Jane Fonseca Dias

TELERREABILITAÇÃO: evidências atuais e futuras aplicações

Belo Horizonte

Escola de Educação Física, Fisioterapia e Terapia Ocupacional da UFMG

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Dissertação apresentada ao Curso de Mestrado em Ciências da Reabilitação da Escola de Educação Física, Fisioterapia e Terapia Ocupacional da Universidade Federal de Minas Gerais, como requisito parcial à obtenção do título de Mestre em Ciências da Reabilitação.
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Orientadora: Profa. Dra. Rosana Ferreira Sampaio
Coorientador: Prof. Dr. Vinícius Cunha de Oliveira.

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PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS DA REABILITAÇÃO

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FOLHA DE APROVAÇÃO

TELERREABILITAÇÃO: Evidências atuais e futuras aplicações

JANE FONSECA DIAS

Dissertação submetida à Banca Examinadora designada pelo Colegiado do Programa de Pós-Graduação em CIÊNCIAS DA REABILITAÇÃO, como requisito para obtenção do grau de Mestre em CIÊNCIAS DA REABILITAÇÃO, área de concentração DESEMPENHO FUNCIONAL HUMANO.

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RESUMO

Telerreabilitação é definida como o uso de um conjunto de recursos e tecnologias de informação e comunicação que possibilitam tratamento à distância. Tem sido considerada uma estratégia viável e acessível de cuidados de saúde para pessoas com deficiência, ajudando a superar diferentes barreiras que limitam ou impedem o acesso a programas presenciais. Dentre os vários benefícios da telerreabilitação destacam-se a melhora na qualidade do atendimento e na equidade do acesso aos serviços de reabilitação, favorecendo a resolubilidade dos casos, reduzindo custos e otimizando recursos. No entanto, até o momento, não há consenso quanto a efetividade das intervenções baseadas em exercícios ofertados por telerreabilitação para adultos com deficiência física. Assim, o objetivo desta dissertação foi investigar a efetividade do exercício por telerreabilitação na melhora da dor, função física e qualidade de vida de adultos com deficiência física por meio de uma revisão sistemática com metanálise. Inicialmente, uma pesquisa estruturada foi realizada nas seguintes bases de dados: AMED, MEDLINE, CINAHL, SPORTDiscus, EMBASE, PEDro, Cochrane, PsycINFO. Foram considerados apenas Ensaios Clínicos Aleatorizados (ECA) que avaliaram protocolos de telerreabilitação que incluíam exercícios físicos do tipo aeróbico e / ou cinesioterapia. A população foi composta por adultos (≥18 anos) com deficiência física. As comparações foram feitas com dois grupos: controle sem intervenção e outras intervenções ou controle ativo. Os desfechos foram dor, função física e qualidade de vida. Os processos de seleção dos estudos, extração e análise dos dados seguiram o protocolo registrado na base PROSPERO (CRD42019122824). O GRADE foi usado para classificar a força da evidência atual. Como resultado foram identificados 13.007 registros nos bancos de dados pesquisados. Após os processos de triagem e avaliação da elegibilidade, 54 ECA foram incluídos na análise final. Quando a telerreabilitação foi comparada a outras intervenções, os resultados mostraram evidências de moderada qualidade e pequeno tamanho de efeito a favor da telerreabilitação na redução da dor a longo prazo (SMD: -0,2; IC95%: -0,3 a -0,1) e alta qualidade da evidência com tamanho de efeito pequeno a favor da telerreabilitação na melhora da qualidade de vida a curto prazo (SMD: 0,3; IC95%: 0,1 a 0,5). As estimativas também mostraram moderada qualidade da evidência para nenhuma diferença entre telerreabilitação e outras intervenções na melhora da função física a curto prazo (95% CI: -0,1 a 0,5) e longo prazo (IC 95%: -0,1 a 0,2) e qualidade de vida a longo prazo (IC 95%: -0,1 a 0,4). Os resultados mostraram que a telerreabilitação parece ser tão ou mais eficaz que outras intervenções na melhora da dor a longo prazo, função física a curto e longo prazo e qualidade de vida a curto e longo prazo. Além disso, esta estratégia de oferta de reabilitação parece ser promissora em diversas categorias clínicas como musculoesquelética, oncológica e cardiovascular, apresentando resultados equivalentes ou melhores que outras intervenções na melhora da dor, função física e qualidade de vida. No entanto, estudos de melhor qualidade metodológica comparando telerreabilitação com grupo controle sem intervenção ainda são necessários para afirmar seu benefício e efeito.

Palavras-chave: Revisão sistemática. Metanálise. Telerreabilitação. Deficiência. Dor. Função física. Qualidade de vida.

