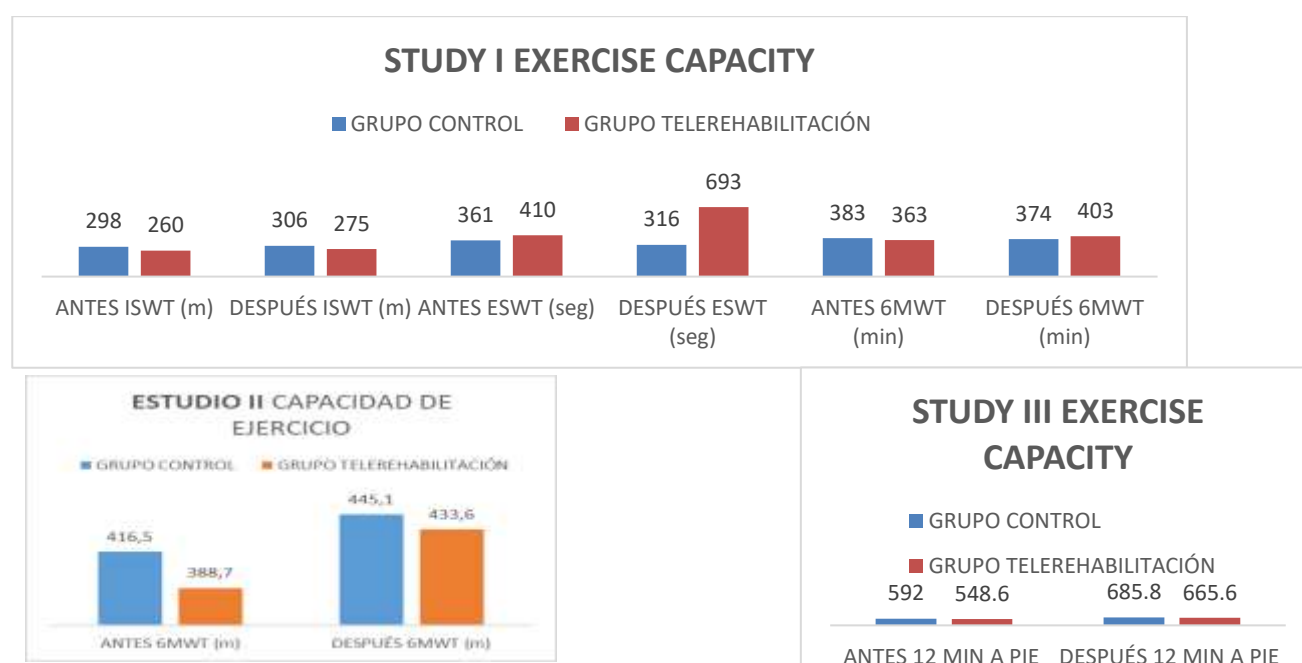


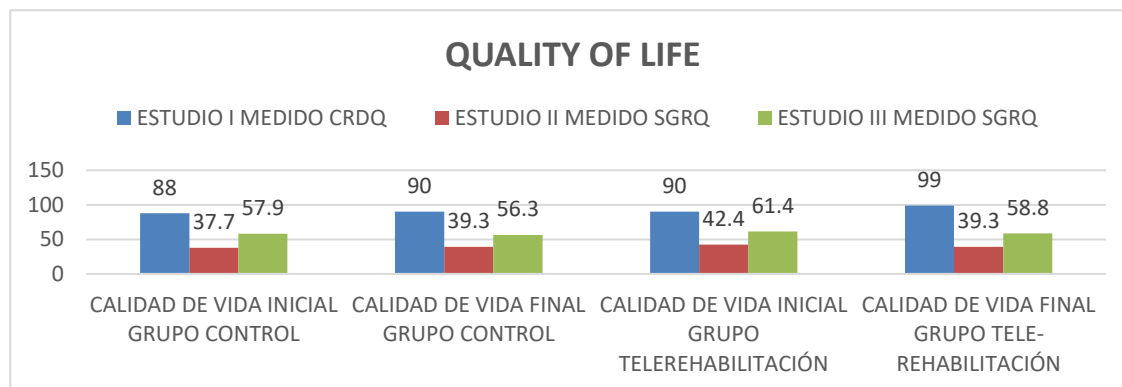
Figure 2. Exercise capacity.

In terms of dyspnea there were no significant changes at rest in either group over the course of the study as shown in Figure 3; however, dyspnea measured by the Borg scale after ISWT in the cell phone group decreased significantly compared to that of the control group after 12 weeks of resistance exercise with walking at home.

Figure 3. Dyspnea.

In relation to quality of life, the results show that there is no inferiority in quality of life for the tele-rehabilitation group. In Figure 4, the quality of life scores suggested non-inferiority for the online intervention group. Both programs demonstrated clinical improvement and that the improvement in the Tele-rehabilitation Group was non-inferior to the Control Group.

Figure 4 Quality of Life



Discussion

Tele-rehabilitation is effective and offers similar benefits to classic outpatient or inpatient pulmonary rehabilitation in patients with COPD in the study "Using Telehealth technology to deliver pulmonary rehabilitation to patients with chronic obstructive pulmonary disease" (20), and home-based tele-rehabilitation via real-time videoconferencing is a strategy for pulmonary rehabilitation as evidenced by the study Online versus face-to-face pulmonary rehabilitation for patients with chronic obstructive pulmonary disease: randomized controlled trial (19).

Other types of tele-rehabilitation interventions, cell phone-based exercise program for COPD and online exercises to assess exercise capacity and quality of life is demonstrated in the research "Home-based telerehabilitation via real-time videoconferencing improves endurance exercise capacity in patients with COPD: The randomized controlled TeleR Study" (18).

Conclusions

Tele-rehabilitation is an effective intervention to improve exercise tolerance, decrease dyspnea and quality of life in COPD patients, constituting a useful tool for those COPD patients who have difficulties to access a program of Classic Outpatient or Inpatient Pulmonary Rehabilitation.

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Declaration of conflict of interest

The authors declare that there is no conflict of interest.

Reference

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