Effectiveness of exercises by telerehabilitation on pain, physical function and quality of life in people with physical disabilities: a systematic review of randomised controlled trials with GRADE recommendations

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ABSTRACT

Objective Investigate whether exercise-based telerehabilitation improves pain, physical function and quality of life in adults with physical disabilities.

Design Systematic review of randomised controlled trials.

Data sources Searches were performed in AMED, MEDLINE, CINAHL, SPORTDiscus, Embase, PEDro, Cochrane Library and PsycINFO.

Eligibility criteria Trials were considered if they evaluated exercise by telerehabilitation. The population included adults with physical disability. Comparisons were control and other interventions. The outcomes were pain, physical function and quality of life. Study selection, data extraction and analysis followed the protocol registered in PROSPERO (CRD42019122824). GRADE determined the strength of evidence.

Results Forty-eight trials were included in the quantitative analysis. When compared with other interventions, there was high-quality evidence that telerehabilitation was not different to other interventions for pain (95% CI: −0.4 to 0.1), physical function (95% CI: −0.2 to 0.2) and quality of life (95% CI: −0.1 to 0.5) at long-term. There was moderate-quality evidence that telerehabilitation was not different to other interventions for physical function (95% CI: −0.1 to 0.5) and quality of life (95% CI: −0.2 to 0.5) at short-term. However, due to the low-quality evidence and the small number of trials comparing exercise protocols offered by telerehabilitation with control groups, it is still not possible to state the efficacy of telerehabilitation on pain, function and quality of life at short-term and long-term.

Conclusions Exercise by telerehabilitation may be an alternative to treat pain, physical function and quality of life in adults with physical disabilities when compared with other intervention.

INTRODUCTION

According to the World Report on Disability (WHO 2011), over one billion people live with a disability worldwide, and almost 200 million experience considerable functional limitations.[1] Healthcare services face challenges to address the needs of people with physical disabilities,[2] including: patients' physical incapacity to attend treatment centres, absence of caregivers, scarcity of health professionals and limited resources in local communities. Lack of transport to clinical centres can be a particular barrier for people with disability to access care.[1 3 4] Limited access to healthcare services may allow health and quality of life to deteriorate.[5]

To address these challenges, many countries are employing telecommunication technologies as part of the healthcare service.[6] Telerehabilitation may improve the quality of services by monitoring patients in their own place, mainly in communities far from urban centres. It is also expected to improve cost-effectiveness of interventions.[7–9] Previous systematic reviews have evaluated the feasibility, efficacy and cost of telerehabilitation for people with different health conditions, and the reviews supported telerehabilitation as an effective alternative to supervised/face-to-face interventions.[10–13]

Exercise is one of the treatments that clinicians can deliver using telerehabilitation. Exercise is cost-effective[14 15] and recommended for people with physical disabilities due to musculoskeletal conditions, coronary heart disease, some types of cancer, type 2 diabetes, hypertension, among others.[16]

Conclusions from previous systematic reviews that investigated effectiveness of exercise by telerehabilitation in people with physical disabilities were limited by confounders such as inclusion of poor quality studies (ie, no randomised controlled trials),[17 18] and absence of investigation of effect sizes and the strength of the recommendation.[18] The aim of this systematic review of randomised controlled trials was to investigate short-term and long-term effectiveness of exercise by telerehabilitation on pain, physical function and quality of life in adults with physical disabilities when compared with control and other interventions. Effect estimates and a rating of the certainty of the current evidence were reported.

METHODS

Search strategy and inclusion criteria

The present systematic review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[19] and Cochrane recommendations.[20] Its protocol was prospectively registered at PROSPERO (CRD42019122824). Search strategies were conducted in May 2018 and updated in February 2020 on Allied and Complementary Medicine Database (AMED), Medical Literature Analysis and Retrieval System Online (MEDLINE), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Excerpta Medica dataBASE (Embase), Physiotherapy Evidence Database (PEDro), Cochrane Library, SPORTDiscus and PsycINFO database. There was no date or language restriction. Online supplemental material 1 details the search strategy. The health condition of interest was unlimited to increase sensitivity of our search strategy, avoiding exclusions of potential populations that we were unaware of. In addition, we manually searched identified systematic reviews in the area and specific journals of telemedicine (eg, Journal of Telemedicine and Telecare, and Telemedicine Journal and e-Health) to identify potentially relevant trials.

We included published randomised controlled trials investigating effectiveness of telerehabilitation on pain, physical function and/or quality of life in adults with physical disabilities. Physical disability was defined according to the International Classification of Functioning, Disability and Health (ICF). In the ICF, issues with human functioning are categorised in three interconnected components: impairments are issues in body function or alterations in body structure; activity limitations are issues in executing activities; participation restrictions are issues involving any area of life. Physical disability refers to difficulties encountered by people with health conditions in any or all three components of functioning described above.[21]

Population of interest were adults (≥18 years old) with physical disabilities related to any health condition. Telerehabilitation was considered in the current review as any take-home exercise (ie, aerobic exercises and/or kinesiotherapy) provided by telecommunication technologies such as phone calls, video conferences and/or software applications.[7] We arbitrarily decided to exclude trials investigating virtual reality by telerehabilitation because of the specificity of the theme and costs of the technology. Comparators of interest were control (ie, no intervention, waiting list, placebo or sham) and other interventions (ie, any other active intervention such as traditional rehabilitation at home or in healthcare facilities). Our outcomes of interest were pain, physical function and quality of life. Trials were included if they reported any valid measures of our outcomes of interest such as: Visual Analogue Scale (VAS) or Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain subscale for pain;[22] 6 min walk test (6MWT) or Arthritis Self-Efficacy Scale (AIMS2) subscale for physical function;[23] and Short Form Health Survey-36 (SF-36_ or Minnesota Living with Heart Failure questionnaire for quality of life.[24] When more than one valid measure was available in the trial for the same outcome, we considered the most consistent measurement instrument across trials included in this review.[25–73]

Study selection

After searches, retrieved references were exported to the EndNote Reference Manager Software and duplicates were removed. Then, titles and abstracts were screened, and two reviewers independently (JFD and FCMSD) assessed potential full-texts using our eligibility criteria outlined above. Trials fulfilling our eligibility criteria were included in the review. A third reviewer (RFS) solved disagreements.

Two reviewers independently (JFD and PRTB) assessed the quality of included trials using the 0 to 10 PEDro scale (http://www.pedro.org.au/). The PEDro scale has been shown to have acceptable reliability and validity for rating quality of randomised controlled trials.[74 75] A third reviewer (RFS) solved discrepancies. When available, we used the scores from the PEDro database.[76]

Data extraction

The two reviewers independently (JFD and PRTB) extracted descriptive and outcome data from included trials, and the third reviewer (RFS) solved discrepancies. Descriptive information included: source of participants; health condition; age; sex; type and dosage for telerehabilitation and comparators; outcomes; and time points. Extracted outcome data included means, standard deviations (SDs) and sample sizes of all groups to investigate short-term and long-term effects. Short-term effect was considered follow-up up to 3 months after baseline, and long-term effect was considered follow-up over 3 months after baseline. When more than one time point was available within the same follow-up period, the one closer to the end of the intervention was considered. If trials investigated more than one type of exercise by telerehabilitation[31] or more than one comparator,[29 40] groups were combined as recommended by Cochrane.[77] Some included trials did not provide SDs and data were imputed from: SEs;[26] CIs;[29 46] P values;[46 65] medians and IQRs;[36 44 61 64] or other trials included in the review that used the same instrument,[37] following the Cochrane recommendations.[77] Trials that reported outcome data not normally distributed (ie, mean/SD ratio of less than 2)[78] and did not provide log-transformed outcome data[29 31 40 48 56–58 68 72 73] were excluded from the quantitative analyses (ie, meta-analyses), following recommendations.[77] Online supplemental material 2 details the data extraction.

Study analysis

Meta-analysis was conducted using random-effects model because of the effects being estimated in the different studies were not identical. The model represents our lack of knowledge about why real or apparent intervention effects differ by considering the differences as if they were random.[77] For the outcomes of interest, standardised mean differences (SMDs) and 95% CIs were presented, at first, for overall effect analyses on pain, physical function and quality of life in the forest-plots. The overall effects of telerehabilitation in people with physical disabilities (all health conditions combined) investigated the efficacy of telerehabilitation on outcomes of various functional levels. We chose to do this overall analyses as people with different health conditions may experience similar difficulties across functional levels.[79] After the overall analyses, subgroup analyses investigated potential impact of specific clinical categories. Trials were categorised following the International Classification of Diseases and Related Health Problems (ICD-10) and grouped into 10 clinical categories (oncology, neurology, cardiovascular, pulmonary, urology, musculoskeletal, postoperative orthopaedic conditions, rheumatological, endocrine and multiple conditions).[80] Subgroup and sensitivity analyses assessed potential sources of heterogeneity: clinical categories; and methodological quality of included trials (ie, a PEDro score <6 out of 10 was considered poor quality), using meta-regression when possible (ie, when at least 10 trials were pooled, following the Cochrane recommendations).[77] Otherwise, qualitative subgroup analyses were conducted by different clinical categories and removing poor quality trials (ie, when less than 10 trials were pooled). Publication bias was investigated using the funnel plot and the Egger's test when at least 10 trials were pooled.[81] All analyses were conducted using Comprehensive Meta-analysis software, V.2.2.04 (Biostat, Englewood, New Jersey). Estimated effect

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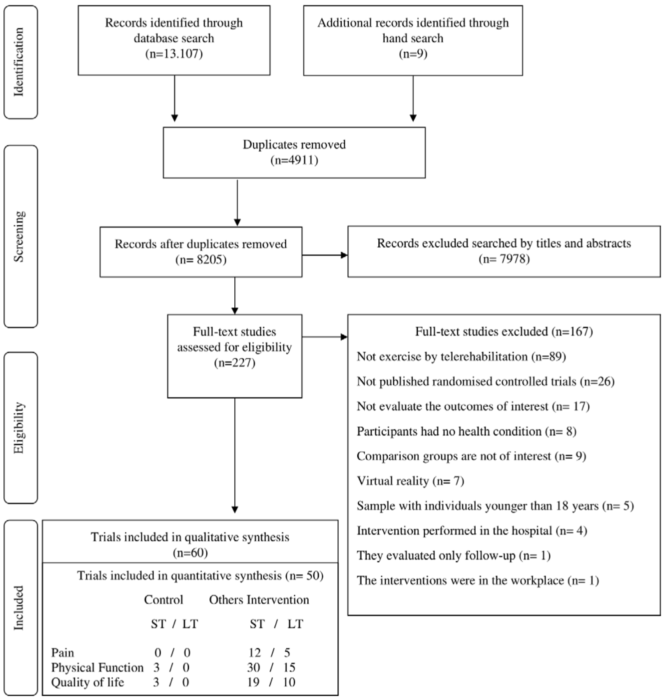

Figure 1 Flow of studies through the review (n=60 original trials included in qualitative synthesis and n=50 original trials included in quantitative synthesis). LT, long-term; ST, short-term.

sizes were assessed using Cohen's benchmarks: d≥0.2 for small; d≥0.5 for medium; and ≥0.8 for large effects.[82]

The two reviewers independently (JFD and PRTB) assessed the strength of the recommendation using the GRADE system.[83] According to the four-level GRADE system, recommendation may range from high to very-low quality. Low levels indicate uncertainty of the estimated effects. In the current review, high-quality evidence was downgraded in one point for each of the following issues: imprecision when analysed sample <400;[84] risk of bias when >25% of the participants were from trials with a high risk of bias (ie, PEDro score <6 out of 10);[85] inconsistency when I^2 statistics >50% or when pooling was not possible;[86] and publication bias when pooling ≥10 trials.[81] A third reviewer (RFS) solved discrepancies between reviewers.

RESULTS

Study selection

We identified 8205 references and 60 original trials were included in the review. The main reasons for exclusion of potential full-texts were: no population of interest (n=13); no intervention of interest (n=100); no comparator of interest (n=9); no outcome of interest (n=17); and not published randomised controlled trials (n=26). The flowchart describing trials selection is in figure 1.

Study characteristics

Characteristics of included trials and outcome data are presented in online supplemental material 3. All 60 included trials were published between 2002 and 2019. They were conducted in Europe (n=20, 33.3%), North America (n=17, 28.3%), Oceania (n=10, 16.6%), Asia (n=10, 16.6%), Africa (n=2, 3.3%) and South America (n=1, 1.6%). Thirteen trials were conducted in USA and 10 in Australia. In 76% of the trials (n=46), a single technological resource was used as telerehabilitation (eg, video or telephone). The others combined more than one technology (eg, video and telephone, n=4, 6.7%; video, telephone and audio, n=2, 3.3%; Internet-based and telephone, n=2, 3.3%).

All telerehabilitation exercise programmes included in this review were home-based. The duration ranged from 10 days to 12 months, with weekly frequency and duration of each session ranging from 2 to 7 times and from 20 to 90 min, respectively. Programmes included strength and stretching exercises combined or not with aerobic exercise. Initial evaluation of participants was conducted in all trials. After the initial evaluation, six trials[35 45 53 57 71 87] had initial face-to-face contact with participants to establish goals, performed the supervised exercise programme and verified the correct use of telerehabilitation devices. Eight trials[27 28 34 43 44 51 65 88] adopted face-to-face meetings with the telerehabilitation group during the intervention period to conduct sessions supervised by therapists and verified the absence of complications.

Seven trials with 898 participants compared telerehabilitation with control (ie, no intervention, waiting list, placebo or sham),[25 31 32 52–54 72] and 53 trials including 4920 participants compared telerehabilitation with other interventions (ie, traditional rehabilitation at home or in healthcare settings, gym-base exercises, written programmes, usual care-medications and oxygen prescription, medical and other professionals follow-up and encouragement to improve physical activity).[26–30 33–51 55–71 73 89–93] Forty one trials reported short-term effects (ie, ≤3 months after baseline) and 19 reported long-term effects (ie, >3 months after baseline). Pain, physical function and quality of life were investigated in 23, 55 and 37 trials, respectively.

Quality of the methods in the included trials

The quality of the methods in the included trials ranged from 4 to 8 points on the 0 to 10 PEDro scale (table 1). All trials reported random allocation, differences between groups, point measures and measures of variability. Forty (66.6%) out of the 60 included trials scored above 6 points on the PEDro scale. The main reasons for downgrading the methodological quality were lack of therapist blinding (n=60, 100%), lack of participant blinding (n=60, 100%), lack of concealed allocation (n=30, 50%) and absence of intention-to-treat analysis (n=29, 48%).

Effects of telerehabilitation on pain, physical function and quality of life

We presented our quantitative findings by outcome of interest (data from 50 trials). First, we report the overall effect analyses of telerehabilitation in people with physical disabilities (all health conditions combined) (figure 2). We then categorise effects by subgroups of health conditions categorised according to the ICD-10 were estimated (figure 3). In the overall effect analyses, evidence was downgraded due to risk of bias (PEDro score <6) and /or inconsistency (I^2>50%). We found no evidence of publication bias (ie, Funnel plots and Egger's tests when pooling at least 10 trials are provided in online supplemental material 4).

