

Physiotherapeutic telerehabilitation, the effectiveness of a digital approach: a systematic review

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Abstract

Objective: to compile relevant information regarding the clinical effectiveness and feasibility of telerehabilitation in different health conditions, so that greater precision can be made in decision-making regarding treatment. Methods: To this end, a search was carried out in the SciELO, MEDLINE, LILACS and PEDro databases, covering studies from the last 5 years. Structured and organized in the PICO format, the research was carried out by two independent evaluators and the methodological quality was evaluated according to the PEDro scale. At the end of the selection process, ten studies were included. Results: The analyzed studies emphasize that, as main therapy or complementary therapy, telerehabilitation proved to be effective, safe and viable, providing evidence that suggests its equivalence to conventional outpatient therapy. Conclusion: Teleservice presents similar results to face-to-face service, being effective in the proposed treatment.

Keywords: Telerehabilitation; Teleattendance; Teleconsultation; Physiotherapy; Remote Rehabilitation.

Resumen

Telerehabilitación en fisioterapia, la eficacia de un enfoque digital: una revisión sistemática.

Objetivo: recopilar información relevante sobre la eficacia clínica y factibilidad de la telerehabilitación en diferentes condiciones de salud, para que haya mayor precisión en la toma de decisiones sobre el tratamiento. Métodos: Se realizó una búsqueda en las bases de datos SciELO, MEDLINE, LILACS y PEDro, abarcando estudios de los últimos 5 años. Estructurada y organizada en formato PICO, la investigación fue realizada por dos evaluadores independientes y la calidad metodológica fue evaluada según la escala PEDro. Al final del proceso de selección, se incluyeron diez estudios. Resultados: Los estudios analizados destacan que, como terapia principal o terapia complementaria, la telerehabilitación demostró ser efectiva, segura y viable, aportando evidencias que sugieren su equivalencia con la terapia ambulatoria convencional. Conclusión: El teleservicio presenta resultados similares al servicio presencial, siendo efectivo en el tratamiento propuesto.

Palabras clave: Telerehabilitación; Teleservicio; Teleconsulta; Fisioterapia; Rehabilitación a Distancia.

Resumo

Telereabilitação fisioterapêutica, a eficácia de uma abordagem digital: uma revisão sistemática.

Objetivo: compilar informações relevantes quanto à eficácia clínica e viabilidade da telereabilitação em diferentes condições de saúde, para que se possa ter maior precisão na tomada de decisões com relação ao tratamento. Métodos: Para tal, foi realizada uma busca nas bases SciELO, MEDLINE, LILACS e PEDro, abrangendo estudos dos últimos 5 anos. Estruturada e organizada na forma PICO, a pesquisa foi realizada por dois avaliadores independentes e a qualidade metodológica foi avaliada conforme a escala PEDro. Ao final do processo de seleção, dez estudos foram incluídos. Resultados: Os estudos analisados salientam que, como terapia principal ou terapia complementar, a telereabilitação se mostrou eficaz, segura e viável, fornecendo evidências que sugerem sua equivalência a terapia ambulatorial convencional. Conclusão: O tele atendimento apresenta resultados semelhantes ao atendimento presencial, sendo eficaz no tratamento proposto.

Palavras-chave: Telereabilitação; Tele atendimento; Tele consulta; Fisioterapia; Reabilitação Remota.

Introduction

Since the introduction of Web 2.0 in 2004 with its enhanced functionality and its rapid evolution with digital tools, technologies, and media, several scientific studies and evidence related to physical therapy for digital practice have emerged. The term telerehabilitation is often used to describe this practice¹. Telerehabilitation is considered a branch of telehealth and consists of the delivery of rehabilitation services, offered at a distance through remote information and communication technologies, with the professional and the patient in different places².

Physiotherapy telerehabilitation aims to facilitate the delivery of effective physiotherapy services, which are based on scientific evidence, as well as ethics, privacy, confidentiality, and security to patients. The method provides real-time interaction through video and audio, allowing communication between the patient and the physical therapist at a distance, or even asynchronously with message recordings¹. It is also a way to increase accessibility and improve continuity of care in populations with disabilities, geographically remote or vulnerable. Innovative and alternative, the method allows remote access to the rehabilitation team, using information and telecommunication technologies through cameras and software^{2,3}.