ABSTRACT

Telerehabilitation is defined as the use of a set of resources and technologies of information and communication that allow remote treatment. It has been considered a viable and affordable delivery of health care for people with disabilities, helping to overcome different barriers to access the face-to-face programs. Among the several benefits of telerehabilitation, highlight the capacity to improve the quality of care and increase the equity of access to rehabilitation services, favoring the resolubility of cases, reducing costs and optimizing resources. However, to date there is no consensus as to the effectiveness of exercise-based interventions delivered through telerehabilitation for adults with physical disabilities. Thus, the objective of this dissertation was to investigate the effectiveness of exercise by telerehabilitation in improving pain, physical function and quality of life of adults with physical disabilities through a systematic review with meta-analysis. Initially, a structured search was performed on the following databases: AMED, MEDLINE, CINAHL, SPORTDiscus, EMBASE, PEDro, Cochrane, PsycINFO. We considered only randomized clinical trials (RCT) that evaluated telerehabilitation protocols that included aerobic physical exercises and / or kinesiotherapy. The population included adults (≥18 years) with physical disability. Comparisons were made with two groups: control without intervention and other interventions or active control. The outcomes were pain, physical function and quality of life. The processes of study selection, data extraction and analysis followed the protocol registered in PROSPERO database (CRD42019122824). GRADE determined the strength of current evidence. As a result, 13.007 records were identified by searching the databases. After the screening and eligibility evaluation processes, 54 RCT were included in the final analysis. When telerehabilitation was compared to other interventions, the results showed evidence of moderate quality evidence of small effects of telerehabilitation in reducing pain intensity at long-term (SMD: -0.2; 95% CI: -0.3 to -0.1) and high quality evidence of small effects of telerehabilitation in the improvement of the quality of life at short-term (SMD: 0.3; 95% CI: 0.1 to 0.5). Estimates also showed moderate quality of evidence for no difference between telerehabilitation and other intervention in the improvement of physical function at short-term (95% CI: -0.1 to 0.5) and long-term (95% CI: -0.1 to 0.2), and quality of life at long-term (95% CI: -0.1 to 0.4). The results showed that telerehabilitation appears to be as or more effective than other interventions for improvement pain at long-term, physical function at short- and long-term, and quality of life at short- and long-term. In addition, this strategy of offering rehabilitation seems to be promising in several clinical categories such as musculoskeletal, oncological and cardiovascular, presenting results equivalent to or better than other interventions in improving pain, physical function and quality of life. However, studies of better methodological quality comparing telerehabilitation with control group without intervention are still necessary to assert its benefit and effect.

Keywords: Systematic Review. Meta-analysis. Telerehabilitation. Disabilities. Pain. Physical function. Quality of life.

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PREFÁCIO

A presente dissertação foi desenvolvida de acordo com as resoluções estabelecidas pelo Colegiado do Programa de Pós-graduação em Ciências da Reabilitação da Escola de Educação Física, Fisioterapia e Terapia Ocupacional da Universidade Federal de Minas Gerais e redigida considerando as normas da Associação Brasileira de Normas Técnicas (ABNT). O formato adotado foi o opcional e suas seções foram denominadas como: introdução, artigo, considerações finais, referências e apêndices. O capítulo 1 contém a introdução, que aborda a contextualização do problema de pesquisa e justificativa. O capítulo 2 contém o artigo redigido em inglês, no formato do periódico *British Journal of Sports Medicine (BJSM)* ao qual será submetido para publicação, e apresenta os resultados da pesquisa realizada. No capítulo 3 encontram-se as considerações finais desta dissertação e recomendações advindas do trabalho. Ao final, estão indicadas a lista completa de referências e os apêndices. Destaca-se que o estudo aqui apresentado se enquadra na primeira fase de um projeto de pesquisa que vai desenvolver um ensaio clínico pragmático para testar a efetividade de um protocolo de exercícios por telerreabilitação e avaliar o impacto desta intervenção no custo, acesso e outros desfechos clínicos em uma amostra de idosos brasileiros, usuários do Sistema Único de Saúde (SUS).

1 INTRODUÇÃO

1.1 Panorama da saúde no mundo

Em todo o mundo mais de um bilhão de pessoas convivem com algum tipo de deficiência e cerca de 200 milhões experimentam severas incapacidades funcionais. Para a Organização Mundial de Saúde (OMS) os problemas na funcionalidade humana são categorizados em três áreas distintos e interconectados: alterações nas estruturas e funções corporais que são problemas nos sistemas fisiológicos e nas estruturas que compõem o corpo; limitações nas atividades que são as dificuldades para executar certas atividades da vida cotidiana e restrições na participação que são problemas que envolvem diferentes aspectos da vida em sociedade. Deficiência, nesta perspectiva, refere-se às dificuldades encontradas em alguma ou todas as três áreas da funcionalidade (ORGANIZAÇÃO MUNDIAL DA SAÚDE, 2011).

O aumento no número de pessoas com deficiência deve-se em parte às mudanças no perfil etário caracterizado pelo envelhecimento da população mundial. Esta transformação demográfica vem acompanhada de importantes mudanças epidemiológicas com alta prevalência de doenças crônico-degenerativas, tais como problemas cardiovasculares, câncer, distúrbios musculoesqueléticos, entre outras (BARRETO, MAYCKEL DA SILVA; CARREIRA; MARCON, 2015; GOULART, 2011). Assim, o envelhecimento e o adoecimento crônico podem vir acompanhados de deficiências, limitações na realização de tarefas e restrições na participação social, resultando em diferentes níveis de incapacidade a depender do contexto em que o indivíduo está inserido.

Este novo perfil da população mundial tem provocado uma demanda crescente por cuidados de saúde e exigem serviços mais qualificados, em especial os de reabilitação e de natureza pública (MIRANDA; MENDES; SILVA, 2016; ORGANIZAÇÃO MUNDIAL DA SAÚDE, 2011; VERAS, 2009). Dito de outra forma, os serviços e programas de saúde enfrentam desafios e devem se reestruturar para oferecer respostas às complexas necessidades que envolvem a atenção à saúde das pessoas com diferentes patologias e deficiências (MENDES *et al.*, 2012). Somado a estes fatores macroestruturais, inúmeras barreiras dificultam o acesso dos pacientes aos serviços de reabilitação, como incapacidade física para se deslocar até o local de tratamento, ausência ou indisponibilidade de acompanhantes, falta de profissionais e recursos materiais nas comunidades locais frente a grande demanda, dificuldades com transporte agravadas por longas distâncias até os centros especializados, dentre outros (ASSIS; JESUS, 2012;ORGANIZAÇÃO MUNDIAL DA SAÚDE, 2011; SOUZA *et al.*, 2016). As lacunas no acesso aos serviços de reabilitação aumentam a probabilidade de desenvolvimento de novas doenças e lesões e de graves limitações na realização de atividades; provocando a deterioração da saúde em todos os aspectos e um declínio na qualidade de vida (DARZI *et al.*, 2016).