Overall effects (all health conditions were combined) of telerehabilitation on pain, physical function and quality of life

Pain

In the overall effect analyses for pain at long-term, there was high-quality evidence that telerehabilitation was not different to other interventions (SMD: −0.2; 95% CI: −0.4 to 0.1 p=0.079; five trials[27 28 30 46 47]; n=830 participants). At short-term, the strength of the recommendation was low and very low when

Table 1 Methodological quality of the included trials using the 0 to 10 PEDro scale. (n=60 original trials). *Trials included in the quantitative analysis (n=50)

Study	2	3	4	5	6	7	8	9	10	11	Total (0 to 10)
Alibhai SMH, *et al* (2014)*[52]	Y	Y	N	N	N	Y	Y	Y	Y	Y	7
Allen KD, *et al* (2010)*[46]	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Allen KD, *et al* (2016)[73]	Y	N	Y	N	N	Y	N	Y	Y	Y	6
Ariza-Garcia A, *et al* (2019)*[96]	Y	Y	Y	N	N	Y	N	Y	Y	Y	7
Azma K, *et al* (2018)*[42]	Y	N	Y	N	N	N	N	Y	Y	Y	5
Bennell KL, *et al* (2017)*	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Bernocchi P, *et al* (2017)[68]	Y	N	Y	N	N	N	N	N	Y	Y	4
Bini SA and J Mahajan (2017)*[49]	Y	Y	Y	N	N	N	Y	N	Y	Y	6
Bourne S, *et al* (2017)*[55]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Brooks D, *et al* (2002)*[65]	Y	N	Y	N	N	Y	N	N	Y	Y	5
Buhrman M, *et al* (2004)*[25]	Y	N	Y	N	N	N	Y	N	Y	Y	5
Calner T, *et al* (2017)*[47]	Y	Y	N	N	N	N	N	N	Y	Y	4
Carrion Perez F, *et al* (2015)*[61]	Y	N	Y	N	N	N	N	N	Y	Y	4
Chhabra HS, *et al* (2018)*[59]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Chen M, *et al* (2016)*[33]	Y	Y	Y	N	N	Y	Y	N	Y	Y	7
Chen J, *et al* (2017)*[39]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Chien CL, *et al* (2011)*[53]	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Chumbler N, *et al* (2012)*[38]	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Conroy SS, *et al* (2018)*[91]	Y	N	Y	N	N	Y	N	N	Y	Y	5
Coronado RA, *et al* (2019)*[97]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Cuperus N, *et al* (2015)[48]	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Damush TM, *et al* (2003)*[28]	Y	Y	Y	N	N	Y	N	Y	Y	Y	7
Demeyer H, *et al* (2017)[56]	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Duruturk N and MA Ozkoslu (2019)*[87]	Y	Y	Y	N	N	N	Y	N	Y	Y	6
Ellis TD, *et al* (2019)*[66]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Fang J, *et al* (2019)*[88]	Y	N	Y	N	N	N	N	N	Y	Y	4
Fjeldstad-Pardo C, *et al* (2018)[40]	Y	N	Y	N	N	Y	Y	N	Y	Y	6
Frederix I, *et al* (2015)*[11]	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Galiano-Castillo N, *et al* (2017)*[90]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Galiano-Castillo N, *et al* (2016)*[69]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Goode AP, *et al* (2018)[31]	Y	N	N	N	N	Y	N	N	Y	Y	4
Hayes SC, *et al* (2013)[29]	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Hinman RS, *et al* (2019)*[94]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Holland AE, *et al* (2017)[57]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Hong J, *et al* (2017)*[32]	Y	N	Y	N	N	N	N	N	Y	Y	4
Hornikx M, *et al* (2015)[58]	Y	N	Y	N	N	N	Y	N	Y	Y	5
Hwang R, *et al* (2017)*[62]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Iles R, *et al* (2011)*[43]	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Jackson JC, *et al* (2012)*[44]	Y	Y	Y	N	N	Y	Y	N	Y	Y	7
Jansons P, *et al* (2017)*[67]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Kalron A, *et al* (2018)*[89]	Y	Y	Y	N	N	Y	N	N	Y	Y	6
Kraal JJ, *et al* (2014)*[35]	Y	N	N	N	N	N	Y	N	Y	Y	4
Ligibel JA, *et al* (2012)*[30]	Y	N	Y	N	N	N	N	N	Y	Y	4
Moffet H, *et al* (2015)*[26]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Morey MC, *et al* (2012)*[93]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Morey MC, *et al* (2009)[72]	Y	N	Y	N	N	Y	Y	N	Y	Y	6
O'Brien J, *et al* (2017)*[36]	Y	N	N	N	N	N	Y	Y	Y	Y	5
Odole AC and OD Ojo (2013)*[41]	Y	N	Y	N	N	N	Y	N	Y	Y	5
Pastora-Bernal JM, *et al* (2018)*[37]	Y	N	Y	N	N	Y	Y	N	Y	Y	6
Paul L, *et al* (2014)*[50]	Y	N	Y	N	N	N	Y	N	Y	Y	5
Paul L, *et al* (2019)*[95]	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Peng X, *et al* (2018)*[63]	Y	Y	Y	N	N	Y	N	N	Y	Y	6
Piga M, *et al* (2014)*[45]	Y	N	N	N	N	N	Y	N	Y	Y	4
Piotrowicz E, *et al* (2015)*[70]	Y	N	Y	N	N	N	Y	N	Y	Y	5
Piqueras M, *et al* (2013)*[34]	Y	N	Y	N	N	Y	N	N	Y	Y	5
Salvetti XM, *et al* (2008)*[71]	Y	Y	Y	N	N	N	Y	N	Y	Y	6
Sari D and L Khorshid (2009)*	Y	N	Y	N	N	N	N	N	Y	Y	4
Stewart AV, *et al* (2003)*[92]	Y	N	Y	N	N	Y	Y	N	Y	Y	6
Tsai LL, *et al* (2017)*[60]	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Varnfield M, *et al* (2014)*[64]	Y	Y	Y	N	N	N	N	Y	Y	Y	6

PEDro, Physiotherapy Evidence Database.

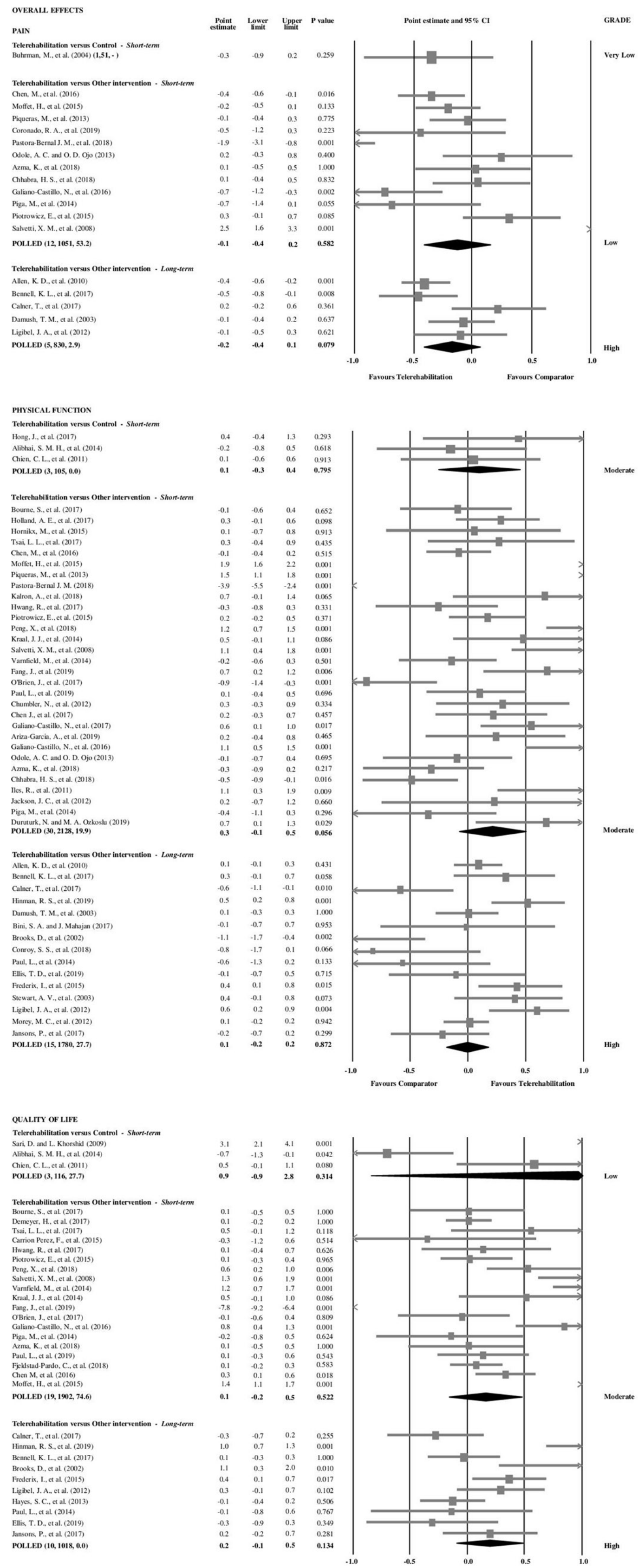

Figure 2 Overall effects of telerehabilitation on pain, physical function and quality of life. In parentheses: number of trials, total number of participants, I^2. Pain other intervention short-term: (Z=−0.5, random-effects). Pain other intervention long-term: (Z=−1.8, random-effects). Function control short-term: (Z=0.3, random-effects). Physical function other intervention short-term: (Z=1.9, random-effects). Physical function other intervention long-term: (Z=0.2, random-effects). Quality of life control short-term: (Z=1.0, random-effects). Quality of life other intervention short-term: (Z=0.8, random-effects). Quality of life other intervention long-term: (Z=1.5, random-effects). Pain control short-term: individual trial.

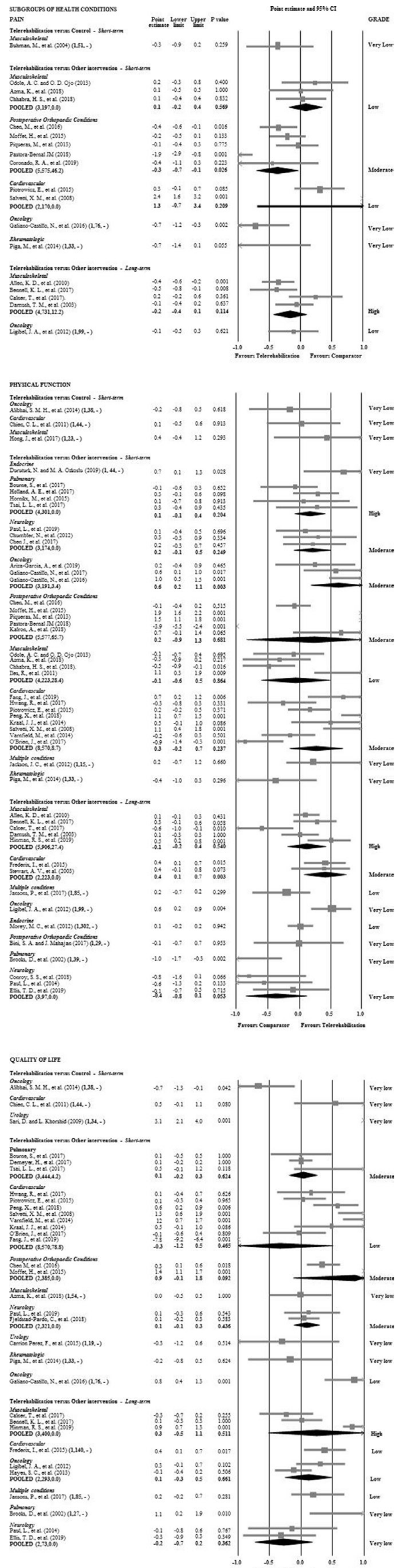

Figure 3 Subgroup analyses by clinical categories for pain, physical function and quality of life. In parentheses: number of trials, total number of participants, I^2.

telerehabilitation was compared with control and with other intervention (figure 2).

Physical function

Overall effect analyses showed high-quality evidence that telerehabilitation was not different to other interventions on physical function at long-term (SMD of 0.1 95% CI: −0.2 to 0.2; p=0.872; 15 trials[27 28 30 46 47 49–51 65–67 91–94]; n=1780). At short-term, there was moderate evidence of no difference between telerehabilitation and control (SMD of 0.1 (95% CI: −0.3 to 0.4; p=0.795; three trials[32 52 53]; n=105) or other interventions (SMD of 0.3 (95% CI: −0.1 to 0.5; p=0.056; 30 trials[26 33–35 37–39 41–45 55 56 58–60 62–64 67 69–71 87–90 95 96]; n=2128) (figure 2).

Quality of life

For quality of life, overall effect analyses showed high-quality evidence that telerehabilitation was not different to other interventions at long-term (SMD: 0.2; 95% CI: −0.1 to 0.5; p=0.134; 10 trials[27 29 30 47 50 51 65–67 94]; n=1018) and moderate-quality evidence that telerehabilitation was not different to other interventions at short-term when compared with other intervention (SMD: 0.1; 95% CI: −0.2 to 0.5; p=0.522; 19 trials[26 33 35 36 40 42 45 55 56 60–64 69–71 88 95]; n=1902). The strength of the recommendation was low when telerehabilitation was compared with control at short-term (figure 2).

Effects of telerehabilitation on pain, physical function and quality of life for different subgroups of health conditions

Subgroup analyses using meta-regression to investigate the impact of clinical categories on the overall effect estimates were possible only when telerehabilitation was compared with other intervention because of small number of pooled trials (ie, <10 trials): outcome of pain at short-term; physical function at short-term and long-term; and quality of life at short-term. Qualitative analyses were conducted for the remained comparisons. Detailed subgroup analyses for all outcomes of interest are presented in figure 3.

Pain

When compared with other interventions at short-term, results of meta-regression showed impact of clinical categories on overall estimates (p<0.001). Qualitative subgroup analyses by clinical categories also suggested impact of subgroups on the overall estimates for pain. There was high-quality evidence of no difference between telerehabilitation and other intervention on pain at long-term for musculoskeletal conditions (SMD: −0.2; 95% CI: −0.4 to 0.1; p=0.114; four trials[27 28 46 47]; n=731) and moderate-quality evidence a small effect of telerehabilitation for postoperative orthopaedic conditions at short-term (SMD: −0.3; 95% CI: −0.7 to −0.1; p=0.026; five trials[26 33 34 37 97]; n=575). The strength of the recommendation was low and very low for all the other comparisons (figure 3).

Physical function

When compared with other interventions at short-term and long-term, results of meta-regression showed impact of clinical categories on overall estimates for physical function (p<0.001). High-quality evidence showed that telerehabilitation was not different to other interventions on physical function for pulmonary conditions at short-term and for musculoskeletal conditions at long-term. SMDs of 0.1 (95% CI: −0.1 to 0.4; p=0.204; four trials[55 56 58 60]; n=301) and −0.1 (95% CI: −0.2 to 0.4;

p=0.540; five trials[27 28 46 47 94]; n=906) for pulmonary and musculoskeletal conditions, respectively. Besides, moderate-quality evidence showed a medium effect of telerehabilitation for oncology conditions at short-term (SMD: 0.6; 95% CI: 0.2 to 1.1; p=0.003; three trials[69 90 96]; n=191), a small effect of telerehabilitation for cardiovascular conditions at long-term (SMD: 0.4; 95% CI: 0.1 to 0.7; p=0.003; two trials[51 92]; n=223) and not different to other interventions at short-term for neurological (SMD: 0.2; 95% CI: −0.1 to 0.5; p=0.249; three trials[38 39 95]; n=174), cardiovascular conditions (SMD: 0.3; 95% CI: −0.2 to 0.7; p=0.237; eight trials[35 36 62–64 70 71 88]; n=570) and postoperative orthopaedic conditions (SMD: 0.2; 95% CI: −0.9 to 1.3; p=0.681; five trials[26 33 34 37 89]; n=577). As shown in figure 3, low to very-low quality evidence also suggested impact of different subgroups of health conditions on the estimates for physical function.