In Brazil, telerehabilitation by physiotherapy was prohibited until March 20, 2020, when the president of the Federal Council of Physiotherapy and Occupational Therapy, temporarily authorized through Resolution 516 Physiotherapy and Occupational Therapy service to the population during the crisis caused by the COVID-19⁴.

The increasing spread of the SARS-CoV-2 virus has led the governments of the main affected countries to gradually suppress social interaction between people⁵. Social distancing was adopted as one of the main measures to curb the number of cases of people sick with COVID-19 in the hope of reducing the need for the number of hospitalizations, and avoiding an overload on the health system⁶. With the need to remove the population from any non-essential external activities and home confinement, the result is a drastic decrease in physical activity and physical exercises⁷.

Although the main task is to contain the spread of infection and treat patients affected by COVID-19, it is important to note that side effects arising from the lack of care for other health problems can occur, and the discontinuation of treatment can interfere negatively

with the individual's health, worsening the condition or installation of new pathologies⁸.

The conventional way of doing physical therapy rehabilitation had to be innovated. In addition, many rehabilitation centers have abruptly changed the way their interventions reach those who continue to need them for other reasons. Therefore, physiotherapy professionals and occupational therapists need to quickly adapt to changes in the way of promoting, restoring, and rehabilitating the functional capacity of their patients⁹. Thus, professionals must be familiar with the evidence base associated with digital practice since the success of telerehabilitation (telemonitoring) will depend on the therapist's skills and the service patient's ability to use them¹⁰.

The internet is the fastest technological revolution in history, along with near-daily advances in health-related technologies. The published evidence is being replaced faster than it is created. Therefore, to provide timely assistance to physical therapy professionals in the current evidence available for the practice of telerehabilitation, the study aims to compile relevant information on the clinical effectiveness and feasibility of telerehabilitation in conventional rehabilitation in conventional rehabilitation in different health conditions.

Method

Research characterization and search strategies

This systematic review was conducted according to the Prisma recommendations. Searches for scientific articles were conducted by two independent researchers in the electronic databases Scientific Electronic Library Online (SciELO), MEDLINE (via PubMed), LILACS (via VHL), and PEDro, with a time limit of five years. The research was structured and organized in the PICO form, which stands for an acronym for Target Population, Intervention, Comparison, and Outcomes. Due to the purpose of this research, the acronym Population was not used as it is not applicable.

The descriptors were selected from the Medical Subject Heading Terms (MeSH) dictionary, given its wide use by the scientific community for indexing articles in the PubMed, Lilacs, and Scielo databases.

The following keywords and Boolean operators were proposed for the searches:
 [("Telerehabilitation/methods" OR
 "Telerehabilitation/standards") AND

(“Rehabilitation/methods” OR “Rehabilitation/standards”)], which were subsequently suitable for the other bases that were used in this systematic review.

Eligibility Criteria

Inclusion criteria

The designs of the studies selected to compose this review were: controlled and randomized clinical trials, quasi-randomized controlled trials, and comparative studies with simultaneous controls, published from 2015 to the present date.

The sample should be composed of telerehabilitation and conventional physical therapy rehabilitation applied virtually or in clinics and outpatient clinics respectively, regardless of the dysfunction to be treated. We included studies in Portuguese and English.

Exclusion criteria

We excluded letters to the editor files, guidelines, systematic reviews, meta-analyses, case studies, case series with 10 or more consecutive cases, and abstracts. Studies that presented only Virtual Reality as the main intervention or usual care as the only control group was also excluded.

Selection of studies

Two independent examiners selected the studies. Initially, studies were excluded based on the title, then the abstracts were analyzed and only those that were potentially eligible were selected for a full evaluation. Disagreements were resolved by consensus.

Data extraction

Data extraction was performed using a form created by the researchers in Excel®, in which the extracted results were initially added by one of the researchers and then checked by another researcher. When necessary, the corresponding authors of the studies were contacted to answer questions and/or provide information not presented in the published study.