Darzi *et al.* sugere que aumentar o acesso e otimizar o uso dos serviços de saúde já disponíveis por meio da oferta de "reabilitação baseada na comunidade" e "reabilitação em casa" sejam modalidades viáveis e aceitáveis de melhorar os resultados da reabilitação (DARZI *et al.*, 2016). Desta forma, em busca de novas possibilidades de organização e de oferta de serviços de saúde em geral e mais especificamente de reabilitação, muitos países estão empregando tecnologias de informação e telecomunicação para fornecer e apoiar cuidados de saúde à distância (SEELMAN; HARTMAN, 2009). O uso destas tecnologias recebeu diferentes nomenclaturas, sendo chamados com mais frequência por e-saúde, telessaúde ou telemedicina e, gradativamente, vem sendo ampliados e consolidados como política pública (COOPER *et al.*, 2001; RUSSELL, 2007).

1.2 Principais Tecnologias da Informação e Comunicação (TIC) e sua utilização na área da saúde no Brasil:

Nas últimas décadas houve um notável crescimento na difusão de tecnologias de informação e comunicação (TIC) em todo o mundo. A integração das TIC na vida cotidiana foi impulsionada pelos avanços tecnológicos, investimentos econômicos e mudanças socioculturais (KIM, 2010). As TIC também podem ser utilizadas como potencial ferramenta para políticas na área da saúde, colaborando para o uso racional dos recursos e para a redução dos custos (PINOCHET, 2017). Durante a 58ª Assembleia Mundial da Saúde de 2005, e-

Saúde foi definida na resolução WHA58.28 como: *"o uso seguro e custo-efetivo das TIC em apoio a saúde e áreas relacionadas, incluindo serviços de saúde, vigilância sanitária, literatura e educação sobre saúde, conhecimento e pesquisa em saúde "* (WORLD HEALTH ORGANIZATION, 2005).

O uso das TIC possui um importante papel na promoção da cobertura universal de saúde, podendo ocorrer de diferentes formas, como por exemplo, através da Telessaúde e do *m-Health* (*mobile-Health*) (WORLD HEALTH ORGANIZATION, 2016b). A telessaúde se dá pelo contato entre o profissional de saúde e o paciente, quando os dois estão separados por distância. Esse contato pode ocorrer de maneira síncrona, ou seja, em tempo real, por meio de chamadas telefônicas ou vídeochamadas; ou de maneira assíncrona na qual a informação é armazenada e encaminhada por mensagens instantâneas (SMS) e e-mails (WORLD HEALTH ORGANIZATION, 2016b). O *m-Health* é definido como o uso de dispositivos móveis, como telefones celulares, nas práticas de saúde. Esta modalidade tem aumentado seu potencial devido ao crescimento exponencial mundial do uso de dispositivos móveis (WORLD HEALTH ORGANIZATION, 2016b). Em 2018, mais de cinco bilhões de habitantes do mundo possuíam um telefone celular e 4.021 bilhões de pessoas utilizavam a Internet(KEMP, 2018). No Brasil, até o ano de 2017, 93,2% dos brasileiros possuía um aparelho celular e 74,9% da população utilizava à internet (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2018). Desta forma, tanto a telessaúde quanto o *m-Health* tem potencial para impactar nos serviços tradicionais de saúde, aumentando a acessibilidade aos cuidados, melhorando a qualidade do atendimento e reduzindo os custos (WORLD HEALTH ORGANIZATION, 2016b).

Outras formas de uso das TIC na saúde são por *e-Learning,* Registros Eletrônicos de Saúde, Mídias Sociais e *Big Data.* Na Ciência da Saúde, o *e-Learning* é o uso das TIC para o desenvolvimento e promoção da educação, tornando-a mais acessível (WORLD HEALTH ORGANIZATION, 2016a). O *e-Learning* possibilita a formação e capacitação dos profissionais de saúde de maneira flexível, eficiente e na maioria das vezes sem a necessidade de sair do local de trabalho (WORLD HEALTH ORGANIZATION, 2016b). Os Registros Eletrônicos de Saúde têm importante papel na prestação dos cuidados de saúde. Possibilitam armazenamento e acesso por parte de todos profissionais às informações de saúde do paciente, promovendo maior qualidade do atendimento, aumentando a confiabilidade das informações e reduzindo custos (WORLD HEALTH ORGANIZATION, 2016b). As Mídias Sociais também podem impactar na cobertura universal de saúde, ao aumentar o envolvimento dos pacientes com a sua própria saúde, aumenta a disseminação de conhecimento através de mensagens e campanhas de saúde, compartilhamento de experiências e pontos de vista de especialistas em blogs e reportagens (WORLD HEALTH ORGANIZATION, 2016b). Por fim, o *Big Data* utiliza de análises preditivas para fornecer novos dados sobre populações e indivíduos, dando suporte aos serviços de saúde para todos (WORLD HEALTH ORGANIZATION, 2016b).

No Brasil, o Ministério da Saúde vem criando estratégias a fim de ampliar, diversificar e melhorar a qualidade dos serviços, para fornecer suporte adequado aos pacientes e as famílias. Em 2007 o governo brasileiro criou o Programa Nacional Telessaúde Brasil Redes, por meio da Portaria do Ministério da Saúde nº 35 de janeiro de 2007. O objetivo deste arcabouço legal foi fortalecer as ofertas de Educação Permanente em Saúde para os profissionais e trabalhadores do SUS por meio das tecnologias de comunicação e informação. As ações do programa são coordenadas pela Secretaria de Gestão do Trabalho e da Educação na Saúde (SGTES) e Secretaria de Atenção à Saúde (SAS), articulando-se com outros Ministérios, Universidades Públicas, Escolas Técnicas de Saúde e entidades das áreas de Saúde e Educação (BRASIL, 2007).