Quality of life

When compared with other interventions at short-term, meta-regression showed impact of clinical categories on overall estimates for quality of life (p<0.001). High-quality evidence showed that telerehabilitation was not different to other interventions on quality of life for musculoskeletal conditions at long-term (SMD: 0.3; 95% CI: −0.5 to 1.1; p=0.511; three trials[27 47 94]; n=400). Besides, moderate-quality evidence showed that telerehabilitation was not different to other interventions on quality of life at short-term for pulmonary, neurology and postoperative orthopaedic conditions. SMDs of 0.1 (95% CI: −0.2 to 0.3; p=0.624; three trials[55 57 60]; n=444), 0.1 (95% CI: −0.1 to 0.3; p=0.436; two trials[40 95]; n=321) and 0.9 (95% CI: −0.1 to 1.8; p=0.092; two trials[26 33]; n=385), respectively. Qualitative subgroup analyses suggested impact of subgroups on the remained comparisons for quality of life as well.

Sensitivity analysis

Meta-regression to investigate the impact of methodological issues was possible for few cases when telerehabilitation was compared with other interventions: pain at short-term; physical function at short- and long-term; and quality of life at short-term. Meta-regression showed impact of poor methods quality on overall estimates for pain at short-term, physical function at short-term and long-term and quality of life at short-term and long-term (p<0.001). Detailed qualitative sensitivity analyses by removing trials of poor methodological quality (<6 on the 0 to 10 PEDro scale) suggesting potential impact of poor methodological quality of included trials are presented in online supplemental material 5.

DISCUSSION

To our knowledge, this is the first systematic review with meta-analysis that investigated the effects of telerehabilitation on pain, physical function and quality of life in people with physical disabilities, when compared with control and other interventions. High-quality or moderate-quality evidence showed that telerehabilitation was not different to other interventions on pain at long-term, physical function at short-term and long-term and quality of life at short-term and long-term. Therefore, we are confident that the true effect lies close to the estimate of the effect and that telerehabilitation may be an alternative to treat people with physical disabilities. We have very little confidence in the effect estimate when telerehabilitation was compared with control.

In some included trials, telerehabilitation groups received more follow-up than the comparison groups, with more elaborate interventions preceded by conventional rehabilitation or periodic meetings during the intervention period. Hailey *et al*[98] pointed out in their review on telerehabilitation in routine care that, in most studies, telerehabilitation intervention was more elaborate than the comparator, with additional services and more frequent contacts between patients and professionals. Thus, the authors argue that the positive results found could be attributed to the use of more elaborate interventions. Moreover, some trials investigated interventions focussed not only on the exercise protocol, but incorporated other strategies such as a stimulus to increase physical activity, self-management, education and behavioural changes.[25 27 28 31 43 46–48 59 73] Multicomponent interventions have been employed in different contexts to facilitate self-management of the disease and to involve the patient in their treatment.[97 99 100] This type of intervention has shown better results when compared with single component interventions in chronic patients.[100] Pietrzak *et al*[101] identified in their review that self-management programmes, education and exercises at a distance can be used successfully in patients with osteoarthritis, resulting in improvements in health status indicators, access to care and communication between patients and health professionals. To investigate whether different types and dosage of exercise by telerehabilitation would impact on estimates, we planned subgroup analyses; however, investigation was not possible because of the small number of included trials.

Overall, for the outcomes of physical function and quality of life, our results showed evidence of moderate and high quality for no difference between telerehabilitation and other interventions at short-term and long-term. Therefore, it is likely that telerehabilitation is equivalent to other forms of care. Possible mediating variables reinforced the beneficial effects that physical activity exerts on quality of life. Self-efficacy in older adults, for example, is a possible mediator of physical and psychological results associated with physical activity, by increasing the sense of control and satisfaction with the lives of these individuals.[102] Specific studies of cardiac populations have shown similar results. Hwang *et al*[103] reported in their systematic review on the effects of telerehabilitation in patients with cardiopulmonary diseases that, in general, the telerehabilitation group significantly improved the quality of life of patients with cardiomyopathy. Chan *et al*[104] conducted a meta-analysis on exercise by telemonitoring and telerehabilitation compared with traditional cardiac and pulmonary rehabilitation. They concluded that, for patients with cardiac diseases, telerehabilitation provided similar benefits to usual care and without reports of adverse effects.

Efficacy

Finally, due to the low-quality evidence and the small number of trials comparing exercise protocols offered by telerehabilitation with control groups, it is still not possible to state the efficacy of telerehabilitation on pain, function and quality of life at short-term and long-term, for adults with physical disabilities. In general, evidence comparing telerehabilitation with control group without intervention was considered low or very low due to imprecision (grouping <400 participants), risk of bias (PEDro score <6) and/or inconsistency (I^2>50%). Further high-quality trials comparing telerehabilitation with control to investigate efficacy on our population of interest are needed. It is also promising in postoperative orthopaedic, oncological, cardiovascular, pulmonary, neurological and musculoskeletal conditions.

The risk of bias of the trials was relatively low, with PEDro greater than 6 points out of 10 in more than half of the trials included in this review. This type of study, in recent years, has followed detailed guidelines and strict criteria for its publication. It is noteworthy that none of the trials reached the maximum score, which can be explained by the difficulty of blinding the participants and therapists, due to the characteristics of the interventions implemented by telerehabilitation. Two other limitations found in 50% of the included trials were the absence of concealed allocation and intention-to-treat analysis. These strategies have been recommended to preserve the integrity of randomisation and prevent bias caused by loss of participants.[105 106] Without these, the benefits of randomisation may be lost.[106]

Limitations

This study has some limitations. A potential limitation was the heterogeneity across trials (eg, different clinical conditions and different telerehabilitation delivery modes pooled and risk of bias). To solve this potential limitation, we conducted clinical conditions subgroup and sensitivity analyses to explore their impact on the estimates using meta-regression when possible. Consistent findings showed that clinical categories and risk of bias impact on estimates. Subgroup analyses for telerehabilitation delivery mode was not possible due to small number of included trials. Another potential limitation was that our included trials assessed the same outcome of interest but measured it in different validated ways. In this context, we used SMDs to conduct meta-analysis in the current review. Although weighted mean differences are better for interpretation, SMDs are also allowed and recommended by the Cochrane[77] to pool data from different measurements. Other sources of heterogeneity were also potential limitations, such as type and dosage of telerehabilitation. Exploration of their potential impact on the estimates was limited by the number of included trials and by missing data. To decrease these other potential limitations, we used random-effect models for pooling and did not consider trials reporting data not normally distributed in the quantitative analyses.[77] Future trials with greater sample sizes and appropriate reported data should further investigate impact of types and dosage of exercise by telerehabilitation in our population of interest.

What is already known

- ► Telerehabilitation has the capacity to provide equitable access to individuals who do not have access to services, whether for geographical, physical or economic reasons.
- ► Telerehabilitation has the potential to improve quality of care, increase access to services and support health services.

What are the new findings

- ► Exercise by telerehabilitation can lead to clinical results similar to other interventions in improvement of pain, physical function and quality of life at short-points and long-points.
- ► Few studies compared exercise by telerehabilitation with control groups without any intervention, so it is still not possible to affirm the efficacy of telerehabilitation in reducing pain, function and quality of life in adults with physical disabilities.

CONCLUSIONS

This systematic review with meta-analysis was developed to support decision-making related to public policies and health programmes. Policies based on scientific evidence have ensured that decisions are based on the best available scientific evidence. This systematic review indicates that exercise by telerehabilitation has at least similar effects on pain, physical function and quality of life when compared with other interventions. However, efficacy is still limited by the scarcity of trials and low certainty of the current evidence.

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Supplementary material 1. Search strategy conducted in May 2018 and updated in February 2020.

OVID (Cochrane, Medline, Embase, AMED, Psychinfo)

1. Randomized Controlled Trial.mp. or Randomized Controlled Trial/
2. Random Allocation/ or randomised controlled trial.mp.
3. Controlled Clinical Trial/
4. Telerehabilitation.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
5. Tele-rehabilitation*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
6. Tele rehabilitation*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
7. Telemedicine.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
8. telecommunication*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
9. telehealth.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
10. telehealthcare.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
11. telecare.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
12. teletherapy.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
13. telecoaching.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
14. e-health.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
15. e-medicine.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
16. Remote Rehabilitation*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
17. Rehabilitation*, Remote.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
18. Virtual* Rehabilitation*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
19. Rehabilitation*, Virtual*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
20. Delivery of Health Care.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
21. Videoconferencing.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
22. Remote Consultation.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
23. User-Computer Interface.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
24. Computer Communication Network*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
25. mobile health.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx,

dq, nm, kf, px, rx, an, ui, sy]
26. web-based.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
27. Service delivery.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
28. home.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
29. community.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
30. dwelling community.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
31. Home rehabilitation*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
32. Community Healthcare*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
33. Healthcare*, Community.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
34. Health Care, Community.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
35. Care, Community Health.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
36. Community Health Care.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
37. Community Health Service*.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
38. Health Service*, Community.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
39. Service*, Community Health.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
40. Primary health care.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
41. Primary care.mp. [mp=ab, hw, kw, ti, ot, tx, ct, sh, tc, id, tm, tn, dm, mf, dv, fx, dq, nm, kf, px, rx, an, ui, sy]
42. 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41
43. 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
44. 1 or 2 or 3
45. 42 and 43 and 44

EBSCO (Sportdiscus and CINAHL)
(Tele*) AND (Randomised controlled trial OR randomized controlled trial OR random allocation OR comparative stud* OR controlled trial)

PEDro
Abstract & Title: tele*
Therapy: no selection
Problem: no selection
Body Part: no selection
Subdiscipline: no selection
Topic: no selection

Method: clinical trial

Supplementary material 5. Data extraction

Study	EG			CG			Comments
	n	Mean	SD	n	Mean	SD	
Musculoskeletal							
Buhrman M., et al. (2004)	22	34.3	16.8	29	39.6	16.3	*Instrument: Pain diary

1.1 Pain Short-term (Telerehabilitation x Control)

Study	EG			OI			Comments
	n	Mean	SD	n	Mean	SD	
Postoperative orthopaedic							
Chen M. et al. (2016)	94	16.1	6.2	93	18.4	6.7	*Instrument: VAS
Moffet. H., et al. (2015)	98	-77.2	1.4	100	-76.9	1.4	*Instrument: WOMAC Subscale Pain; *Imputed from standard errors
Piqueras M., et al. (2013)	72	-0.69	1.44	70	-0.61	1.87	*Instrument: VAS
Pastora-Bernal JM (2018)	8	-11.38	0.46	10	-10.3	0.61	*Instrument: Constant–Murley Test Subscale pain
Coronado, R. A., et al. (2019)	15	2.5	2.5	15	3.5	1.9	*Instrument: Numeric Rating Scale (NRS)
Musculoskeletal							
Odole A. C. and O. D. Ojo (2013)	25	22.4	13.76	25	18.84	15.99	*Instrument: VAS
Azma K., et al. (2018)	27	62.5	8.8	27	62.5	9.5	*Instrument: VAS
Chhabra H. S., et al. (2018).	45	3.3	1.7	48	3.2	2.7	*Instrument: Numeric Pain Rating Scale (NPRS)
Oncology							
Galiano-Castillo N., et al. (2016)	39	2.53	2.16	37	4.12	2.13	*Instrument: Brief Pain Inventory short form
Rheumatologic							
Piga M., et al. (2014)	18	32.85	28.36	15	53.68	32.35	*Instrument: VAS; *Combination of Systemic Sclerosis and Rheumatoid Arthritis groups
Cardiovascular							
Piotrowicz E., et al. (2015)	75	2.66	2.22	56	2	2.07	*Instrument: SF-36 Subscale pain
Salvetti X. M., et al. (2008)	19	97.68	7.22	20	64.8	17.22	*Instrument: SF-36 Subscale pain

1.2 Pain Short-term (Telerehabilitation x Other Interventions)

Study	EG	OI	Comments

	n	Mean	SD	n	Mean	SD	
Musculoskeletal							
Allen K. D., et al. (2010)	172	4.8	2.37	171	5.8	2.37	* Instrument: VAS; * Imputed from confidence intervals
Bennell K. L., et al. (2017)	72	4.2	3	70	5.7	3.6	* Instrument: WOMAC subscale pain
Calner T., et al. (2017).	48	59.4	21.4	35	54.9	23	* Instrument: VAS
Damush T. M., et al. (2003)	76	4.7	2.8	87	4.9	2.6	* Instrument: AIMS2 subscale Pain
Oncology							
Ligibel J. A., et al. (2012)	48	-4.9	17.5	51	-2.6	27.4	* Instrument: EORTC QLQ C-30 subscale pain

1.3 Pain Long-term (Telerehabilitation x Other Interventions)

Study	EG			CG			Comments
	n	Mean	SD	n	Mean	SD	
Musculoskeletal							
Hong J., et al. (2017)	11	193.1	36.2	12	175.6	42.1	*Instrument: Senior Fitness Test
Oncology							
Alibhai S. M. H., et al. (2014)	21	106	229.4	17	140.6	188.1	*Instrument: 6MWT
Cardiovascular							
Chien C. L., et al. (2011)	22	433	145	22	429	93	*Instrument: 6MWT

2.1 Physical Function Short-term (Telerehabilitation x Control)

Study	EG			OI			Comments
	n	Mean	SD	n	Mean	SD	
Pulmonary							
Bourne S., et al. (2017)	64	433.6	102.9	26	445.1	124.9	* Instrument: 6MWT
Demeyer H., et al. (2017)	159	457	108	159	449	118	* Instrument: 6MWT
Hornikx M., et al. (2015)	12	67	84	15	64	59	* Instrument: 6MWT
Tsai L. L., et al. (2017)	19	403	82	17	374	136	* Instrument: 6MWT
Postoperative orthopaedic							
Chen M., et al. (2016)	94	20.7	8.2	93	21.5	8.6	* Instrument: WOMAC Subscale Physical function
Moffet H., et al. (2015)	98	373.2	5.9	100	362	5.9	* Instrument: 6MWT; *Imputed from standard errors
Piqueras M., et al. (2013)	72	3.36	5.38	70	-5.22	6.25	* Instrument: TUG
Pastora-Bernal JM (2018)	8	15.5	0.46	10	17.7	0.59	* Instrument: Subscale Function Constant–

							Murley Test
Kalron A., et al. (2018)	15	-11.7	11	17	-19.2	11.3	* Instrument: TUG
Cardiovascular							
Hwang R., et al. (2017)	24	364	96	26	394	119	* Instrument: 6MWT
Piotrowicz E., et al. (2015)	75	-21.6	9.65	56	-23.2	10.71	*Instrument: SF-36 Subscale Physical Function
Peng X., et al. (2018)	49	419.23	9.67	49	406.55	12.54	*Instrument: 6MWT
Kraal J. J., et al. (2014)	25	6.1	0.5	25	5.8	0.7	*Instrument: MacNew questionnaire
Salvetti X. M., et al. (2008)	19	97.32	2.63	20	78	23.81	*Instrument: SF-36 Subscale Physical Function
Varnfield. M., et al. (2014)	48	570	80	28	584	99	*Instrument: 6MWT
O'Brien. J., et al. (2017)	29	16.75	5.14	30	21	4.44	*Instrument: Tinetti Gait and Balance; *Imputed from medians and interquartile ranges
Fang, J., et al. (2019)	33	420.65	33.7	34	396.12	36.42	*Instrument: 6MWT
Neurology							
Chumbler. N., et al. (2012)	22	82.7	9.7	22	79	15	*Instrument: FONEFIM
Jing. C., et al. (2017)	26	37.04	3.78	25	36.08	5.31	*Instrument: Berg Balance Scale
Paul, L., et al. (2019)	39	43.7	11.2	40	42.8	9.22	*Instrument: Berg Balance Scale
Oncology							
Galiano-Castillo. N., et al. (2017)	39	417.55	219.06	37	313.64	144.17	*Instrument: 6MWT
Galiano-Castillo. N., et al. (2016)	39	86.84	12.56	37	71.53	17.33	*Instrument: EORTC subscale Physical Function
Ariza-Garcia, A., et al. (2019)	19	483.46	149.37	20	453.79	99.98	*Instrument: 6MWT
Musculoskeletal							
Odole. A. C. and O. D. Ojo (2013)	25	83.7	10.26	25	84.87	10.79	*Instrument: Ibadan Knee/Hip Osteoarthritis Outcome Measure (IKHOAM)
Azma. K., et al. (2018)	27	67.1	22.6	27	75	24.1	*Instrument: WOMAC
Chhabra. H. S., et al. (2018).	45	20.2	17.8	48	29.9	20.1	*Instrument: Modified Oswestry Disability Index (MODI)
Iles. R., et al. (2011)	13	8.3	2.1	13	5.2	3.4	*Instrument: Patient Specific Functional Scale
Multiple conditions							
Jackson. J. C., et al. (2012)	7	-9.76	3.03	8	-10.36	2.23	*Instrument: TUG; *Imputed from medians and interquartile ranges
Rheumatologic							