Results

To answer the guiding question, “Does telerehabilitation have clinical efficacy and feasibility comparable to conventional physical therapy rehabilitation in different health conditions?”, the studies went through a process that involved search, identification, mapping, and analysis activities. Figure 1 shows the study selection process.

During the analysis of the selected studies, we extracted data relevant to this research, as shown in Table 1.

Figure 1. Flowchart of the selection of studies according to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – (SHAMSEER et al., 2015).

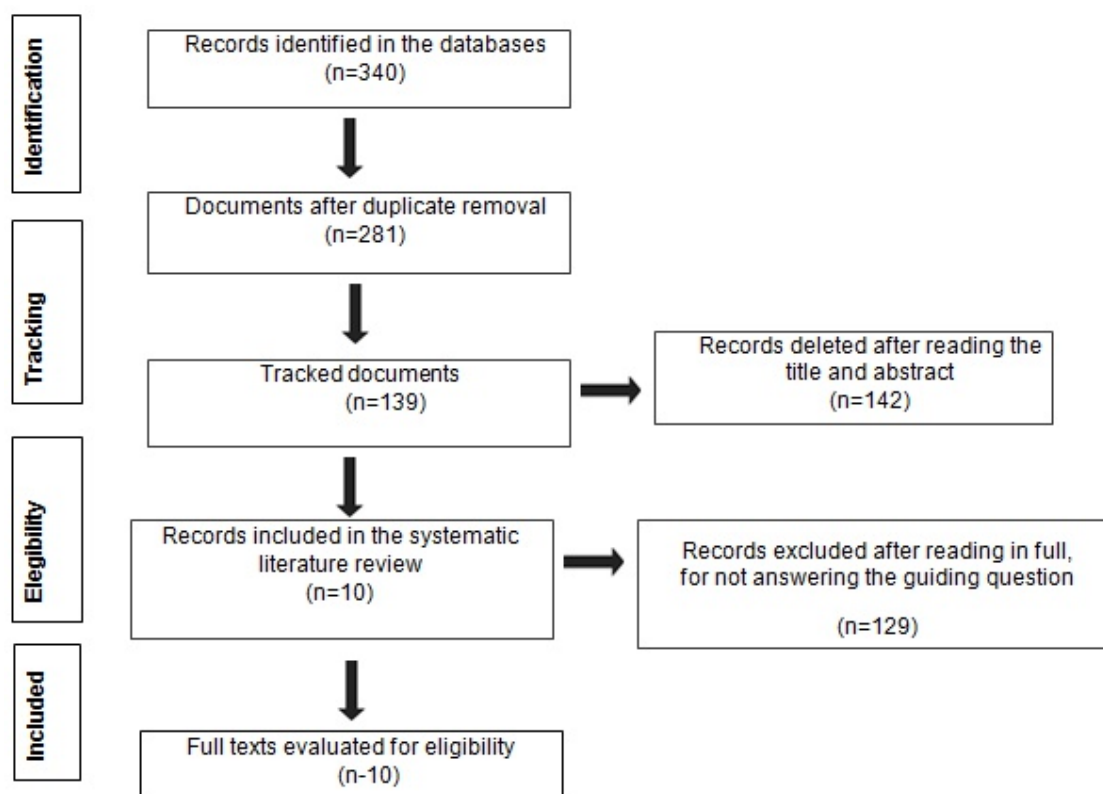


Table 01: Characterization of the analyzed studies.