Na Atenção Básica, o programa de telessaúde é parte do Programa de Requalificação das Unidades Básicas de Saúde (UBS) para aumentar a resolutividade e promover a integração com as Redes de Atenção à Saúde. Dessa forma, o programa tem como perspectiva a melhoria da qualidade do atendimento, a ampliação das ações ofertadas pelas equipes, aumentando a capacidade clínica a partir do desenvolvimento de ações de apoio à atenção à saúde e de educação permanente (BRASIL, 2011).

As iniciativas do programa estão voltadas para a redução de custos com deslocamentos de pacientes, uma maior resolubilidade da Atenção Básica e o aumento da oferta das especialidades, através dos serviços de teleconsultoria (esclarecimento de dúvidas sobre procedimentos, ações de saúde e questões relativas a processo de trabalho, sendo realizada entre profissionais de saúde), segunda opinião formativa (resposta sistematizada, construída com base em revisão bibliográfica, evidências científicas e clínicas), tele-educação (atividades educacionais à distância para apoiar e qualificar estudantes, profissionais e trabalhadores da saúde), telediagnóstico (realização de exames com emissão de laudos à distância) (BRASIL, 2007; BRASIL, 2011). Estas iniciativas tem contribuído para a melhora da qualidade do atendimento na Atenção Básica, resolubilidade dos casos, redução de custos, otimização de recursos e diminuição d necessidade de referência dos usuários a outros serviços (HADDAD, 2012).

No Brasil, as iniciativas para o uso das TIC no campo da reabilitação ainda são incipientes, não existindo nenhum projeto específico ou legislação que regulamente e estimule sua aplicação na prática. A literatura científica nacional também é escassa em relação ao tema. Foram encontrados apenas três artigos publicados na área da reabilitação relacionados às TIC, sendo duas revisões narrativas publicadas em periódicos nacionais (MARQUES *et al.*, 2014; MORETTI, 2017) e um único estudo transversal foi desenvolvido com o objetivo de conhecer os padrões de uso e a percepção sobre internet por pessoas com lesão medular. Os resultados indicaram que a internet pode ser uma alternativa que favorece a reabilitação (CAUCHIOLI RODRIGUES; DE ARAUJO, 2012). Desta forma, é possível afirmar que há uma carência de ações concretas e de pesquisas nacionais na área da reabilitação associadas ao uso das TIC.

1.3 TELERREABILITAÇÃO

Telerreabilitação pode ser definida como o uso de um conjunto recursos e tecnologias de informação e comunicação que possibilitam o processo de reabilitação à distância com o objetivo de melhorar os serviços, aumentar a capacidade e a acessibilidade aos tratamentos de reabilitação (COOPER *et al.*, 2001). Desenvolvida para permitir acesso equitativo a indivíduos que estão impedidos de chegar aos serviços de saúde, seja por questões geográficas, físicas ou econômicas, a telerreabilitação tem potencial de melhorar a qualidade do atendimento, aumentar o acesso aos serviços e apoiar os cuidados a saúde. Neste contexto, observa-se, nos últimos anos, um crescimento acentuado em todo o mundo de estudos relacionados à reabilitação associada ao desenvolvimento tecnológico (MARQUES *et al.*, 2014).

Acredita-se que a telerreabilitação terá um papel importante na melhoria e na manutenção dos cuidados de reabilitação à medida que possibilita a reorganização dos serviços, sendo capaz de aumentar a eficiência dos programas enquanto contém custos (THEODOROS D, 2008). Por meio da oferta de uma ampla gama de serviços, a telerreabilitação busca atender a demanda de diversas áreas da reabilitação, bem como oferecer assistência a pacientes com diferentes condições de saúde, como reabilitação cardiopulmonar, neurocognitiva, para condições musculoesqueléticas, assim como terapia fonoaudiológica e ainda, fisioterapia e terapia ocupacional em geral (BLOCK *et al.*, 2016; ZAMPOLINI *et al.*, 2008).

A literatura científica internacional sobre telerreabilitação disponibiliza evidências sobre os seus benefícios para algumas áreas específicas, como neurologia, cardiologia, ortopedia e disfunções pulmonares. Na neurologia, estudos com pessoas que sofreram Acidente Vascular Encefálico (AVE) mostraram que a telerreabilitação pode ser tão eficaz quanto a reabilitação convencional na recuperação funcional (CHEN *et al.*, 2017) e reaquisição das habilidades locomotoras associadas ao equilíbrio, com redução de gastos (LLORÉNS *et al.*, 2015). Em indivíduos com condições cardíacas houve boas indicações de sucesso da telerreabilitação, com resultados semelhantes à reabilitação tradicional e sem efeitos adversos relatados (CHAN *et al.*, 2016; HWANG *et al.*, 2017). Na área ortopédica, a telerreabilitação também parece ser eficaz e comparável aos métodos tradicionais na melhora da função física e dor em diversas condições musculoesqueléticas (COTTRELL *et al.*, 2017). Em pacientes com disfunções pulmonares, como Doença Pulmonar Obstrutiva Crônica (DPOC), a telerreabilitação também teve resultados favoráveis quando comparada com os cuidados habituais, na melhora da capacidade de realização de exercícios resistidos e na autoeficácia (TSAI *et al.*, 2017). Portanto, a eficácia da telerreabilitação vem sendo comprovada, juntamente com outros benefícios dessa modalidade que ultrapassam os efeitos físicos, como a redução de custos e a ampliação do acesso aos tratamentos de reabilitação para um maior número de pessoas.