Piga. M., et al. (2014)	18	8.8	5.12	15	11.18	7.79	*Instrument: Dreiser's Functional; *Combination of Systemic Sclerosis and Rheumatoid Arthritis groups
Endocrine							
Duruturk, N. and M. A. Ozkoslu (2019)	23	554.39	139	21	450.9	165.81	*Instrument: 6MWT

2.2 Physical Function Short-term (Telerehabilitation x Other Interventions)

Study	EG			OI			Comments
	n	**Mean**	**SD**	**n**	**Mean**	**SD**	
Musculoskeletal							
Allen. K. D., et al. (2010)	172	-2.5	1.18	171	-2.6	1.17	* Instrument: AIMS2 subscale physical function; *Imputed from p-values
Bennell. K. L., et al. (2017)	72	-14.7	10.6	70	-18.3	11.9	*Instrument: WOMAC subscale physical function
Calner. T., et al. (2017)	48	52.1	24.5	35	65.9	22.2	*Instrument: SF-36 Subscale Physical Function
Damush. T. M., et al. (2003)	76	-2	1.5	87	-2	2.5	*Instrument: AIMS2 Subscale Physical Function
Hinman, R. S., et al. (2019)	87	10.8	9.2	88	5.8	10.5	*Instrument: WOMAC subscale physical function
Postoperative orthopaedic							
Bini. S. A. and J. Mahajan (2017)	14	-17.591	17.148	15	-17.251	14.201	*Instrument: KOOS
Pulmonary							
Brooks. D., et al. (2002)	18	345	22.79	21	370	24.62	*Instrument: 6MWT; *Imputed from p-values
Neurology							
Conroy. S. S., et al. (2018)	16	879.2	611.5	8	1330.8	372	*Instrument: 6MWT
Paul. L., et al. (2014)	15	-24.32	21.85	14	-15.1	5.37	*Instrument: TUG
Ellis. T. D., et al. (2019)	23	536	92.4	21	546.9	105.5	*Instrument: 6MWT
Cardiovascular							
Frederix. I., et al. (2015)	69	2.52	0.52	71	2.28	0.63	*Instrument: HeartQol subscale physical function
Stewart. A. V., et al. (2003)	41	499	95	42	463	86	*Instrument: 6MWT
Oncology							
Ligibel. J. A., et al. (2012)	48	186.9	215.1	51	81.9	135.2	*Instrument: 6MWT
Endocrine							
Morey. M. C., et al. (2012)	180	518.3	127.4	122	517.2	129.1	*Instrument: 6MWT

Multiple conditions							
Jansons. P., et al. (2017)	39	385	127	46	409	84	*Instrument: 6MWT

2.3 Physical Function Long-term (Telerehabilitation x Other Interventions)

Study	EG			CG			Comments
	n	Mean	SD	n	Mean	SD	
Oncology							
Alibhai. S. M. H., et al. (2014)	21	0.5	12.7	17	11.7	20.1	*Instrument: QLQ-C30
Cardiovascular							
Chien. C. L., et al. (2011)	22	-7	9	22	-13	13	*Instrument: Minnesota living with heart failure questionnaire
Urology							
Sari. D. and L. Khorshid (2009)	17	23.19	11.43	17	-5.74	6.26	*Instrument: I-QOL

3.1 Quality of life Short-term (Telerehabilitation x Control)

Study	EG			OI			Comments
	n	Mean	SD	n	Mean	SD	
Pulmonary							
Bourne. S., et al. (2017)	64	39.3	18.5	26	39.3	18.5	*Instrument: ST Georges Respiratory Questionnaire (SGRQ)
Holland. A. E., et al. (2017)	72	2.99	5.54	76	2.09	5.45	*Instrument: CRDQ
Tsai. L. L., et al. (2017)	19	99	16	17	90	18	*Instrument: CRDQ
Urology							
Carrion Perez. F., et al. (2015).	10	7.83	4.73	9	9	2.62	*Instrument: ICIQ-SF; *Imputed from medians and interquartile ranges
Cardiovascular							
Hwang. R., et al. (2017)	24	-32	19	26	-35	24	*Instrument: Minnesota living with heart failure questionnaire
Piotrowicz. E., et al. (2015)	75	-69.2	26.44	56	-70.5	25.4	*Instrument: SF-36
Peng. X., et al. (2018)	49	-43.11	8.76	49	-49.2	12.44	*Instrument: Minnesota living with heart failure questionnaire
Salvetti. X. M., et al. (2008)	19	89.05	11.28	20	66.85	21.25	*Instrument: SF-36
Varnfield. M., et al. (2014)	48	0.94	0.0764	28	0.8066	0.1562	*Instrument: EQ-5D; *Imputed from medians and interquartile ranges
Kraal. J. J., et al. (2014)	25	6.1	0.5	25	5.8	0.7	*Instrument: MacNew questionnaire
O'Brien. J., et al. (2017)	29	45	24.2	30	46.33	17.68	*Instrument: SF-8

Fang, J., et al. (2019)	33	68.7	6.65	34	63.14	8.92	*Instrument: SF-36
Oncology							
Galiano-Castillo. N., et al. (2016)	39	81.42	19.97	37	61.47	26.49	*Instrument: EORTC
Rheumatologic							
Piga. M., et al. (2014)	18	41.2	11.09	15	43.4	14.65	*Instrument: SF-36; *Combination of Systemic Sclerosis and Rheumatoid Arthritis groups
Musculoskeletal							
Azma. K., et al. (2018)	27	133.3	88.9	27	133.3	90.1	*Instrument: KOOS subscale Quality of Life
Neurology							
Fjeldstad-Pardo. C., et al. (2018)	121	45.64	23.9	121	44.09	19.83	*Instrument: SF-36
Paul, L., et al. (2019)	39	0.73	0.13	40	0.71	0.16	*Instrument: EQ-5D
Postoperative orthopaedic							
Chen M. et al. (2016)	94	47.8	7.15	93	45.4	6.55	*Instrument: SF-36
Moffet. H., et al. (2015)	98	63.9	1.9	100	61.3	1.9	*Instrument: KOOS subscale quality of life; *Imputed from standard errors

3.2 Quality of life Short-term (Telerehabilitation x Other Interventions)

Study	EG			OI			Comments
	n	Mean	SD	n	Mean	SD	
Musculoskeletal							
Calner. T., et al. (2017).	48	46.32	24.46	35	52.68	25.8	*Instrument: SF-36
Bennell. K. L., et al. (2017)	72	0.8	0.1	70	0.8	0.1	*Instrument: AQoL II
Hinman, R. S., et al. (2019)	87	0	0.1	88	-0.1	0.1	*Instrumento: Assessment of Quality of Life (AQoL) *Change within groups
Pulmonary							
Brooks. D., et al. (2002)	18	-47	1.94	9	-49	1.37	*Instrument: ST Georges Respiratory Questionnaire (SGRQ); *Imputed from p-values
Cardiovascular							
Frederix. I., et al. (2015)	69	2.53	0.44	71	2.32	0.58	*Instrument: HeartQol
Oncology							
Ligibel. J. A., et al. (2012)	48	4.3	16	51	-1.5	18.8	*Instrument: EORTC QLQ C-30
Hayes. S. C., et al. (2013)	67	125.6	19.42	127	127.57	19.7	*Instrument: FACT-B +4; *Combined data in the control group (FtF + UC); *Imputed from

							confidence intervals
Neurology							
Paul. L., et al. (2014)	15	10.2	4.71	14	10.71	4.53	*Instrument: LEEDS QoL
Ellis. T. D., et al. (2019)	23	11.4	5.9	21	13.4	8.1	*Instrument: Parkinson Disease Questionnaire
Multiple conditions							
Jansons. P., et al. (2017)	39	72	17	46	68	17	*Instrument: VAS EQ-5D

3.3 Quality of life Long-term (Telerehabilitation x Other Interventions)

Supplementary material 2. Characteristics of the included trials (n = 60). † Median [range]

Study	**Sample characteristics**	**Intervention**	**Comparator** CWI = Control without intervention OI= Other interventions	**Outcomes measures**
Alibhai, S. M. H., et al. (2014)	n= 38 *Source= Princess Margaret Hospital in Toronto, CA. *Health condition= Acute Myeloid Leukemia *Age= 56.1 (8.7) *Sex= 55% female/45% male	n= 21 *Telephone *12 weeks home-based exercise program with weekly telephone support, frequency 3–5 days per week, intensity moderate, and exercise mixed modality. The duration of exercise was increased over the course of the intervention, with a target of 30 min per session (150 min per week), following physical activity guidelines.	n=17 *CWI: Participants maintained their usual lifestyle	*Pain: Not evaluated (NE) *Physical function: 6-min walk test (6MWT) *Quality of life: QLQ-C30 *Time-point: 12 weeks (Short-term)
Allen, K. D., et al. (2010)	n= 515 *Source= Primary care clinics in a Veterans Affairs Medical Center, USA. *Health condition= hip or knee osteoarthritis (OA) *Age= 60.1 (10.4) *Sex= 7%female/93% male	n= 172 *Video and telephone *Participants received written and audio versions of OA self-management educational materials. Participants also received an exercise video. Monthly phone calls for 12 months to clear questions and set new goals.	n=171 *OI: Usual care	*Pain: Visual Analog Scale (VAS) * Physical function: Arthritis Self-Efficacy Scale (AIMS2) subscale *Quality of life: NE *Time-point: 12 months (Long-term)
Allen, K. D., et al. (2016)	n= 300 *Source= Department of Veterans Affairs Medical Center in Durham, USA. *Health condition= Hip or knee OA	n=151 *Video, telephone and audio *12-month intervention focusing on physical activity, weight management, and cognitive behavioral pain management strategies. Telephone calls were scheduled twice per month for the first 6 months and	n=149 *OI: Usual care	*Pain: Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) subscale *Physical Function: WOMAC subscale

	*Age= 61.1 (9.2) *Sex= 9% female/91%male	monthly for the last 6 months. Participants were given written educational materials to intervention topics, and exercise video, and an audio CD of relaxation exercises.		*Quality of life: NE * Time-point: 12-month (Long-term)
Bennell, K. L., et al. (2017)	n= 168 *Source= Metropolitan and Regional Communities, AU. *Health condition= Knee OA. *Age= Intervention group: 61.1 (6.9) OI group: 63.4 (7.8) *Sex= Intervention group: 68%female/ 32% male OI group: 58% female/ 42% male	n= 84 * Telephone *Participants visited a project physiotherapist for 5 individual, 30-minute sessions/6 months. + Physiotherapy and 6 phone calls form a coach for 6 months (30 minutes of moderate intensity physical activity in bouts of ≥10 minutes on most days and 10,000 steps per day), goals were individualized. Participants were encouraged to monitor their progress and to identify individual barriers.	n= 84 *OI: Participants visited a project physiotherapist for 5 individual, 30-minute sessions/6 months. + Traditional rehabilitation.	*Pain: WOMAC subscale *Physical function: WOMAC *Quality-of-life: AQoL-6D. * Time-point: 6 months (Long-term)
Bernocchi, P., et al. (2017)	n= 112 *Source= Not Specified (NS), IT. *Health condition= Heart failure and Chronic Obstructive Pulmonary Disease (COPD) *Age= Intervention group: 71 (9) OI group: 70 (9.5) *Sex= 18%female/82% male	n= 56 *Telephone * Basic level of program: 15–25 min of exercise with mini-ergometer without load and 30 min of callisthenic exercises performed 3 times/week and free walking twice a week. High level: 30–45 min of mini-ergometer with incremental load (from 0 to 60W), 30–40 min with 0.5 kg weights and pedometer-based walking, 3 to 7 days/week. The physiotherapist made a weekly phone call to each patient, verified the training level of physical activity performed and planned the rehabilitation targets for the following week and gave extra reinforcement on the value of lifestyle changes	n=56 *OI: Usual care	*Pain: NE *Physical function: 6MWT *Quality of life: Minnesota Living with Heart Failure questionnaire (MLHFQ) * Time-point: 4 months-(Long-term)

		and the exercise.		
Bini, S. A. and J. Mahajan (2017)	n= 28 *Source= Urban Medical Centre, USA. *Health condition= Total Knee Arthroplasty (TKA) *Age= Intervention group: 62.9 OI group: 63.6 *Sex= 46%female/54% male	n=14 * Web-based asynchronous visual platforms. * 23 videos illustrating the same exercises taught in the outpatient clinic. One physical therapist send instructional videos to the patients and the patients would respond with recordings of themselves completing their exercises. One physical therapist then uploaded more advanced exercise videos for the patient based on the progress seen.	n=15 *OI: Traditional rehabilitation	*Pain: NE *Physical function: Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS) *Quality of life: NE *Time-point: 24 weeks (Long-term)
Bourne, S., et al. (2017)	n= 90 *Source= Portsmouth Hospitals, UK. *Health condition= COPD *Age= Interventional Group: 69.1 (7.9) OI Group: 71.4 (8.6) *Sex= Interventional Group: 41%female/62%male OI Group= 18%female/ 69%male	n= 64 *Video *Online program: 6 weeks and each week the length of each of the 10 exercises increased by 30 s, starting from 60 s in week 1, to 3½ min in week 6. The on-screen exercises were designed to be carried out with the patient in real time, with the patient following and keeping up with the video-facilitated exercises. The 10 exercises included biceps curls, squats, push-ups against a wall, leg extensions in a sitting position, upright row with weights, sit-to-stand, arm swings with a stick, leg kicks to the side, arm punches with weights and step-ups.	n= 26 *OI: Traditional rehabilitation	*Pain: NE *Physical function: Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS) *Quality of life: NE *Time-point: 24 weeks (Long-term)
Brooks, D., et al. (2002)	n= 85 *Source= Inpatient and outpatient programmes were recruited, CA.	n=37 *Telephone *The program consisted of patient education, psychosocial support and supervised exercises, of	n=48 * OI: Usual care	*Pain: NE *Physical function: 6MWD *Quality of life: ST Georges Respiratory Questionnaire

	*Health condition= COPD *Age= 68 (0.8) *Sex= 41%female/59%male	which breathing exercises, interval training, upper extremity training, leisure walking and treadmill or cycle exercise comprised the main components. The subjects received a phone call from a physical therapist who asked standardized questions regarding adherence to their program and discussed any of their concerns.		(SGRQ) *Time-point: 7 weeks (Short-term)
Buhrman, M., et al. (2004)	n= 56 *Source= Newspaper articles in national and regional papers and Webpage for health on the Internet, SE. *Health condition= Chronic back pain *Age= 44.6 (10.4) *Sex= 62% female/38%male	n=22 *Internet-based and telephone *Internet-based pain management program: The program was derived from the cognitive-behavioral and included psychological components. Was well as stretching and physical exercises. Participants were taught different coping strategies, which was the main component of the program.	n=29 *CWI: Waiting list control	*Pain: Diary *Physical function: NE *Quality of life: NE *Time-point: 3 months (Short-term)
Calner, T., et al. (2017).	n= 109 *Source= Primary Healthcare Centers, SE. *Health condition= musculoskeletal pain * Age= 42.9 (10.7) * Sex= 85%female/15%male	n= 55 *Web-based interventions Multimodal Rehabilitation-web (MMR-web) and the web-based behavioral change program for activity (Web-BCPA). The web program consisted of 8 modules: pain, activity, behavior, stress and thoughts, sleep and negative thoughts, communication and self-esteem, solutions, and maintenance and progress. Each module contained information, assignments, and exercises that could be assimilated via educational texts, films, and writing tasks.	n=44 *OI: MMR three different healthcare professionals (physiotherapist, physician, occupational therapist, psychologist, or psychosocial counselor, nurse) with a minimum of two or three treatment sessions a week for at least six weeks.	*Pain: VAS *Physical function: Short Form Health Survey-36 (SF-36) subscale *Quality of life: SF-36 * Time-point: 4 months (long-time)