Author/ Year/ Title/ Country	Objective	Study Design	Protocol of RP	Efficacy/Feasibility
MADDISON, Ralph, et al. 2019 Effects and costs of real-time cardiac telerehabilitation: a randomized controlled non-inferiority trial. (New Zealand)	To compare the effects and costs of exercise-based cardiac telerehabilitation monitored remotely in real-time with center/clinic-based rehabilitation programs in adults with coronary heart disease.	Intervention study. Randomized 162 patients with coronary heart disease (1:1) to the REMOTE intervention group and the center-based control group. The primary endpoint (non-inferiority) was the difference between groups in VO2 max. measured with an online metabolic cart. Secondary outcomes (superiority) included lipid and glucose concentrations. Anthropometry, BP, physical activity, and quality of life.	It comprised three training sessions per week for 12 weeks in both groups. Participants were assessed at 12 and 24 weeks. The duration of the exercises ranged from 30 to 60 minutes, including the warm-up and cool-down phases. The exercise intensity level ranged from 40-65% of heart rate reserve. The exercise prescription was individualized and progressive based on the maximum aerobic exercise capacity of the participants.	The effectiveness of 6MWT was demonstrated by VO2 max. which was compatible in both groups, as well as the secondary results, there was no significant difference in values. TR proved to be equivalent in effectiveness to conventional rehabilitation. In addition to being safe, it obtained greater adherence among the participants.
CHEN, Jing, et al. 2017 Effects of tele-supervised rehabilitation at home on physical function of stroke survivors with hemiplegia: a randomized clinical trial. (China)	To assess whether home tele-supervision is better than conventional rehabilitation on physical function for stroke survivors with hemiplegia and whether this type of intervention can be useful to alleviate the burden on caregivers.	Twenty-seven patients were randomized to the tele-supervision group and 27 patients to the control group. To measure disability in activities of daily living, the modified Barthel Index was used. To assess balance and Global impairment, the Berg scale and the MRS scale were used, respectively. To assess caregiver stress, the Caregiver Strain Index (CSI) was used. The RMS evaluated muscle contraction using an electromyographic signal (EMG).	The therapeutic strategy was the same in both groups, which received 12 weeks of intervention for 1 hour twice a day in a total of 60 sessions, consisting of: physical and balance exercises, walking, and specific training (Bobath concept). Neuromuscular electrical stimulation was conducted using a portable biofeedback device (ETNS).	Tele supervision was not superior in any of the results, but equivalent to conventional rehabilitation in terms of effectiveness, with no significant difference between the groups for functional recovery of post-stroke individuals with hemiplegia. In addition, no therapy-related complications were showing that the method is safe and effective.
HWANG Rita et al. 2017 Telerehabilitation is not inferior to a center-based program in patients with chronic heart failure: a randomized trial. (Australia)	To determine the effectiveness and safety of a short-term program in the TR group for patients with chronic heart failure, delivered to each participant's home in real-time via an online system, relative to a center-based group rehabilitation program.	Pre- and post-test intervention study. Twenty-four participants were allocated to the intervention group (TR) and 24 to the control group (CG). Participants were evaluated at week 0, week 12, and after intervention at week 24. The 6-minute walk test (6MWT) was the primary outcome measure. Secondary outcomes were: balance, maximal grip strength of both hands, quadriceps strength, quality of life, adverse events, and treatment adherence rates.	Both groups received intervention twice a week for 12 weeks. Both groups had similar protocols which consisted of 10 minutes of warm-up, 40 minutes of aerobic and strength exercises, and 10 minutes of cool-down. In addition, the control group received multidisciplinary guidance on the day of the sessions. The intervention group (telerehabilitation) participated simultaneously by videoconference, with 4 individuals per session.	There was no significant difference between groups for 6MWT, as well as for balance, muscle strength, and quality of life. The analyzes show that both groups had significant improvements in their pre-program to post-program quality of life and were sustained at the 24-week follow-up. The results showed that TR is not inferior to a conventional rehabilitation program, in addition to being safe and with a superior adherence rate.