1.4 JUSTIFICATIVA

Nas últimas décadas, o Brasil vem passando por importantes mudanças demográficas e de saúde acompanhadas de uma grave crise econômica que têm impactado a rede pública e privada de saúde, exigindo novas estratégias e arranjos para o enfrentamento das altas cargas de doenças não transmissíveis somadas às doenças transmissíveis ainda persistentes. Para garantir um sistema de saúde alinhado com as necessidades atuais da população faz-se necessário implementar políticas que garantam um acesso qualificado aos cuidados de saúde. Esta situação tem provocado uma demanda crescente e de maior complexidade para os serviços de reabilitação, mais especificamente para a fisioterapia, o que exige o uso de abordagens inovadoras que ampliem a oferta de tratamento neste campo. Devido ao desenvolvimento tecnológico e a ampliação do acesso à internet de parte importante e crescente da população brasileira, as TIC são ferramentas que podem aumentar a eficiência dos programas de reabilitação. Além disso, nas últimas duas décadas, houve um aumento relevante de estudos relacionados ao uso de tecnologias no campo da reabilitação. Evidências quanto aos benefícios desta modalidade de oferta de tratamento já estão sendo divulgados para algumas áreas específicas e apontam para o potencial da telerreabilitação ser amplamente utilizada em todo mundo, principalmente em países de baixa e médica renda e grande dimensão territorial, como é o caso do Brasil.

Tendo em conta esta realidade, assim como em vários outros países, o governo brasileiro tem ampliado suas ações através de políticas relacionadas ao uso de TIC como a telessaúde. No entanto, as iniciativas em pesquisas científicas e programas governamentais em telerreabilitação ainda são incipientes. Dessa forma, o presente estudo foi delineado com base no potencial da telerreabilitação e nos conhecidos benefícios do exercício físico como parte integrante do processo de reabilitação de pacientes com diferentes condições de saúde, especialmente condições crônicas, e nas possíveis reduções de custos e ampliação do acesso que essas intervenções podem proporcionar. Realizar uma revisão sistemática com metanálise, verificando a eficácia da telerreabilitação em desfechos globais e relevante como dor, função física e qualidade de vida, poderá contribuir para a consolidação desta intervenção como alternativa às intervenções tradicionais. Além disso, os resultados desta revisão poderão contribuir para desenvolvimento de um protocolo para ser aplicado e testado no Sistema em usuários do SUS, e no planejamento de outros programas e serviços de reabilitação à distância, voltados para pessoas com deficiência física.

1.5 OBJETIVO

Investigar, por meio de revisão sistemática com metanálise, se as intervenções baseada em exercícios fornecidos por telerreabilitação são eficazes na melhora da dor, função física e qualidade de vida de adultos com deficiência física.

2 ARTIGO

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

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ABSTRACT

Objective: Investigate whether exercise-based intervention by telerehabilitation is effective in improving pain, physical function and quality of life of adults with physical disabilities.

Design: Systematic review of Randomised Clinical Trials (RCT).

Data sources: Searches were performed in MEDLINE, CINAHL, SPORTDiscus, EMBASE, PEDro, Cochrane, PsycINFO.

Eligibility criteria: RCTs were considered if they evaluated telerehabilitation, including physical exercises offered at a distance. The population included adults (≥18 years) with physical disability. Comparisons were control and other intervention. The outcomes were pain, physical function and quality of life. The processes of study selection, data extraction and analysis followed the protocol registered in PROSPERO (CRD42019122824). GRADE determined the strength of evidence.

Results: 54 RCTs were included in the final analysis. When compared with other intervention, the results showed evidence of moderate quality of evidence with small effects of telerehabilitation in reducing pain intensity at long-term (SMD: -0.2; 95% CI: -0.3 to -0.1) and high quality of evidence with small effects of telerehabilitation in the improvement of the quality of life at short-term (SMD: 0.3; 95% CI: 0.1 to 0.5). Estimates also showed moderate quality of evidence for no difference between telerehabilitation and other intervention in the improvement of physical function at short-term (95% CI: -0.1 to 0.5) and long-term (95% CI: -0.1 to 0.2), as well as of quality of life at long-term (95% CI: -0.1 to 0.4).

Conclusions: Telerehabilitation is promising in improving pain, physical function and quality of life of adults with physical disabilities, with clinical results similar to other intervention. However, more robust evidence is needed to support decisions related to public policies.

Keywords: Telerehabilitation, Disabilities, Pain, Physical function, Quality of life.

INTRODUCTION

According to the World Report on Disability (WHO 2011), over one billion people are disabled worldwide, and almost 200 million experience considerable functional limitations.[1] Disabled people's chronic-degenerative conditions related to aging of the population may be a potential explanation for these high estimates.[2] In the context of the epidemiological changes, health care services face challenges to address the needs of people with physical disabilities.[3] Some challenges are: patients' physical incapacity to move to treatment centers; absence of caregivers; scarce numbers of health professionals and resources in local communities; limited transportation; among others.[1,4,5] Limited access to services may lead to deterioration of health and quality of life.[6]

Attempting to solve these challenges, many countries are employing telecommunication technologies in their provision of health care services.[7] Telerehabilitation is advocated to improve the quality of services by monitoring patients in their own place, mainly in communities far from urban centers. It is also expected to improve cost-effectiveness of interventions.[8–10] Previous systematic reviews have evaluated the feasibility, efficacy and cost of telerehabilitation for people with different health conditions, and their findings supported it as an effective alternative to supervised/face-to-face interventions.[11–14]

Different approaches were previously delivered by telerehabilitation, including exercise. Exercise is a cost-effective[15,16] intervention recommended for people with physical disabilities due to musculoskeletal conditions, coronary heart disease, some types of cancer, type 2 diabetes, hypertension, among others.[17] If provided by telerehabilitation, it may improve health care services for this population.[18] Considering recent interest on telerehabilitation[19–22] and its increasing application in clinical practice,[18] effectiveness of exercise by telerehabilitation needs to be properly evaluated to justify its recommendation to help improve public policies, mainly in low-income countries.