Carrion Perez, F., et al. (2015).	n= 19 *Source= Servicio de Rehabilitacion del Hospital Universitario Virgen de las Nieves, ES. *Health condition = Stress urinary incontinence *Age= Interventional group †: 49 [46-49,75] OI group †: 46 [47-56] *Sex= 100% female	n= 10 *Bluetooth * Pelvic floor muscle training: 5 sessions of 30 min for 2 weeks plus training in the use of the telerehabilitation device (3 sessions of 30 min). The device consists of a vaginal probe that transmits wireless pressure variations (bluetooth). Treatment was at home with the telerehabilitation device through a customized program.	n= 9 *OI: Traditional rehabilitation	*Pain: NE Physical function: NE *Quality of life: International Consultation on Incontinence Questionnaire (ICIQ-SF) * Time-point: 3 months (short-time)
Chen, M., et al. (2016)	n=187 *Source= Large Academic Medical Center, CN. *Health condition= TKA *Age= Interventional group: 66.18±3.59 OI group: 67.1(±4.05) *Sex= 71%female/29%male	n=94 *Telephone *Home exercises for 1 hour/day for 12 weeks. The structured telephone call was also made one week, 3 weeks and 6 weeks after TKA.	n=93 *OI: Traditional rehabilitation	*Pain: VAS *Physical function: WOMAC *Quality of life: SF-36 * Time-point: 3 months (short-time)
Chien, C. L., et al. (2011)	n= 51 *Source= National Taiwan University Hospital, TW. *Health condition= Chronic Heart Failure. *Age= 58 (16) *Sex= 25% female/75%male	n=24 *Telephone *30-minute face-to-face interview with a physical therapist in the clinic to provide an individualized exercise program and instructions to perform exercise safely at home, were instructed at the interview to perform walking exercise combined with strengthening exercises of major limb muscles for at least 30 minutes per session, 3 sessions per week for 8 weeks at home. Subjects were asked to keep a daily	n=27 *CWI: Participants maintained their usual lifestyle	*Pain: NE *Physical function: 6MWT *Quality of life: MLHFQ *Time-point: 8 week (short-time)

		activity log and were followed up by telephone every 1–2 weeks to monitor progress.		
Chumbler, N., et al. (2012)	n= 52 *Source= Veterans Affairs Medical Center, USA. *Health condition= Stroke *Age= Interventional group: 67.1 (9.5) OI group 67.7 (10.0) *Sex= 2% female/ 98% male	n=25 *Televisits; Telephone * 3 home visits 1-hour (televisits) by a trained assistant to assess physical performance and help communicate the instruction of exercises and use of assistive technology and/or adaptive techniques recommended. Participants' daily use of an in-home messaging device that was monitored weekly by the teletherapist; and 5 telephone intervention calls between the teletherapist and the participant. The teletherapist established report and reviewed the participant's current exercise regimen and current assistive technology, explored any potential Identified barriers and solutions. Telephone calls 2 to 5 focused on reassessment and advancement of the exercise program.	n=23 *OI: Usual care	*Pain: NE *Physical function: The motor subscale of the Telephone Version of the Functional Independence Measure (FONEFIM) *Quality of life: NE *Time-point: 3-months (short-time)
Conroy, S. S., et al. (2018)	n= 24 *Source= Baltimore VA Medical Center and the local community, USA. *Health condition= Multiple Sclerosis. * Age= 51 (8.1) *Sex= Intervention group: 44%female/56%male OI group: 63%female/37%male	n=16 *Webpage *Programs were personalized based on individual abilities and expressed goals. Each participant received instruction by the same treating therapist to complete their exercises daily, six-month. Written instruction and exercise prescription followed the same principles for both groups, and in general, repetitions and sets were assigned to be physically challenging but not exhaustive and functional exercises (sit-to-stand, wall push-ups, side stepping,	n=8 *OI: Traditional rehabilitation	*Pain: NE *Physical function: 6MWT *Quality of life: NE *Time-point: 6 month (Long-term)

		etc.) were emphasized.		
Cuperus, N., et al. (2015)	n= 147 *Source= Rheumatology departments of the Sint Maartenskliniek Nijmegen and Woerden, NL. *Health condition= OA *Age= Intervention group: 59 (8) OI group: 61 (8) *Sex= Interventional group: 85% female/ 15%male OI group: 85% female/15%male	n=72 *Telephone *Patients allocated to the telephone-based treatment attended two face-to-face group sessions with a duration of 2-2.5 h and were further monitored by four individual telephone contacts 15-30 min. Included an exercise program tailored to the patient's health problems to improve the quality of movement and posture and to implement the exercises in the home situation.	n=75 *OI: Traditional rehabilitation	*Pain: SF-36 subscale *Physical function: SF-36 subscale * Quality of life: SF-36 *Time-point: 6 weeks (short-time)
Damush, T. M., et al. (2003)	n= 211 *Source= University-affiliated neighborhood health centers and emergency departments, USA. *Health condition= Acute Low Back Pain *Age= Intervention group †: 45.4 [19-77] OI group †: 45.5 [18-82] *Sex= Interventional group: 72%female/28%male OI group: 75%female/25%male	n= 105 * Video and telephone *Acute Low Back Pain Self-Management Program: 3 in-person classes, class handouts (written education materials showed recommended exercises, including walking, and proper body mechanics), Classes on audiotape and a cassette player and telephone follow-up (4, 6, and 8 weeks to discuss ascertainment of goals, assist with problem solving, and set new goals). The staff made telephone calls once a month to continue reinforcing the class sessions and sustain behavioral change.	n= 106 OI: Usual care	*Pain: AIMS2 *Physical function: AIMS2 *Quality of life: NE * Time-point: 4 months (Long-term)

Demeyer, H., et al. (2017)	n= 343 *Source= Six centers BE, GR, UK (2), CH and NL. *Health condition= COPD *Age= Interventional group: 66 (8) OI group: 67 (8) Sex= Interventional group: 35%female/65%male OI group: 37%female/63% male	n=172 *Smartphone with application *Usual care + the telecoaching intervention *Telecoaching intervention: (1) a one-to-one interview with the investigator discussing motivation, barriers, favorites activities and strategies to become more active; (2) a step counter (Fitbug Air) providing direct feedback on the step count, on a 2 × 3 cm display; (3) smartphone with Fitbug application and a project-tailored coaching application. This application was specifically designed for use by patients with COPD in the present project.	n=171 *OI: Usual care	*Pain: NE *Physical function: 6MWT *Quality of life: COPD Assessment Test (CAT) * Time-point: 3 months (short-time)
Frederix, I. et al. (2015)	n= 140 *Source= Hospital the Jessa, Ziekenhuis-Oost Limburg and Hospital ST Franciscus, BE. *Health condition= Cardiac Patients *Age= Interventional Group: 61 (9) OI Group: 61 (8) *Sex= Interventional Group: 14%female/96%male OI Group: 21%female/ 79%male	n=69 *Telecoaching – Internet-based, e-mail, SMS * Traditional rehabilitation (12-week conventional center-based cardiac rehabilitation program) + 12-week the internet-based, comprehensive telerehabilitation program. *The telerehabilitation program started at week 6 of the 12-week center-based cardiac rehabilitation allowing the intervention group patients to become familiarized with the telerehabilitation’s motion sensor (Yorbody accelerometer, Belgium) and associated password-protected web service during the 6-week overlap period. A semiautomatic telecoaching system to provide the patients with feedback via email and short message service (SMS) text messaging (once weekly), encouraging them to gradually achieve predefined exercise training goals.	n= 71 *OI: Traditional rehabilitation	*Pain: NE *Physical function: HeartQol (HRQL) subscale *Quality of life: HRQL *Time-point: 24weeks (Long-term)
Galiano-	n= 76	n= 39	n= 37	*Pain: NE

Castillo, N., et al. (2017)	*Source= Virgen de las Nieves Hospital, ES. *Health condition= Breast Cancer *Age= 48. 30 (± 8.80) *Sex= 100% female	*Website, SMS, video conference sessions, telephone calls *The e-CUIDATE system allows patients to participate in rehabilitation sessions through a broad-reach modality such as the Internet. 24 sessions were included in the exercise program, 3 sessions per week with a duration of 90 min per day. Each session consisted of an initial warm-up, main resistance and aerobic exercise training, and cool-down. Individual supervision by CUIDATE research staff was offered through a control platform and by means of instant messages, video conference sessions, and telephone calls.	*OI: Usual care	*Physical function: 6MWT *Quality of life: NE *Time-point: 8 weeks (short-time)
Galiano-Castillo, N., Demeyeret al. (2016)	n= 81 *Source= Virgen de las Nieves Hospital, ES. *Health condition= Breast Cancer *Age= Intervention group: 47.4 (9.6) OI group: 49.2 (7.9) *Sex= 100% female	n=40 *Website, SMS, video conference sessions, telephone calls *A telerehabilitation program was implemented using the e-CUIDATE system. The schedule consisted of 3 sessions per week that lasted approximately 90 minutes each day. Each session was delivered online and contained a battery of specific exercises that were divided into 3 sections: warm-up, resistance and aerobic exercise training, and cooldown. The system allowed participants to send instant messages and set up video conference sessions (3 times per week). Furthermore, participants received telephone calls from CUIDATE research staff if required.	n=41 *OI: Traditional rehabilitation	*Pain: Brief Pain Inventory short form * Physical Function: EORTC subscale *Quality of life: Spanish version of the EORTC QLQ-C30 *Time-point: 8 weeks (short-time)

Goode, A. P., et al. (2018)	n= 60 *Source= Durham Veterans Affairs Health Care System, USA. *Health condition= Chronic Low Back Pain *Age= 70.3 (4.9) *Sex= 7%female/93%male	n=40 *Telephone; Video called *Each intervention group received 3 telephone follow-up calls from the study physical therapist, and 10 phone calls by the exercise counselor. Participants randomized to the physical activity group or the physical activity + cognitive-behavioral therapy (PA + CBT) group, received written instructions and pictures of exercises. Exercise programs were based on a core set of strengthening and stretching exercises (in addition to regular aerobic activity), which covered major muscle groups and functional tasks. The participants also received instruction in cognitive-behavioral therapy skills, woven into each telephone-based session with the exercise counselor and with specific application to the physical activity.	n=20 CWI: Waiting list control	*Pain: NE *Physical function: Timed Up and Go Test (TUG) *Quality of life: NE *Time-point: 12 weeks (short-time)
Hayes, S. C., et al. (2013)	n= 194 *Source= Brisbane hospitals, AU. *Health condition= Breast cancer *Age= Intervention group: 52.2 (8.6) OI group: Traditional rehabilitation 51.2 (8.8) OI group: Usual-care group 53.9 (7.7) *Sex= 100% female	n= 67 *Telephone *8 month exercise intervention began in the week following baseline assessment.16 scheduled sessions (via telephone) with a designated Exercise Physiologist, starting weekly and tapering to monthly contacts after 4 months. At all stages of the intervention, women were progressing towards (or maintaining) the overall goal of exercising at least 4 days per week for 45 min (accumulating 180+ min of exercise per week) and incorporating both aerobic and strength-based exercises (on at least 2 days per week).	n= 127 *OI: Usual care group (n = 60) Traditional rehabilitation (n = 67)	*Pain: Neuropathic Pain Scale *Physical function: Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH) *Quality of life: Functional Assessment of Cancer Therapy-Breast (FACT-B +4) *Time-point: 2 months (long-time)

Holland, A. E., et al. (2017)	n= 166 *Source= Two tertiary hospitals, AU. *Health condition= COPD *Age= Intervention group: 69 (13) OI group: 69 (10) Sex= Intervention group: 40%female/60%male OI group: 41%female/59%male	n=80 *Telephone *Home-based pulmonary rehabilitation commenced with one home visit by a physiotherapist to establish exercise goals, assess inhaler technique and supervise the first exercise session. At least 30 min of aerobic training for each session, using a modality accessible to the participant, which was usually walking. Participants recorded the distance walked using a pedometer. Resistance training included functional activities and equipment that were accessible in the home. The home visit was followed by seven once-weekly structured telephone calls from a physiotherapist, using a motivational interviewing approach.	n=86 *OI: Traditional rehabilitation	*Pain: NE *Physical function: 6MWT *Quality of life: HRQoL on the Chronic Respiratory Questionnaire (CRQ) *Time-point: 8 weeks (Short-term)
Hong, J., et al. (2017)	n= 23 *Source= Senior Citizen Centre in Gangseo-gu, SK. *Health condition= Sarcopenia *Age= Interventional group: 82.2 (5.6) Control group: 81.5 (4.4) *Sex= Intervention group: 55%female/45%male CWI group: 58%female/42%male	n=11 *Video conferencing *The tele-exercise group performed supervised resistance exercise at home for 20–40 minutes a day three times per week for 12 weeks. The remote instructor provided one-on-one instruction to each participant during the intervention. Each session consisted of a warm-up (5 min), a main exercise (10-30 min), and a cool-down (5 min). The warm-up and cool-down included stretching and walking in place. The main exercise consisted of resistance training including bicep curls, triceps curls, front raises, leg raises, leg curls, leg extensions, squats, and calf raises, with progressive charge. Exercise intensity was progressively increased by about 2 steps every	n=12 CWI: Participants maintained their usual lifestyle	*Pain: NE *Physical function: Senior Fitness Test (SFT) *Quality of life: NE *Time-point: 12-weeks (Short-term)

		four weeks. These exercises targeted the major muscle groups, such as the legs, calves, back, abdomen, chest, shoulders, and arms over three sets of 8-10 repetitions.		
Hornikx, M., et al. (2015)	n= 30 *Source= University Hospital of Leuven, BE. *Health condition= COPD *Age= Interventional group: 66 (7) Control group: 68 (6) *Sex= Interventional group: 47%female/53%male OI group: 40%female/60%male	n= 15 *Telephone *Telephone calls, 3 times a week, were used to motivate and stimulate patients in the intervention group to increase their physical activity level during 1 month. The timing of the telephone calls was determined in agreement with the patients. The goals were set individually, with the aim of improving the level of physical activity as much as possible during 1 month.	n=15 *OI: Usual Care	*Pain: NE *Physical function: 6MWT *Quality of life: CAT *Time-point: 1 month (Short-term)
Hwang, R., et al. (2017)	n= 53 *Source= Two tertiary hospitals, AU. *Health condition= Chronic heart failure. *Age= 67 (12) *Sex= 25%female/75%male	n= 24 *Videoconferencing *The telerehabilitation program was delivered via a synchronous videoconferencing platform across the internet to groups of up to four participants within the home. Participants were provided with additional home exercises similar to the control group. Educational topics were delivered as electronic slide presentations with embedded audio files, which were recorded from the education sessions delivered for a center-based program. Participants were encouraged to watch the designated presentation individually or with their support person, in their own time in preparation for subsequent online group discussions.	n= 29 *OI: Traditional rehabilitation	*Pain: NE *Physical function: 6MWD *Quality of life: MLHFQ *Time-point: 12 weeks (Short-term)

Iles, R., et al. (2011)	n= 30 *Source= Public hospital physiotherapy outpatient department for treatment of low back pain, AU. *Health condition= Non-chronic low back pain *Age= 39.5 (12.0) *Sex= 40%female/60%male	n= 15 *Telephone *Traditional rehabilitation + health coaching via telephone *Coaching was applied via telephone, once per week for 4 weeks after baseline, and once more 3 weeks later. In order to provide support throughout return to usual activity, coaching continued for a total of 5 sessions even if the participant reported returning to full activities. Coaching also continued for 5 sessions if the participant reported being discharged from physiotherapy or decided to pursue alternative forms of treatment. Coaching was applied independently to physiotherapy and there was no correspondence between the treating therapist and the coach.	n= 15 *OI: Traditional rehabilitation	*Pain: NE *Physical function: Patient Specific Functional Scale *Quality of life: NE *Time-point: 12 weeks (Short-term).
Jackson, J. C., et al. (2012)	n= 21 *Source= Vanderbilt University Medical Center, USA. *Health condition= Intensive care unit survivors *Age= Intervention group†: 47 [41–59] OI group†: 50 [46–69] *Sex= Intervention group: 38%female/62%male OI group: 62%female/38% male	n= 13 *Telephone; video *It included a total of 12 visits, six in-person visits for cognitive rehabilitation and six televisits for physical and functional rehabilitation, each 60–75 mins in length. Exercise prescriptions were individually tailored (“dosed”) to correspond to functional status levels and primarily targeted lower extremity function and endurance using exercises that could be easily performed in the home. The exercise intervention included six televideo visits (one every other week) along with six motivational telephone calls. In between visits and calls, the patients performed exercises independently.	n= 8 *OI: Usual Care	*Pain: NE *Physical function: TUG *Quality of life: NE *Time-point: 3 months (Short-term).