<p>DOIRON-CADRIN Patrick; et al. 2020</p> <p>Feasibility and preliminary effects of a tele-prehabilitation program and an in-person prehabilitation program compared to usual care for total hip or knee arthroplasty candidates: a pilot randomized controlled trial (Canada)</p>	<p>To assess the feasibility and impact on pain and disability of a pre-rehabilitation telerehabilitation program for patients awaiting total hip or knee arthroplasty compared with a pre-rehabilitation or usual care program.</p>	<p>Thirty-four patients awaiting total hip or knee arthroplasty. Twelve were allocated to the pre-rehabilitation tele group, 11 to the pre-rehabilitation group, and 11 to the usual care control group. To question the effectiveness, the LEFS questionnaire was used, and to assess pain and disability, the WOMAC was used. Measures for SF-36, TUG, Self-Test and Global Rating of Change scale integrated the secondary outcomes.</p>	<p>Participants in the experimental groups received a 12-week, twice-weekly program. The protocol consisted of: range of motion and strengthening of the hip and knee muscles, proprioception, cardiovascular warm-up, and application of ice. The usual care group received a booklet containing information about the surgery, medications, and rehabilitation.</p>	<p>Although it was not possible to determine the superiority of pre-rehabilitation and tele-rehabilitation due to an insufficient sample for the LEFS primary outcome, the secondary outcomes suggest that, in terms of feasibility, the study proved to be safe without any complications, viable because it was possible to use mobile technology and generated good satisfaction among the participants.</p>
<p>CRAMER, Steven C; et al. 2019</p> <p>Efficacy of home telerehabilitation versus medical therapy for adults after stroke: a randomized clinical trial. (USA)</p>	<p>To determine whether targeted arm movement treatment delivered through a telerehabilitation (RT) system has comparable efficacy to therapy delivered in a traditional clinical (IC) setting, and to examine whether this system has comparable efficacy in providing stroke education.</p>	<p>A total of 124 participants were randomized (1:1) to receive intensive arm motor therapy at the clinic (IC) or the patient's home using TR. The primary outcome was measured by the Fugl-Meyer (FM) scale. Secondary motor outcomes were Box and Blocks Test and Stroke Impact Scale (version) scores, and measures of motivation, stroke knowledge, and adherence were also assessed.</p>	<p>Participants in both groups received 36 sessions, 18 supervised and 18 unsupervised, during 6 weeks. They consist of 70 minutes each, with specific motor therapy for upper limbs, resistance exercises, stretching, strengthening, and active range of motion, in addition to stroke education.</p>	<p>TR proved to be equivalent to outpatient rehabilitation. There were substantial gains in arm motor function regardless of whether therapy was provided through home telerehabilitation or traditional clinical rehabilitation. The most important finding was that the benefits were substantial whether treatment was started <90 days, or delayed >90 days after the stroke.</p>
<p>PASTORA-BERNAL, José M et al. 2017</p> <p>Telerehabilitation after arthroscopic subacromial decompression is effective and not inferior to standard practice: preliminary results (Spain)</p>	<p>To assess the feasibility and effectiveness of a customizable telerehabilitation intervention compared with traditional physical therapy in patients undergoing subacromial decompression.</p>	<p>A controlled clinical study in which 18 patients undergoing arthroscopic subacromial decompression were randomized to a program of telerehabilitation (TR) and traditional physical therapy (PT), 5 days a week during 12 weeks of postoperative rehabilitation. To assess the efficacy and the functional result, the Constant-Murley (CM) score was used.</p>	<p>This study does not present a rehabilitation protocol. Only brief description of delivery of strength exercises, range of motion, and functional exercises for both groups. The difference between the groups was manual therapy that was part of the traditional physiotherapy (TPT) group.</p>	<p>Physical and functional improvements were similar in both groups, with no significant difference. TR with a range of motion exercises, rotator cuff strengthening, and scapula stabilizers proved to be viable, effective, and non-inferior to traditional physical therapy.</p>
<p>AVILA, Andrea et al. 2019</p> <p>Do home exercises with telemonitoring guidance in patients with coronary artery disease improve long-term physical fitness? (Belgium)</p>	<p>To compare the long-term effects of a phase III home exercise program with telemonitoring guidance to a prolonged, center phase III exercise program in patients with coronary artery disease.</p>	<p>Randomized clinical trial. Ninety patients with coronary artery disease, after completing a phase II outpatient CR program, were randomly assigned to TR (30), center-based (30), and usual care control group (30) for 12 weeks. The</p>	<p>The TR group received an exercise prescription recommending 150 minutes per week at a target of 70-80% HR reserve (HRR). The center-based group continued to receive three sessions per week, consisting of approximately 45</p>	<p>Exercise capacity and secondary outcomes were preserved in all three groups regardless of intervention. The home exercise intervention was as effective as in centers and did not result in higher levels of exercise capacity and</p>