Conclusions from previous systematic reviews that investigated effectiveness of exercise by telerehabilitation in people with physical disabilities were limited by methodological confounders such as inclusion of poor quality studies (i.e. no randomised controlled trials),[18,23] absence of investigation of effect sizes and the strength of the recommendation.[18] The aim of this systematic review of randomized controlled trials was to investigate short- 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 intervention. Effect sizes and the strength of the current recommendation were also verified.

METHODS

Search strategy and inclusion criteria

The present systematic review followed PRISMA[24] and Cochrane recommendations.[25] Its protocol was prospectively registered at PROSPERO (CRD42019122824). Search strategies were conducted in May 2018 and updated in February 2019 on AMED, MEDLINE, CINAHL, SPORTDiscus, EMBASE, PEDro, Cochrane and PsycINFO. There was no date or language restriction. Descriptors were related to "randomised controlled trial" and "telerehabilitation". Appendix 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 manual searched identified systematic reviews in the area and in specific journals of telemedicine (e.g. 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. 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 (i.e. aerobic exercises and /or kinesiotherapy) provided by telecommunication technologies such as phone calls, videoconferences and/or software applications.[8] 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 (i.e. no intervention, waiting list, placebo or sham) and other intervention (i.e. any other active intervention such as traditional rehabilitation at home or in health care facilities). Our outcomes of interest were pain, physical function and quality of life. Trials were included if they reported any valid measures our outcomes of interest such as: Visual Analogue Scale / VAS for pain;[26] 6 Minute Walk Test / 6MWT for physical function;[27] and Short Form Health Survey-36 / SF-36 for quality of life.[28] When more them 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.[21,22,37–46,29,47–56,30,57–66,31,67–75,32–36]

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 potential full-texts were assessed by two independent reviewers (JFD and FCMSD) using our eligibility criteria outlined above. Trials fulfilling our eligibility criteria were included in the review. Discrepancies were resolved by a third reviewer (RFS).

Assessment of the methodological quality

Two independent reviewers (JFD and PRTB) assessed methodological quality of included trials using the 0-10 PEDro scale (http://www.pedro.org.au/). A third reviewer (RFS) resolved discrepancies. When available, we used the scores from the PEDro database.[76]

Data extraction

The two independent reviewers (JFD and PRTB) extracted descriptive and outcome data from included trials, and discrepancies were resolved by the third reviewer (RFS). Descriptive information included: source of participants; health condition; age; sex; type and dosage for telerehabilitation and comparators; outcomes; and timepoints. Extracted outcome data included means, standard deviations (SDs) and sample sizes of all groups to investigate short- and long-term effects. Short-term effect was considered follow-up up to three months after baseline, and long-term effect was considered follow-up over three months after baseline. When more than one timepoint 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 (i.e. physical activity and physical activity plus cognitive behavioral therapy[43]) or more than one comparator (i.e. traditional rehabilitation and usual care,[41] unsupervised home-based exercise and in-person physiotherapy[50]), groups were combined as recommended by Cochrane.[77] Some included trials did not provide SDs and data were imputed from: standard errors;[23,44] confidence intervals;[27,29,43,54,64,65] p-values;[24,37,61] medians and interquartile ranges;[35,41,53, 56,60] and other trials included in the review that used the same instrument,[37] following the Cochrane recommendations.[77]

Study analysis

Meta-analysis was conducted using random-effects model. For the outcomes of interest, standardized mean differences (SMDs) and 95% confidence intervals (CIs) were presented, at first, for overall analysis of 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 analysis as people with different health conditions may experience similar difficulties across functional levels.[78] After the overall analysis, subgroup analyses were also presented for each specific clinical category. Trials were categorized following the International Classification of Diseases and Related Health Problems (ICD10) and grouped into ten clinical categories (oncology, neurology, cardiovascular, pulmonary, urology, musculoskeletal, postoperative orthopaedic conditions, rheumatologic, endocrine and multiple conditions).[79] Estimated effect sizes were assessed using Cohen's benchmarks: $d \geq 0.2$ for small; $d \geq 0.5$ for medium; and ≥ 0.8 for large effects.[80]