Jansons, P., et al. (2017)	n= 105 *Source= Cardina Casey Community Health Service, AU. *Health condition= Chronic health conditions *Age= Experimental group: 66 (13) Control group: 68 (11) *Sex= Intervention group:75%female/25%male OI group: 54%female/46%male	n=51 *Telephone *Home-based exercise with telephone support: 1-hour exercise session, 3 sessions per week, at home. The home-based exercise program was supervised via five telephone calls over the first 10 weeks, 25 to 30 minutes in duration. The strength-training component involved 6 to 8 exercises for the upper and lower body using body weight or an elastic exercise bands to provide resistance. The aerobic component included community walking or, if participants had access to their own exercise equipment such as a stationary bike, this was incorporated.	n=54 *OI: Gym-based exercise	*Pain: NE *Physical function: 6MWT *Quality of life: European Quality of Life Instrument (EQ-5D) * Time-point: 12 months (Long-term)
Chen J et. al. (2017)	n= 54 *Source= Shanghai 5th People's Hospital Affiliated to Fudan University, CN. *Health condition= Stroke *Age= Intervention group: 66.52 (12.08) OI group: 66.15 (12.33) *Sex= 39%female/61%male	n=27 *Video conferencing * Therapists supervised the participants to do the physical exercises and ETNS (Electromyography-Triggered Neuromuscular Stimulation) by live video conferencing and collected data by the remote control system during rehabilitation therapy. Physical exercises were conducted for 1 hour, twice in a working day for 12 weeks, a total of 60 sessions.	n=27 *OI: Traditional rehabilitation	*Pain: NE *Physical function: Berg Balance Scale (BBS) *Quality of life: NE *Time-point: 12-weeks (short-time)
Kraal, J. J., et al. (2014)	n= 50 *Source= Medical Centre, NL. *Health condition= After hospitalization for myocardial infarction, unstable angina, or a revascularization procedure	n=25 *Telephone and web application *12-week exercise program with at least two training sessions per week. Patients were instructed to exercise for 45–60 min per session at 70–85% of their maximal heart rate + This patients in the home-	n=25 *OI: 12-week exercise program with at least two training sessions per week + Traditional	*Pain: NE *Physical function: MacNew questionnaire subscale *Quality of life: MacNew questionnaire

	(percutaneous coronary intervention or coronary artery bypass grafting) *Age= Intervention group: 60.6 (7.5) OI group: 56.1(8.7) *Sex= Intervention group: 12%female/88%male OI group: 16%female/84%male	based training received three initial supervised training sessions. The web application was used to review the training data by the patient, the physical therapist and the exercise specialist. During the first sessions, the patients were also familiarized with the training program (duration, intensity) and their preferred training modality in the home environment was discussed. After three supervised training sessions, this group started training in their home environment. They received feedback on training frequency, duration and intensity from the physical therapist once a week via telephone.	rehabilitation	*Time-point: 12 weeks (short-time)
Ligibel, J. A., et al. (2012)	n= 121 *Source= Oncology clinics at ten Cancer and Leukemia Group B institutions, USA. *Health condition= Breast and colorectal cancer *Age= Intervention group: 53.1 (10.8) OI group: 55.5 (10.6) *Sex= Intervention group: 92%female/8%male OI group: 93%female/7%male	n=61 *Telephone The intervention consisted of 10–11 semi-structured phone calls over the 16-week intervention period. Call duration was 30–45 min. Initial calls focused on goal setting and performance assessment so as to build self-efficacy for exercise behaviors, while later calls concentrated upon the adequacy of plans for relapse prevention. Each call reviewed performance on the behaviors previously discussed and encouraged the participant to keep using self-regulatory skills to achieve change. The telephone calls were supplemented by a Participant Workbook. The weekly exercise target was performance of at least 180 min of moderate-intensity physical activity. Participants were allowed to choose their own form of exercise, as long as it involved moderate to strenuous activity. Participants were provided with a	n=60 *OI: Usual care	*Pain: EORTC QLQ C-30 subscale *Physical function: 6MWT *Quality of life: European Organization for Research and Training, Quality of Life Questionnaire—Core 30, Version 3.0 (EORTC QLQ-C30) *Time-point: 16-weeks – (Long-term)

		pedometer (New Lifestyle Digi-Walker) and asked to wear this daily.		
Moffet, H., et al. (2015)	n= 205 *Source= Eight hospitals, CA. *Health condition= TKA *Age= Intervention group: 65 (8) OI group: 67 (8) *Sex= Intervention group: 45%female/55%male OI group: 58%female/42%male	n= 104 *Videoconference * 16 sessions of 45 to 60 minutes, supervised by a trained physical therapist. The intervention's intensity and duration were standardized and based on the recommendations of a group of experts. The components of the intervention were an assessment before and after exercise (a structured interview and observation), supervised exercises during a period of approximately 30 minutes (mobility, strengthening, function, and balance), prescription of home exercises to perform on days without supervised sessions, and advice concerning pain control, walking aids, and the return to activities. The intensity and difficulty level of the exercises were increased according to each patient's tolerance and needs.	n= 101 OI: Traditional rehabilitation	*Pain: WOMAC subscale *Physical function: 6MWT *Quality of life: score quality of life (KOOS) *Time-point: 2 months (Short-term)
Morey, M. C., et al. (2012)	n= 302 *Source= Durham and Raleigh VA clinics, USA. *Health condition= Older Adults with Prediabetes. *Age= Intervention group: 67.1 (6.3) OI group: 67.7 (6.2) *Sex= Intervention group: 4%female/96%male	n= 180 *Telephone * Each individual was given the long-term goal of engaging in 30 or more minutes of lower extremity aerobic exercise, preferably walking, on 5 or more days of the week, and 15 minutes of exercises to increase lower extremity strength on 3 non-consecutive days each week. Regular telephone counseling every 2 weeks for 6 weeks followed by monthly calls over the entire one-year intervention period. Individuals assigned to	n= 122 *OI: Usual Care	*Pain: NE *Physical function: SF-36 subscale *Quality of life: NE *Time-point: 12 months (Long-term)

	OI group: 3%female/97% male	reduced telephone calls received telephone calls every other month during the final 6 months.		
Morey, M. C., et al. (2009)	n= 641 *Source= CA, UK and USA. *Health condition= Cancer survivors Colorectal, Breast and Prostate Cancer *Age= Intervention group: 73.0 (5.0) CWI group: 73.1 (5.1) *Sex= 55%female/45%male	n=319 *Telephone *15 minutes of strength training exercise every other day; 30 minutes of endurance exercise each day. Participants also received a pedometer, exercise bands (three levels of resistance), an exercise poster depicting six lower extremity strength exercises. Each telephone session was 15–30 minutes in duration.	n=322 *CWI: Waiting list control	*Pain: SF-36 subscale *Physical function: SF-36 subscale *Quality of life: SF-36 *Time-point: 12 month (Long-term)
O'Brien, J., et al. (2017)	n= 59 *Source= Two outpatient wound services in Queensland and a community nursing service in Victoria, AU. *Health condition= Venous leg ulcers *Age= 71.5 (14.6) *Sex= 48%female/52%males	n=29 *Telephone * Home-based progressive resistance exercise programme for 12 weeks. All patients received telephone calls at regular time points throughout the 12 weeks. Exercise protocol: Stage 1. Seated heel-rises (both legs): (10 × 3 up to 25 × 3 sets three times per day every day). Stage 2. Standing heel-rises (both legs): (10 × 3 up to 25 × 3 sets three times per day every day). Stage 3. One-legged heel-rises: (10 × 3 up to 25 × 3 sets three times per day every day). Stretching was recommended prior to and following each exercise session.	n=30 OI: Usual care	*Pain: NE *Physical function: Tinetti Gait and Balance *Quality of life: Short Form-8 (SF-8) *Time-point: 12 weeks (Short-time)
Odole, A. C. and O. D. Ojo (2013)	n= 50 *Source= University College Hospital; Neuropsychiatric Hospital; and State Hospital, NG. *Health condition=	n=25 *Telephone The knee osteoarthritis specific exercises were to be performed by the patients at home 3 times per week for 6-weeks. Exercise protocol: Stretching (2x20 seg); Strengthening exercise (2x10 rep); Balance 20	n=25 OI: Traditional rehabilitation	*Pain: VAS *Physical function: Ibadan Knee/Hip Osteoarthritis Outcome Measure (IKHOAM) *Quality of life: NE

	OA of the Knee *Age= 55.50 (7.55) *Sex= 48%female/52%male	seg. The therapists employed uniform statements from a structured telephone intervention guide three times per week.		*Time-point: 6 weeks (Short-term)
Pastora-Bernal JM (2018)	n= 18 *Source= Rehabilitation service, ES. *Health condition= Arthroscopic sub acromial decompression *Age †= 52.50 [33–65] *Sex= 44%female/56%male	n=8 * Web application *Customized exercises program through a web application that allows the physiotherapist to generate videos, images and parameters of each exercise program and send them via email. Subjects received a 12-week (5 days/week) set of self-workout video exercises.	n=10 OI: Traditional rehabilitation	*Pain: Constant–Murley Test (CM) pain subscale *Physical function: CM physical function subscale *Quality of life: NE *Time-point: 12 weeks (Short-term)
Paul, L., et al. (2014)	n= 30 *Source= Multiple Sclerosis Service, at the Douglas Grant Rehabilitation Centre, UK. *Health condition= Multiple Sclerosis *Age= 51.7 (11.2) *Sex= 80%female/20%male	n= 15 Website, Telephone * Participants were advised to undertake the exercise program a minimum of 2 a week and to complete their online exercise diary. The catalog of exercises consisted of: cardiovascular, strengthening and balance exercises, each at four levels of difficulty, as well as warm up and cool down exercises and stretches. Participants were contacted by the physiotherapist each week to discuss progress and update their exercise program by changing any combination of exercises, level of difficulty or number of repetitions.	n= 15 *OI: Usual care	*Pain: NE *Physical function: TUG *Quality of life: Leeds Multiple Sclerosis Quality of Life Scale *Time-point: after 12 weeks (Long-term)
Piga, M., et al. (2014)	n= 40 *Source= Rheumatology outpatient clinic, IT. *Health condition= Systemic Sclerosis and Rheumatoid Arthritis.	n= 20 *Telephone * The kinesiotherapy protocol consisted of 4 strengthening and 3 mobility exercises, to be repeated 5 days per week for 12 weeks, each session lasting a maximum of 50 min. Every workout was	n= 20 *OI: Traditional rehabilitation	*Pain: VAS *Physical function: Dreiser's index *Quality of life: SF-36 *Time-point: 12 weeks

	*Age= Intervention group: 57.0 (10.0) OI group: 57.4 (11.7) *Sex= 50%female/50%male	conducted at home by patients using the Recovery of Movement and Telemonitoring (Re.Mo.Te.).		(Short-term)
Piotrowicz, E., et al. (2015)	n= 131 *Source= Department of Cardiac Rehabilitation and Noninvasive Electrocardiolog, PL. *Health condition= Heart failure *Age= 56.4 (10.9) *Sex= Intervention group: 15%female/85%male OI group: 5%female/95%male	n= 75 *Telemonitored *The training session in both groups (Intervention and OI) consisted of three parts: consisted of a warm-up lasting 5–10 minutes (breathing and light resistance exercises, calisthenics); basic aerobic endurance training for 10–30 minutes; and 5 minutes cooling down, 3 times a week for 8 weeks. The patients received remote equipment for telemonitoring and supervised exercise training, which consisted device which enabled to record and transmit the ECG.	n=56 *OI: Traditional rehabilitation	*Pain: SF-36 subscale *Physical function: SF-36 subscale *Quality of life: SF-36 *Time-point: 8 weeks (Short-term)
Piqueras, M., et al. (2013)	n= 142 *Source= Tertiary hospital, ES. *Health condition= TKA *Age= 73.3 (6.5) *Sex=72%female /28%male	n= 72 *Virtual software-hardware platform * The participants received 1-h the Interactive virtual telerehabilitation system (IVT) sessions for 10 days (5 sessions performed under a therapist's supervision to verify the absence of medical complications and 5 sessions performed at home). The patient received the necessary information to perform the exercises and the therapist remotely monitored the patient's performance.	n=70 *OI: Traditional rehabilitation	*Pain: VAS *Physical function: TUG *Quality of life: NE * Time-point: 10 days (Short-term)
Salvetti, X. M., et al. (2008)	n= 39 *Source= Cardiology clinic, BR. *Health condition= Coronary disease	n=19 *Telephone *2 supervised exercise classes including a 10-minute warm-up consisting of walking and stretching	n=20 *OI: Usual care	*Pain: SF-36 subscale *Physical function: SF-36 subscale *Quality of life:

	*Age= Intervention group:53(8) OI group: 54 (9) *Sex= Intervention group: 26%female/74%male OI group: 25%female/75%male	exercises, 40 minutes of aerobic exercise training consisting of walking and a 10- minute cool-down period. The individualized training in home included standard stretching exercises, walking 3 times per week for 30 minutes on nonconsecutive days for 3 months, at the assessed target heart rate, warm-up and cooldown. The patients were telephoned every 2 weeks by the doctor to monitor progress, assess adherence and provide support.		SF-36 *Time-point: 3-month (Short-term).
Sari, D. and L. Khorshid (2009)	n= 34 *Source= Urology clinics, TR. *Health condition= Urinary Incontinence *Age= 43.23 (7.84) *Sex= 100% female	n= 17 *Telephone *The training program included 3 sets of fast and slow contractions completed daily in supine, sitting, and standing positions. Participants were asked to conduct 30 sustained contractions in 1 set. Muscle training included quick flick exercises (1-2-s contractions), followed by sustained (5 s) contractions. Sustained contractions extended 1 second more in the next 5 weeks, until they reached a maximum of 10 seconds contractions at week 6. The intervention period was 8 weeks.	n=17 *CWI: No intervention	*Pain: NE *Physical function: NE *Quality of life: Incontinence of Quality of Life (I-QOL) * Time-point: 8 Weeks (Short-term)
Stewart, A. V., et al. (2003)	n= 83 *Source= Tertiary care hospital, ZA. *Health condition= Hypertension *Age= Intervention group: 56.3 (11.5) OI group: 58.6 (11.2) *Sex=NS	n=41 *Telephone *Patients in both groups received an educational and home-based exercise program + support of telephone calls from a healthcare practitioner. Patients received an individual walking program to perform 3-5 times a week at home. The time that they were to walk was increased on a weekly basis to a maximum of 30 minutes. The intervention lasted for 24 weeks.	n=42 *OI: Traditional rehabilitation	*Pain: NE *Physical function: 6MWT *Quality of life: NE *Time-point: 24 weeks (Long-term)