		primary endpoint was measured by exercise capacity, and determined by VO2P and heart rate. Physical activity, BP, muscle strength, anthropometry, biochemical analysis, and quality of life were part of the secondary outcomes.	minutes of resistance training at 70-80% HRR followed by relaxation. The CG was instructed to maintain a physically active lifestyle.	physical activity compared to the other two interventions.
NELSON Mark et al. 2019 Telerehabilitation is non-inferior to usual care after total hip arthroplasty: a randomized controlled non-inferiority trial (Australia)	To determine whether physical therapy care via telerehabilitation is as effective as face-to-face outpatient care after total hip arthroplasty.	Seventy patients who received total hip arthroplasty were allocated on a 1:1 basis, center-based control group and TR intervention group, to receive 6 weeks of rehabilitation. The primary outcome measure was the hip disability and osteoarthritis quality of life subscale. Secondary outcomes included scores for strength, balance, self-reported function, satisfaction, and compliance with the home exercise program.	The study did not present a protocol only that the control group received outpatient physical therapy and an exercise program at home. The intervention group received remote telerehabilitation and a technology-based home exercise program using an iPad app.	The results of the study suggest that TR was equivalent to center-based rehabilitation, with no significant difference between groups for physical and functional outcomes. In addition to having generated good satisfaction in the group due to the ease of delivery of rehabilitation.
MOFFET, Hélène et al. 2017 Patient satisfaction with in-home telerehabilitation after total knee arthroplasty: results from a randomized controlled trial. (Canada)	To compare the level of satisfaction of patients who follow home telerehabilitation after total knee arthroplasty with patients who follow home visit rehabilitation.	Randomized controlled trial with a total of 205 randomized patients into TR group and home visits group. The outcome for satisfaction was measured using the Health Care Sa questionnaire. To classify knee function about pain and stiffness, the WOMAC index (version 5) was used.	The physical therapy intervention program was similar for both groups; based on mobility, strengthening, gait training, transference, and balance. Interventions of 45 to 60 minutes in duration are delivered fortnightly over 8 weeks.	The level of satisfaction among patients who received TR and rehabilitation by home visit was similar with no significant difference.
VASILOPOULOU, Maroula et al. 2017 Home maintenance telerehabilitation reduces the risk of acute COPD exacerbations, hospitalizations, and emergency department visits (Greece)	To investigate whether home-maintenance telerehabilitation is as effective as hospital-based maintenance rehabilitation and superior to usual care in reducing the risk of exacerbations of acute chronic obstructive pulmonary disease (COPD)	There were 150 COPD patients were randomized into three groups: (n=50) outpatient rehabilitation, (n=50) telerehabilitation, and (n=50) usual care. The primary outcome measure was the rate of moderate to severe acute exacerbation of COPD, hospitalizations for acute exacerbation, and emergency room visits. Pulmonary function assessment was performed by post-bronchodilation dynamic spirometry and exercise bike test. Functional capacity was assessed by the 6MWT.	In the TR program, 144 sessions were delivered over 12 months. The program included upper and lower limb exercises and walking exercises in addition to dietary advice and self-management. The outpatient rehabilitation group received 96 sessions twice a week for 12 months and consisted of physical training, dietary and psychological counseling. The GC maintained usual care.	Both the TR and outpatient rehabilitation groups showed a lower rate of acute exacerbation and hospitalizations due to COPD in the 12-month follow-up compared to the usual care group. The study suggests that the TR program is not inferior to the ambulatory PR program in preserving the true effects of physiological training, respiratory symptoms, daily activity levels, and quality of life aspects in individuals with COPD.

Caption: TR telerehabilitation; 6MWT: 6-minute walk test; WOMAC: Western Ontario and MacMaster Universities Arthritis Index, SF-36: The short form (36) Health Survey; TUG: Time up and Go; IC: Traditional clinical setting; FM: Fugl-Meyer score; CVA: Stroke; PT: traditional physical therapy; LEFS: Lower Extremity Functional Scale
 Primary data (2020)

From the reading of the articles, it was identified that TR proved to be effective or equivalent to conventional physical therapy outpatient rehabilitation in different health conditions. Rehabilitation through telecommunication also proved to be feasible when factors such as distance and displacement were considered critical reasons by patients.