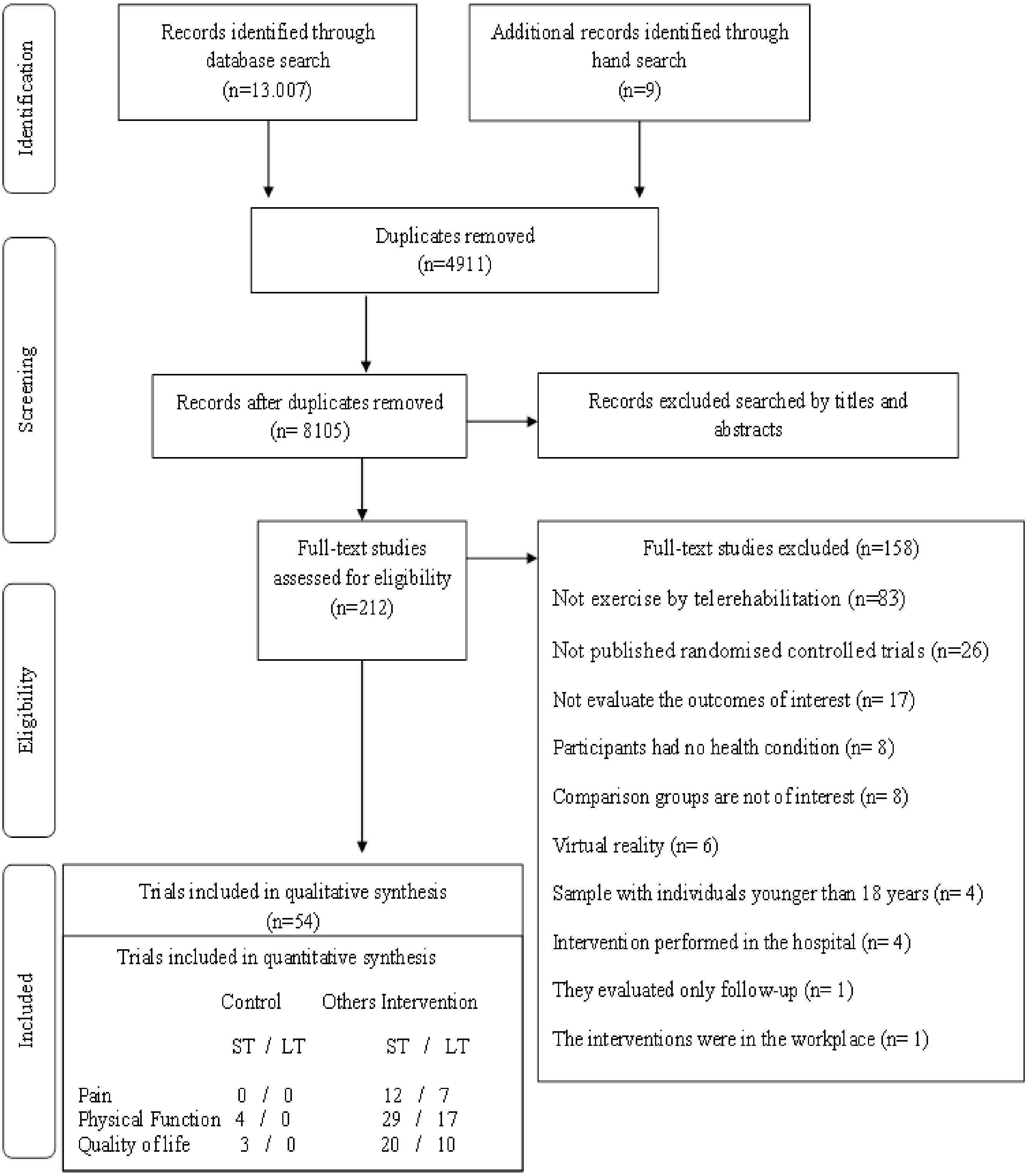
The two independent reviewers (JFD and PRTB) assessed the strength of the recommendation using the GRADE system.[81] According to the four-level GRADE system, recommendation may range from high to very-low quality. Low levels indicate uncertainty of the estimated effects. In the current review, high-quality evidence was downgraded in one point for each of the following issues: imprecision when analysed sample <400;[82] risk of bias when >25% of the participants were from trials with a high risk of bias (i.e. PEDro score <6 out of 10);[83] and inconsistency when I^2 statistics >50% or when pooling was not possible.[84] Between-reviewer discrepancies were resolved by a third reviewer (RFS).

Sensitivity analyses investigated whether poor methodological quality impacted on the estimated effects. All analyses were conducted using Comprehensive Meta-analysis software, version 2.2.04 (Biostat, Englewood, NJ).

RESULTS

Study selection

We identified 8105 references and 54 original trials were included in the review. The main reasons for exclusion of potential full-texts were: target intervention was not exercise by telerehabilitation (n=83); outcomes were others than those defined as of interest (n=17); and not published randomised controlled trials (n=26). The flow diagram illustrating trials selection is presented in Figure 1.



ST = Short-term; LT= Long-term

Figure 1: Flow of studies through the review (n = 54 original trials)

Study characteristics

Characteristics of included trials and outcome data are presented in Appendix 2. All 54 included trials were published between 2002 and 2019. They were conducted in Europe (n= 18, 33.3%), North America (n= 16, 29.6%), Oceania (n= 9, 16.7%), Asia (n= 8, 14.8%), Africa (n=2, 3.7%) and South America (n= 1, 1.9%). Twelve trials were conducted in USA and nine in Australia. In 74% of the trials (n=40), a single technological resource was used as telerehabilitation (e.g. video and telephone). The others combined more than one technology (e.g. video and telephone, n=4, 0.7%; video, telephone and audio, n=2, 0.4%; internet-based and telephone, n=2, 0.4%).

All telerehabilitation exercise programs 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 minutes. Programs included strength and stretching exercises combined or not with aerobic exercise. Initial evaluation of participants was conducted in all trials. After the initial evaluation, five trials[40,48,56,60,75] had initial in person contact with participants to establish goals, performed the supervised exercise program and verified the correct use of telerehabilitation devices. Seven trials[31,32,38,46,47,54,67] adopted face-to-face meetings with the telerehabilitation group during the intervention period to conduct sessions supervised by physiotherapist and verified the absence of complications.

Seven trials with 898 participants compared telerehabilitation with control (i.e. no intervention, waiting list, placebo or sham),[29,35,36,39,55–57] and 47 trials including 4920 participants compared telerehabilitation with other intervention (i.e. traditional rehabilitation-at home or in health care settings, gym-base exercises, written programs; usual caremedications and oxygen prescription, follow up medical and other professional, encouragement to improve physical activity).[21,22,30–34,37,38,40–54,58–75,85–89] Thirty-six trials reported short-term effects (i.e. ≤3 months after baseline) and 18 reported long-term effects (i.e. > 3 months after baseline). Pain, physical function and quality of life were investigated in 22, 50 and 34 trials, respectively.