Tsai, L. L., et al. (2017)	n= 36 *Source= Tertiary hospital PR program, AU. *Health condition= COPD *Age= Intervention group: 73 (8) OI group: 75 (9) *Sex= Intervention group: 37%female/63%male OI group: 65%female/35%male	n=19 *Videoconferencing *Telerehabilitation was conducted as supervised group exercise training, 3 times a week for 8 weeks. The participants performed lower limb cycle ergometry (Intensity: 60% Peak cycle work rate - 80% Peak cycle work rate; Duration: 15min, 20min, 30min), walking training (Intensity: 80% of 6MWT speed; Duration: 15min, 20min, 30min) and strengthening exercises.	n=17 *OI: Usual care	*Pain: NE *Physical function: 6MWT *Quality of life: The Chronic Respiratory Disease Questionnaire (CRDQ) *Time-point: 8 weeks (Short-term)
Varnfield, M., et al. (2014)	n= 94 *Source= Primary & community Health Services, AU. *Health condition= Post myocardial Infarction *Age= Intervention group: 55.5 (9.6) OI group: 55.7 (10.4) *Sex= Intervention group: 9%female/91%male OI group: 7%female/83%male	n=53 * Text messages and pre-installed audio and video files on smartphone, web portal, telephone calls *Mentors provided weekly scheduled telephone consultations (~15 min each) over 6 weeks. Exercise targets were at least 30 min of moderate activity on most days of the week with walking as the main exercise mode.	n=41 *OI: Traditional rehabilitation	*Pain: NE *Physical function: 6MWT *Quality of life: EQ-5D HRQoL *Time-point: 6 weeks (Short-term)
Azma, K., et al. (2018)	n= 54 *Source= Physical medicine and rehabilitation clinic, IR. *Health condition= Knee OA. *Age= 58.2 (7.41) *Sex= 60%female/40%male	n=27 *Telephone * Exercises strengthening, endurance, flexibility, and active range of motion exercises. Then, they received a pamphlet containing descriptions and pictures detailing the above exercises and also a logbook to record their activities. Patients were asked to	n=27 *OI: Traditional rehabilitation	*Pain: VAS *Physical function: WOMAC *Quality of life: KOOS *Time-point: 6 weeks (Short-term).

		continue these exercises for three times a week for 6 weeks (total of 18 sessions). They were told to place a hot pack on their knees for 20 minutes before every session. A specialist remotely monitored for telephone the progress of exercises, maintaining principles of daily activities, and symptom improvements.		
Ellis, T. D., et al. (2019)	n= 51 *Source= Boston University Medical Center, Center for Neurorehabilitation and Fox Trial Finder, USA. *Health condition= Parkinson Disease *Age= 64.1 (9.5) *Sex= 45%female/55%male	n=26 *Mobile application * Individualized exercise and walking program: 5 to 7 strengthening exercises for ≥ 3 d/wk. The walking component of the home program consisted of an individualized recommended range of steps per day that was determined from each participant's baseline activity level. Changes to the exercise program were made via the app approximately 2 to 3 times per month based on the progress of each participant.	n=25 *OI: Traditional rehabilitation	*Pain: NE *Physical function: 6MWT *Quality of life: Parkinson Disease Questionnaire 39 (PDQ-39) *Time-point: 12 months (Long-term).
Fjeldstad-Pardo, C., et al. (2018)	n= 29 *Source= NS, USA. *Health condition= Multiple Sclerosis *Age= 54.7 (12.3) *Sex= 69%female/31%male	n= 10 *Telecommunication (audio/visual real-time) *Supervised adaptable sessions with the treating physical therapist via audio/visual real-time telecommunication twice weekly.	n= 19 OI: Traditional home rehabilitation (n= 10) OI: Traditional rehabilitation in the physiotherapy clinic (n= 9)	*Pain: NE *Physical function: BBS *Quality of life : SF-36 *Time-point: 8 weeks (Short-term)
Kalron, A., et al. (2018)	n= 40 *Source= E-mails and printed advertisements, IL. *Health condition= Hip surgery *Age= 67.5 (7.8)	n=20 *Software program- video The software includes short video clips of common rehabilitation exercises (e.g. squats, lunges, heel rises, etc.) and an audio clip describing the different	n=20 *OI: Traditional rehabilitation	*Pain: NE *Physical function: TUG *Quality of life: NE *Time-point: 6 weeks (Short-

	*Sex= 45%female/55%male	phases of the exercise and a depiction of correct versus incorrect performances. According to the patient's feedback, the therapist would readjust or change the program. Participants were instructed to perform the exercise drill 3 times a week for 6 weeks.		term)
Peng, X., et al. (2018)	n= 98 *Source= Teaching hospital, CN. *Health condition= Heart failure *Age= 66.3 (10.50) *Sex= 41%female/59%male	n=49 *Instant messaging online and online webcam communication and supervision *First stage (1–4 weeks) was focused on endurance exercises with 3 20-minute sessions per week. The training modalities included walking and jogging. The patients received a total of 12 20-minute sessions of exercise training in the first stage, with 3 sessions per week. Second stage (5–8 weeks) included resistance and muscular strengthening exercises in 5 30-minute sessions per week. The target training HR was 40% to 70% of the HR reserve plus the resting HR. Each training session in both stages started with a warmup and ended with a cool-down exercise. The training modalities included walking, jogging, and calisthenics for muscular training. The muscular strengthening exercises included multiple weight-bearing calisthenics, such as single-leg squats, deep squats and partial squats.	n=49 *OI: Usual care	*Pain: NE *Physical Function: 6MWD *Quality of life: MLHFQ *Time-point: 2 months (Short-term)
Chhabra, H. S., et al. (2018).	n= 93 *Source= Spine Department in a private hospital, IN. *Health condition= Chronic low back pain *Age= Intervention group: 41.4	n= 45 *App group * The program Snapcare App addressed the following: 1) Increase in physical activity: Activity goals consisted of aerobic exercises (walking/running), and a set of home exercises	n= 48 *OI: Traditional rehabilitation	*Pain: Numeric Pain Rating Scale (NPRS) *Physical function: Modified Oswestry Disability Index (MODI) *Quality of life: NE

	(14.2) OI group: 41.0 (14.2) *Sex= NS	customized according to each individual participant's health. 2) Improvement in function: The aim was to see their progress toward normality in terms of performing basic tasks such as walking, sitting, standing, and self-care activities, without pain.		*Time-point: 12 weeks (Short-term)
Ariza-Garcia, A., et al. (2019)	n= 68 *Source= Hospital Virgen de las Nieves Granada, ES. *Health condition= Breast cancer *Age= Intervention group: 48.82 (7.68) OI group: 47.32 (9.92) *Sex= 100%female	n= 34 *Web-site * The program was organized into a warm up, a main, and a cool down part. The aerobic exercise intensity was between 45% and 60% of the maximum heart rate and lasted for 15-30 minutes. There were a total of 5 strength exercises of low intensity with functional implementation. The exercises their volume and intensity, were adapted for each patient. Participants were instructed to perform the exercise three sessions per week on nonconsecutive days.	n= 34 *OI: Usual care	*Pain: NE *Physical function: 6MWT *Quality of life: NE *Time-point: 8 weeks (Short-term)
Coronado, R. A., et al. (2019)	n=30 *Source= Vanderbilt University Medical Center, Nashville, EUA. *Health condition= Anterior Cervical Discectomy and Fusion (ACDF) *Age= Intervention group: 51.8 (10.3) OI group: 49.3 (11.9) *Sex= 53%female/47%male	n= 15 * Telephone * The program included daily walking and sleeping instructions, and range of motion and strengthening exercises. Cognitive-behavioral strategies included relaxation, deep breathing, and distraction. Specific therapeutic exercises included neck range of motion, shoulder and upper back and strengthening exercises neck, shoulder and core/trunk. Therapeutic exercises were progressed in difficulty over three 2-week phases as participants tolerated and as directed by a physical therapist over weekly phone calls.	n= 15 *OI: Usual Care	*Pain: Numeric Rating Scale (NRS) *Physical function: NE *Quality of life: NE *Time-point: 6 weeks (Short-term)

Duruturk, N. and M. A. Ozkoslu (2019)	n= 50 *Source= Baskent University Hospital, TK. *Health condition= Type 2 Diabetes *Age= TK Intervention group: 52.82 (11.86) OI group: 53.04 (10.45) *Sex= 40%/60%	n= 25 * Internet based videoconferences * All subjects in the TR group trained three times a week, for 6 weeks, lasted 40 min at home by internet based videoconferences with the supervision of a physiotherapist. Only the first session of the training was performed at the clinic to precept the exercises. The TR group performed breathing exercises and callisthenic exercise that consist of 16 different, rhythmical exercises of strengthening and stretching of the lower and upper extremity muscles. Before the callisthenic exercises, warm-up exercises involving lower and upper extremity joint movements were repeated 10 times each.	n= 25 *OI: Usual Care	*Pain: NE *Physical function: 6MWT *Quality of life: NE *Time-point: 6 weeks (Short-term)
Fang, J., et al. (2019)	n= 80 *Source= Hospital of Shantou University Medical College, CN. *Health condition= Coronary Heart Disease *Age= Intervention group: 60.24 (9.35) OI group: 61.41 (10.17) *Sex= 37%female/63%male	n= 40 *Smartphone with an application and telephone * Participants were instructed to complete outdoor walking or jogging with real-time physiological monitoring no less than thrice/week for 6 weeks. They also received two home visits by a physical therapist during a 6-week interval to enhance their training. In between visits, a weekly telephone call was made by the physical therapist to resolve any questions the patients might have.	n= 40 *OI: Usual Care	*Pain: NE *Physical function: 6MWT *Quality of life: SF-36 *Time-point: 6 weeks (Short-term)
Hinman, R. S., et al. (2019).	n= 175 *Source= NS, AU. *Health condition= Knee OA *Age= Intervention group: 62.4 (9.1) OI group: 62.5 (8.1)	n= 87 * Website * The program included an action plan for home-based strengthening exercise and physical activity. For strengthening, physiotherapists chose 5–6 exercises performed three times per week.	n= 88 *OI: Usual Care	*Pain: NE *Physical function: WOMAC *Quality of life: Assessment of Quality of Life (AQoL)

	*Sex= 63%female/37%male	Physiotherapists aimed to prescribe a programme and dosage that was 'hard' to 'very hard' to perform to stimulate strength gains that would translate to improved function. Physiotherapists assisted participants to develop a physical activity plan aimed at increasing physical activity.		*Time-point: 6 months (Long-term)
Paul, L., et al. (2019)	n= 90 *Source= NHS Ayrshire and Arran, NHS Lothian and Plymouth Hospitals NHS Trust, UK. *Health condition= Multiple Sclerosis *Age= 56.1 (9.6) *Sex= 77% females/23% males	n= 45 * Web-site Programmes could consist of cardiovascular, strengthening and balance exercises, as well as warm up, cool down and stretching exercises, at different levels of difficulty and a prescribed number of sets/repetitions individualized to meet the participants' needs. The website contained exercises (videos, text and audio description) and disease-specific advice and education.	n= 45 *OI: Traditional rehabilitation	*Pain: NE *Physical function: BBS *Quality of life: EQ-5D *Time-point: 3 months (Short-term)

Supplementary 3. Funnel plots for pain, physical function and quality of life.

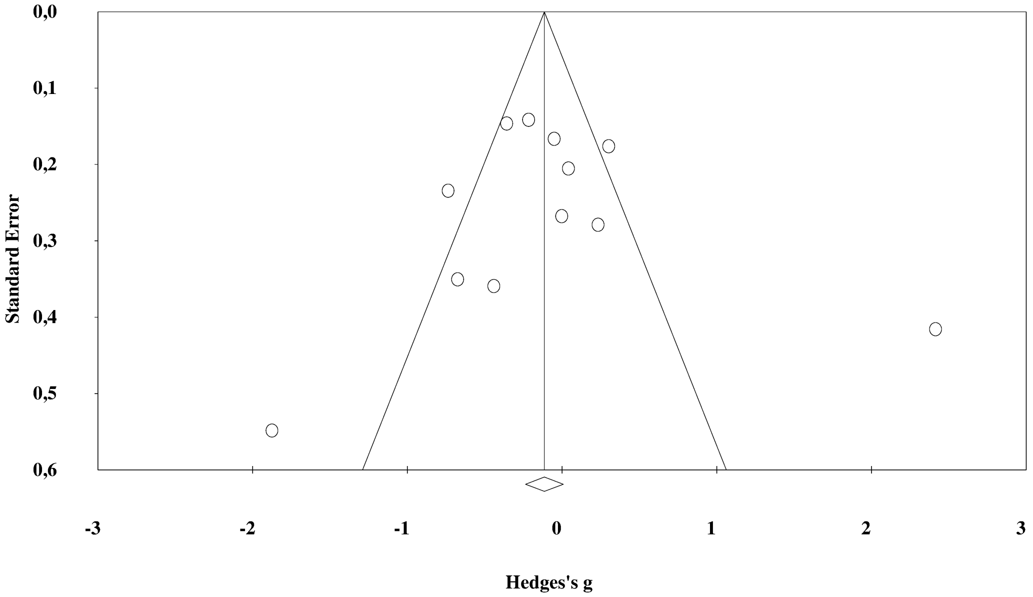


Figure 1.1 Funnel plot pain at short-term. Egger test: Intercept = 0.3925 (95% CI = -4.2 to 5.1; p > 0.427).

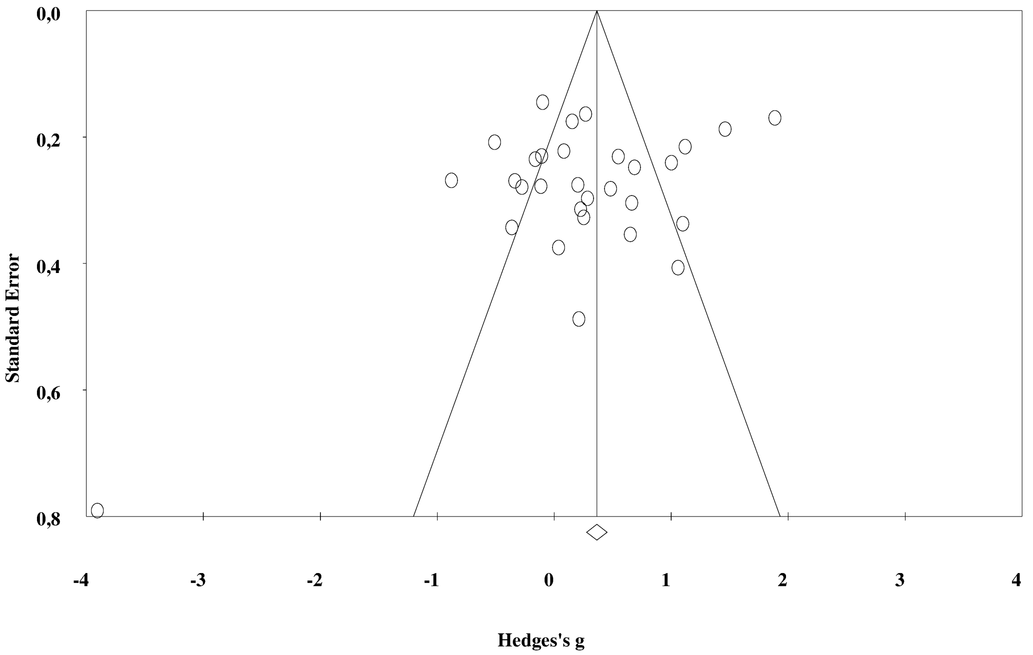


Figure 1.2 Funnel plot physical function at short-term. Egger test: Intercept = -2.5065 (95% CI = -6.1 to 1.2; p > 0.085).