In addition to the aforementioned efficacy, during the reading of the analyzed articles, other conditions favorable to the use of TR were identified, such as safety in the delivery of rehabilitation, the adherence of the participants (which was higher in many studies), an increase in the level of activity even active after the end of therapy in the TR group, the level of patient's satisfaction with the method and the issue of lack of time remedied because an asynchronous delivery is

possible. In addition, it is possible to use mobile devices such as smartphones that are already widely used by the general population for various other services. TR proved to be beneficial and effective if accompanied by a professional in the field of physiotherapy, who can provide support for a recovery similar to conventional treatments.

Study quality assessment

To assess the methodological quality, the PEDro Scale was used. The PEDro scale is based on the Delphi list, to assist in the methodological identification of studies. This is divided into 11 items, in which item "1" is not scored, resulting in scores ranging from 0 to 10 points at the end. (Table 2)

Table 2: Assessment of methodological quality according to the PEDro scale

Study	(1)*	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Total
MADDISON, Ralph, et al. 2019	+	+	+	+	-	-	+	+	+	+	+	8
CHEN, Jing, et al. 2017	-	+	+	+	-	-	+	+	+	+	+	8
HWANG Rita et al. 2017	+	+	+	+	-	-	+	+	+	+	+	8
DOIRON-CADRIN Patrick; et al. 2020	+	+	+	+	-	-	+	+	+	+	+	8
CRAMER, Steven C; et al. 2019	+	+	-	-	-	-	+	+	+	+	+	6
PASTORA-BERNAL, José M et al. 2017	-	+	-	+	-	-	+	+	-	+	+	6
AVILA, Andrea et al. 2019	-	+	-	+	-	-	-	+	-	+	+	5
NELSON Mark et al. 2019	+	+	-	+	-	-	+	+	+	+	+	7
MOFFET, Helena et al. 2017	+	+	-	+	-	-	+	+	-	+	+	6
VASILOPOULOU, Maroula et al. 2017	+	+	-	+	-	-	-	+	-	+	+	5

Caption: (1): eligibility; (2): random distribution; (3): hidden allocation; (4): baseline compatibility; (5): blind individuals; (6): blind therapists; (7): blind raters; (8): adequate follow-up; (9): intention-to-treat analysis; (10): comparison between groups; (11): estimated points and feasibility. (+): criterion is satisfied; (-): criterion is not satisfied. * The eligibility criteria item does not contribute to the total score. Maximum score: 10 points.

Discussion

This study analyzed the effectiveness and feasibility of Physiotherapy Telerehabilitation, compared to the use of traditional Physiotherapy applied in person, exposed in 10 different articles.

The daily routine of rehabilitation has been undergoing important changes and adjustments, especially in Brazil. Due to the expansion of SARS-CoV-2 infection, many physiotherapy professionals had to adapt their work to the telerehabilitation modality. The demand for

physiotherapeutic rehabilitation services is increasing, as the population ages and chronic, degenerative, and other problems arising from living conditions appear¹⁰. Given this, the possibility of distance therapies has been increasing and becoming an alternative both for the physical therapist and for the patient who needs to be assisted regardless of their pathology or need³.

Many studies have sought to analyze the effectiveness of telerehabilitation in its numerous objectives. This systematic review of the literature enabled us to observe not only rehabilitation in different health

conditions but also its effectiveness and feasibility for such therapy. In the quest to assess the effectiveness and acceptance of digital rehabilitation in individuals with spinal cord injury Coulter et al. (2016), obtained satisfactory results regarding the method. Although the study has limitations due to the small number of participants and the short intervention period, the results obtained justify future work with a larger and more homogeneous sample¹¹.

In the study aimed at patients with chronic obstructive pulmonary disease (COPD) Vasilopoulou et al. (2017), not only evidenced the effectiveness of TR concerning daily activity levels, effects of physiological training, and respiratory symptoms over 12 months but also obtained a treatment adherence rate of 93.5%. This suggested that impeding barriers such as transport difficulties, lack of adequate structure, and low level of motivation, can be remedied with digital delivery, in real-time, and be the subject of future studies, given the importance of the benefits that the program offers for this social share¹².

Regarding rehabilitation (TR) before and after orthopedic surgeries, this research returned favorable results for TR, evidencing the delivery of therapy effectively and safely, with good acceptability in terms of general patient experience, with emphasis on the fact that, there is a need to travel to rehabilitation centers¹³⁻¹⁵.

Concerning exercise-based rehabilitation and neuromuscular electrical stimulation for stroke patients with hemiplegia, Chen et al., (2017), showed that it is possible to deliver efficient rehabilitation by digital means, showing promising results in terms of efficacy and safety of the method that did not present interferences related to therapy. In addition, the method did not impose an extra burden on caregivers and was as efficient as rehabilitation applied in centers^{3,16}.

Group activities complementing therapeutic procedures are often used in the health area. In a groundbreaking study for patients with chronic heart failure, Hwang et al. (2017) proved possible for the interaction between patients (groups of up to four individuals) in the delivery of digital rehabilitation through videoconferencing. In her findings, the author highlights that TR proved to be equivalent to rehabilitation in centers in all measures investigated and it obtained a higher rate of adherence among patients, suggesting that it is a promising alternative for this population and encouraging further research on TR Group for different health conditions¹⁶⁻¹⁸.

Another important aspect is satisfaction with the use of these resources. Among the articles analyzed on applications with patients, 8 studies, that is, 80% demonstrated that the benefits of their programs were the increase in quality of life, also mentioning the satisfaction of patients with the delivery method.

In contrast to the benefits mentioned above, some authors draw attention to the need to make adjustments in research on TR programs. The small number of participants, the short intervention period, and even the internet speed as limitations for the results investigated by them, highlighting the importance of further research and sample homogeneity to generalize the results found¹⁹⁻²⁰.

It also verified the scarcity of studies that refer to the scarcity of studies that refer to the implications of TR programs in the dynamics of health services. Aspects such as cost-benefits and implementation feasibility need to be further addressed by research.

Regarding the methodological quality and level of evidence, the classifications were extracted from the Data Bank of Evidence in Physiotherapy (PEDro). The following cutoff points were suggested to categorize studies by quality: excellent (9 to 10), good (6 to 8), regular (4 to 5), and poor (≤ 3). For the ten studies included in this systematic review, the PEDro scores ranged from 5 to 8, with a median of 6.7. These results provide an overview of current research design and methodological quality issues for studies examining TR interventions. The methodological classification criteria that were most frequently not satisfied in the articles were related to hidden allocation, blind individuals, and blind therapists. The methodological quality of studies for this systematic review was generally rated as good. Although some evidence of the effectiveness of TR interventions was gathered from this systematic review, researchers must improve the methodological quality of studies to definitively determine the effectiveness and feasibility of these interventions.

Conclusion

We concluded that most studies highlight the positive aspects of the use of TR, evidencing its effectiveness represented by a recovery similar to conventional treatments, making clear the relevance of a digital approach. Although this systematic review has revealed that there is an insufficient number of high-quality studies on TR interventions, the results of these studies may encourage the application and use of TR combined with periodic evaluations to monitor the

effectiveness of the program in individuals with different diseases and needs. Even so, given all the positive results, this study enabled us to survey some aspects that should still be considered in future research to improve the delivery of rehabilitation adequately. Aspects such as age and culture must be taken into account, as well as user preferences in the way the service is delivered.

There is a need for research on its use at different stages of the disease, as well as larger samples for more significant evidence. Finally, the present study revealed that, in addition to the limitations found by the aforementioned authors in this review, it is necessary to investigate the main barriers encountered by physical therapy professionals in the delivery of rehabilitation in a digital way, and whether these are the acceptability in the use of technologies in different target audiences, treatment adherence/effectiveness ratio, or even the form of interaction addressed by them, which could contribute to remedying future limitations.

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