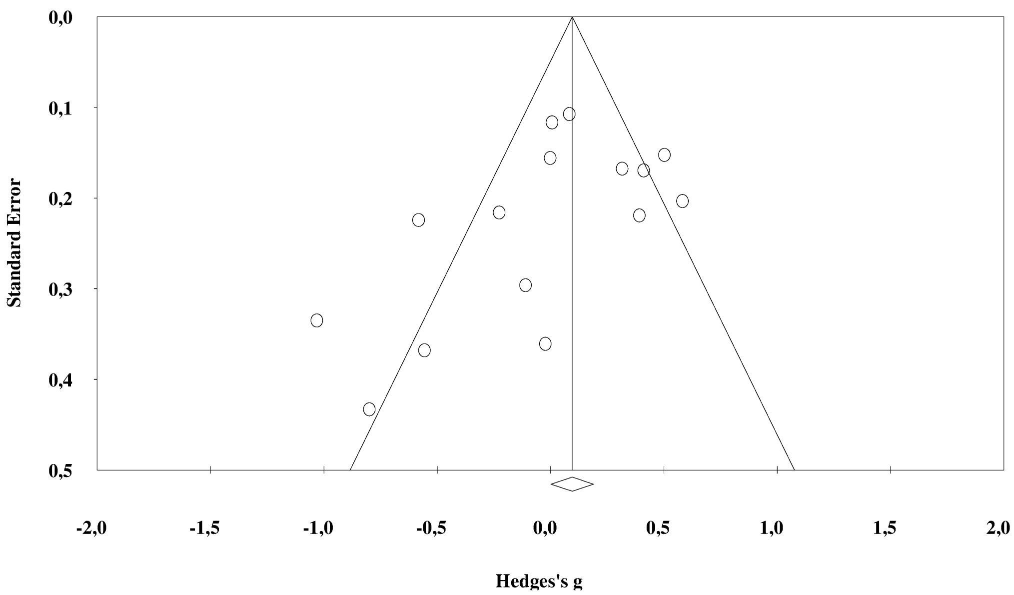


Figure 1.3 Funnel plot physical function at long-term. Egger test: Intercept = -2.1506 (95% CI = -4.8 to 0.5; p > 0.052).

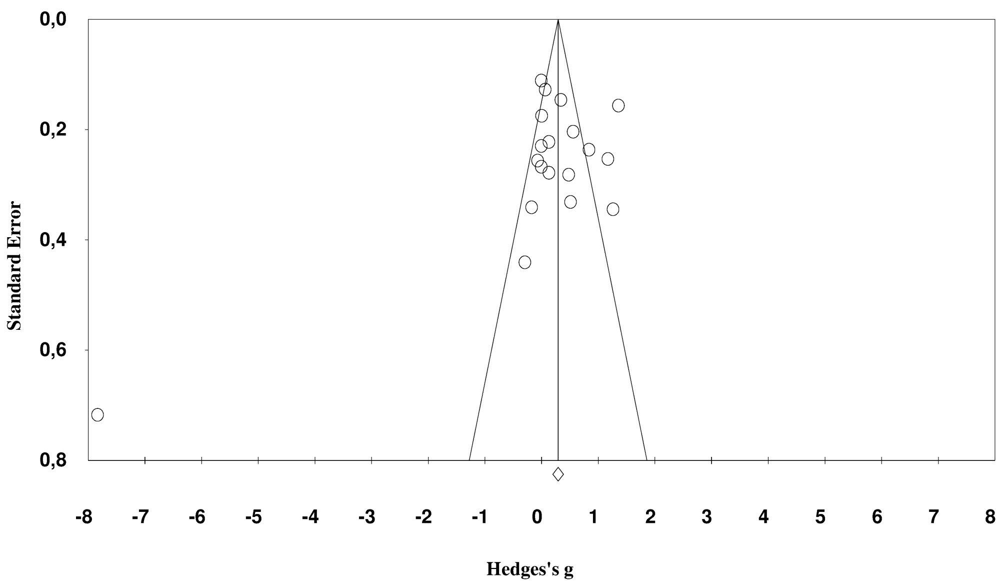


Figure 1.4 Funnel plot quality of life at short-term. Egger test: Intercept = -2.2507 (95% CI = -9.7 to 2.2; p > 0.148).

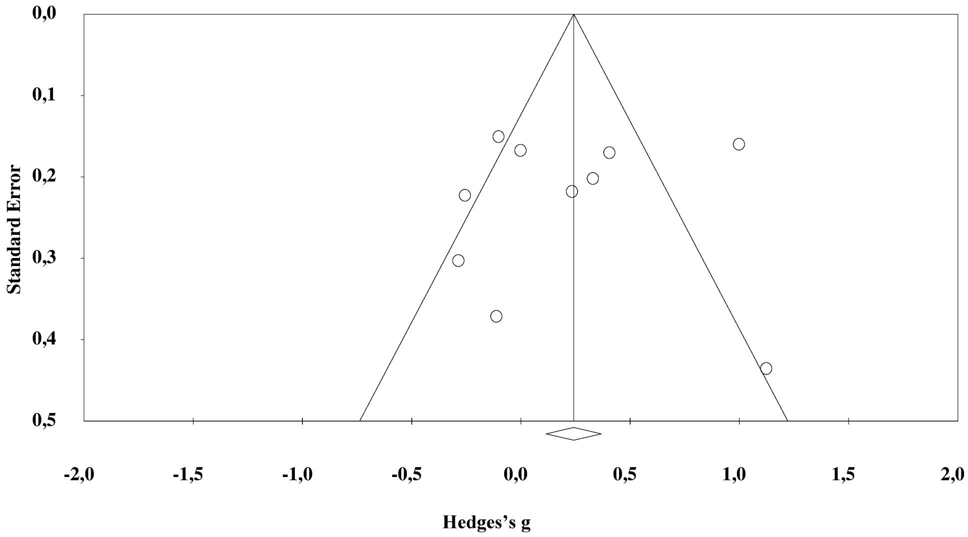


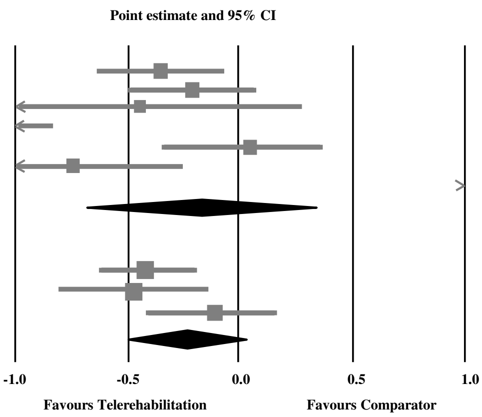
Figure 1.5 Funnel plot quality of life at long-term. Egger test: Intercept = -0.5593 (95% CI = -6.3 to 5.2; p > 0.414).

Supplementary 4. Sensitivity analyses removing poor-quality trials (PEDro < 6 out of 10) for pain, physical function and quality of life. In parentheses: number of trials, total number of participants, I²

SENSITIVITY ANALYSIS

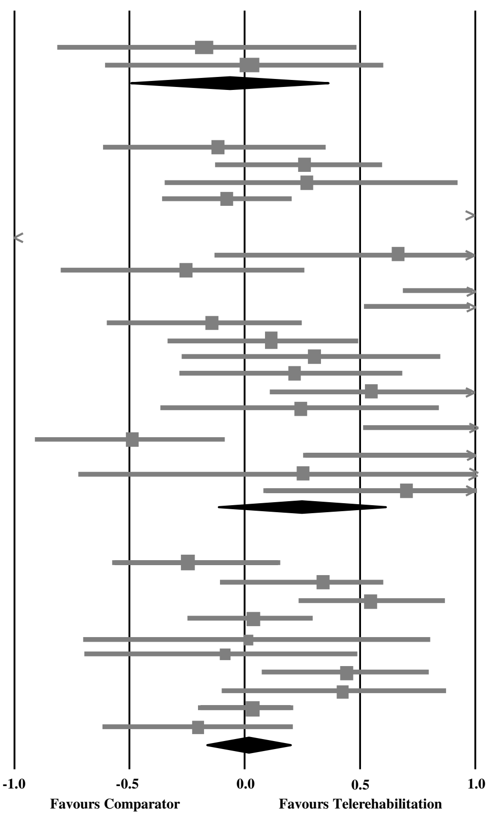
PAIN

Study	Point estimate	Lower limit	Upper limit	p-Value	GRADE
Telerehabilitation versus Other intervention - *Short-term*					
Chen, M., et al. (2016)	-0.4	-0.6	-0.1	0.016	
Moffet, H., et al. (2015)	-0.2	-0.5	0.1	0.133	
Coronado, R. A., et al. (2019)	-0.4	-1.1	0.3	0.223	
Pastora-Bernal J. M., et al. (2018)	-1.9	-2.9	-0.8	0.001	
Chhabra, H. S., et al. (2018)	0.1	-0.4	0.4	0.832	
Galiano-Castillo, N., et al. (2016)	-0.7	-1.2	-0.3	0.002	
Salvetti, X. M., et al. (2008)	2.4	1.6	3.2	0.001	
POLLED (7, 641, 62.5)	**-0.1**	**-0.7**	**0.4**	**0.582**	**Low**
Telerehabilitation versus Other intervention - *Long-term*					
Allen, K. D., et al. (2010)	-0.4	-0.6	-0.2	0.001	
Bennell, K. L., et al. (2017)	-0.5	-0.8	-0.1	0.008	
Damush, T. M., et al. (2003)	-0.1	-0.4	0.2	0.637	
POLLED (3, 648, 3.5)	**-0.3**	**-0.5**	**0.1**	**0.005**	**High**



PHYSICAL FUNCTION

Study	Point estimate	Lower limit	Upper limit	p-Value	GRADE
Telerehabilitation versus Control - *Short-term*					
Alibhai, S. M. H., et al. (2014)	-0.2	-0.8	0.5	0.618	
Chien, C. L., et al. (2011)	0.1	-0.6	0.6	0.913	
POLLED (2, 82, 0.0)	**0.1**	**-0.5**	**0.4**	**0.795**	**Moderate**
Telerehabilitation versus Other intervention - *Short-term*					
Bourne, S., et al. (2017)	-0.1	-0.6	0.4	0.652	
Holland, A. E., et al. (2017)	0.3	-0.1	0.6	0.098	
Tsai, L. L., et al. (2017)	0.3	-0.4	0.9	0.435	
Chen, M., et al. (2016)	-0.1	-0.4	0.2	0.515	
Moffet, H., et al. (2015)	1.9	1.6	2.2	0.001	
Pastora-Bernal J.M. (2018)	-4.1	-5.7	-2.4	0.001	
Kalron, A., et al. (2018)	0.7	-0.1	1.4	0.065	
Hwang, R., et al. (2017)	-0.3	-0.8	0.3	0.331	
Peng, X., et al. (2018)	1.1	0.7	1.6	0.001	
Salvetti, X. M., et al. (2008)	1.1	0.5	1.8	0.001	
Varnfield, M., et al. (2014)	-0.2	-0.6	0.3	0.501	
Paul, L., et al. (2019)	0.1	-0.4	0.5	0.696	
Chumbler, N., et al. (2012)	0.3	-0.3	0.9	0.334	
Chen J., et al. (2017)	0.2	-0.3	0.8	0.457	
Galiano-Castillo, N., et al. (2017)	0.6	0.1	1.1	0.017	
Ariza-Garcia, A., et al. (2019)	0.2	-0.4	0.9	0.465	
Galiano-Castillo, N., et al. (2016)	1.0	0.5	1.5	0.001	
Chhabra, H. S., et al. (2018)	-0.5	-0.9	-0.1	0.016	
Iles, R., et al. (2011)	1.1	0.3	1.9	0.009	
Jackson, J. C., et al. (2012)	0.2	-0.8	1.2	0.660	
Duruturk, N. and M. A. Ozkoslu (2019)	0.7	0.1	1.3	0.029	
POLLED (21, 1515, 29.7)	**0.3**	**-0.1**	**0.6**	**0.060**	**Moderate**
Telerehabilitation versus Other intervention - *Long-term*					
Allen, K. D., et al. (2010)	-0.2	-0.6	0.2	0.299	
Bennell, K. L., et al. (2017)	0.3	-0.1	0.6	0.058	
Hinman, R. S., et al. (2019)	0.5	0.2	0.8	0.001	
Damush, T. M., et al. (2003)	0.1	-0.3	0.3	1.000	
Bini, S. A. and J. Mahajan (2017)	-0.1	-0.7	0.7	0.953	
Ellis, T. D., et al. (2019)	-0.1	-0.7	0.5	0.715	
Frederix, I., et al. (2015)	0.4	0.1	0.7	0.015	
Stewart, A. V., et al. (2003)	0.4	-0.1	0.8	0.073	
Morey, M. C., et al. (2012)	0.1	-0.2	0.2	0.942	
Jansons, P., et al. (2017)	-0.2	-0.6	0.2	0.299	
POLLED (10, 1248, 0.0)	**0.1**	**-0.1**	**0.3**	**0.125**	**High**



QUALITY OF LIFE

Study	Point estimate	Lower limit	Upper limit	p-Value	GRADE
Telerehabilitation versus Control - *Short-term*					
Alibhai, S. M. H., et al. (2014)	-0.7	-1.3	-0.1	0.042	
Chien, C. L., et al. (2011)	0.5	-0.1	1.1	0.080	
POLLED (2, 82, 0.0)	**-0.1**	**-1.2**	**1.1**	**0.915**	**Low**
Telerehabilitation versus Other intervention - *Short-term*					
Bourne, S., et al. (2017)	0.1	-0.5	0.5	1.000	
Demeyer, H., et al. (2017)	0.1	-0.2	0.2	1.000	
Tsai, L. L., et al. (2017)	0.5	-0.1	1.2	0.118	
Hwang, R., et al. (2017)	0.1	-0.4	0.7	0.626	
Peng, X., et al. (2018)	0.6	0.2	1.0	0.006	
Salvetti, X. M., et al. (2008)	1.3	0.6	1.9	0.001	
Varnfield, M., et al. (2014)	1.2	0.7	1.7	0.001	
Galiano-Castillo, N., et al. (2016)	0.8	0.4	1.3	0.001	
Paul, L., et al. (2019)	0.1	-0.3	0.6	0.543	
Fjeldstad-Pardo, C., et al. (2018)	0.1	-0.2	0.3	0.583	
Chen M, et al. (2016)	0.3	0.1	0.6	0.018	
Moffet, H., et al. (2015)	1.4	1.1	1.7	0.001	
POLLED (12, 1489, 0.0)	**0.5**	**-0.2**	**0.8**	**0.001**	**Moderate**
Telerehabilitation versus Other intervention - *Long-term*					
Hinman, R. S., et al. (2019)	1.0	0.7	1.3	0.001	
Bennell, K. L., et al. (2017)	0.1	-0.3	0.3	1.000	
Frederix, I., et al. (2015)	0.4	0.1	0.7	0.017	
Hayes, S. C., et al. (2013)	-0.1	-0.4	0.2	0.506	
Ellis, T. D., et al. (2019)	-0.3	-0.9	0.3	0.349	
Jansons, P., et al. (2017)	0.2	-0.2	0.7	0.281	
POLLED (6, 780, 0.0)	**0.2**	**-0.2**	**0.6**	**0.240**	**High**