Methodological quality of included trials

Methodological quality of the included trials ranged from four to eight points on the 0-10 PEDro scale (Table 2). All trials reported random allocation, between-group differences, point measures and measures of variability. Thirty-five (64.8%) out of the 54 included trials scored above six points on the PEDro scale. The main reasons for downgrading the methodological quality were lack of therapist blinding (n=54, 100%), lack of participant blinding (n=54, 100%), lack of concealed allocation (n= 28, 50%), and absence of intention-to-treat analysis (n=27, 50%).

Study	2	3	4	5	6	7	8	9	10	11	Total (0 to 10)
Alibhai, S. M. H., et al. (2014)	Y	Y	N	N	N	Y	Y	Y	Y	Y	7
Allen, K. D., et al. (2010)	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Allen, K. D., et al. (2016)	Y	N	Y	N	N	Y	N	Y	Y	Y	6
Bennell, K. L., et al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Bernocchi, P., et al. (2017)	Y	N	Y	N	N	N	N	N	Y	Y	4
Bini, S. A. and J. Mahajan (2017)	Y	Y	Y	N	N	N	Y	N	Y	Y	6
Bourne, S., et al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Brooks, D., et al. (2002)	Y	N	Y	N	N	Y	N	N	Y	Y	5
Buhrman, M., et al. (2004)	Y	N	Y	N	N	N	Y	N	Y	Y	5
Calner, T., et al. (2017)	Y	Y	N	N	N	N	N	N	Y	Y	4
Carrion Perez, F., et al. (2015)	Y	N	Y	N	N	N	N	N	Y	Y	4
Chen, M., et al. (2016)	Y	Y	Y	N	N	Y	Y	N	Y	Y	7
Chien, C. L., et al. (2011)	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Chumbler, N., et al. (2012)	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Conroy, S. S., et al. (2018)	Y	N	Y	N	N	Y	N	N	Y	Y	5
Cuperus, N., et al. (2015)	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Damush, T. M., et al. (2003)	Y	Y	Y	N	N	Y	N	Y	Y	Y	7
Demeyer, H., et al. (2017)	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Frederix, I., et al. (2015)	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Galiano-Castillo, N., et al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Galiano-Castillo, N., et al. (2016)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Goode, A. P., et al. (2018)	Y	N	N	N	N	Y	N	N	Y	Y	4
Hayes, S. C., et al. (2013)	Y	N	Y	N	N	Y	Y	Y	Y	Y	7
Holland, A. E., et al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Hong, J., et al. (2017)	Y	N	Y	N	N	N	N	N	Y	Y	4
Hornikx, M., et al. (2015)	Y	N	Y	N	N	N	Y	N	Y	Y	5
Hwang, R., et al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8

Iles, R., et al. (2011)	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Jackson, J. C., et al. (2012)	Y	Y	Y	N	N	Y	Y	N	Y	Y	7
Jansons, P., et al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Chen J et. al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Kraal, J. J., et al. (2014)	Y	N	N	N	N	N	Y	N	Y	Y	4
Ligibel, J. A., et al. (2012)	Y	N	Y	N	N	N	N	N	Y	Y	4
Moffet, H., et al. (2015)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Morey, M. C., et al. (2012)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Morey, M. C., et al. (2009)	Y	N	Y	N	N	Y	Y	N	Y	Y	6
O'Brien, J., et al. (2017)	Y	N	N	N	N	N	Y	Y	Y	Y	5
Odole, A. C. and O. D. Ojo (2013)	Y	N	Y	N	N	N	Y	N	Y	Y	5
Pastora-Bernal JM. , et al. (2018)	Y	N	Y	N	N	Y	Y	N	Y	Y	6
Paul, L., et al. (2014)	Y	N	Y	N	N	N	Y	N	Y	Y	5
Piga, M., et al. (2014)	Y	N	N	N	N	N	Y	N	Y	Y	4
Piotrowicz, E., et al. (2015)	Y	N	Y	N	N	N	Y	N	Y	Y	5
Piqueras, M., et al. (2013)	Y	N	Y	N	N	Y	N	N	Y	Y	5
Salvetti, X. M., et al. (2008)	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, A. V., et al. (2003)	Y	N	Y	N	N	Y	Y	N	Y	Y	6
Tsai, L. L., et al. (2017)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Varnfield, M., et al. (2014)	Y	Y	Y	N	N	N	N	Y	Y	Y	6
Azma, K., et al. (2018)	Y	N	Y	N	N	N	N	Y	Y	Y	5
Chhabra, H. S., et al. (2018)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Ellis, T. D., et al. (2019)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Fjeldstad-Pardo, C., et al. (2018)	Y	N	Y	N	N	Y	Y	N	Y	Y	6

Kalron, A., et al. (2018)	Y	Y	Y	N	N	Y	N	N	Y	Y	6
Peng, X., et al. (2018)	Y	Y	Y	N	N	Y	N	N	Y	Y	6

Table 2. Methodological quality of the included studies using the 0-10 PEDro scale

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

We presented our findings by outcome of interest. At first, overall effect analyses of telerehabilitation in people with physical disabilities (all health conditions were combined) were described (Figure 2); then, effects by subgroups of health conditions categorized according to the CDI were estimated (Figure 3). In the overall effect analysis, evidence was lowered due to imprecision (grouping <300 participants), risk of bias (PEDro score <5) and / or inconsistency (i²> 50%).

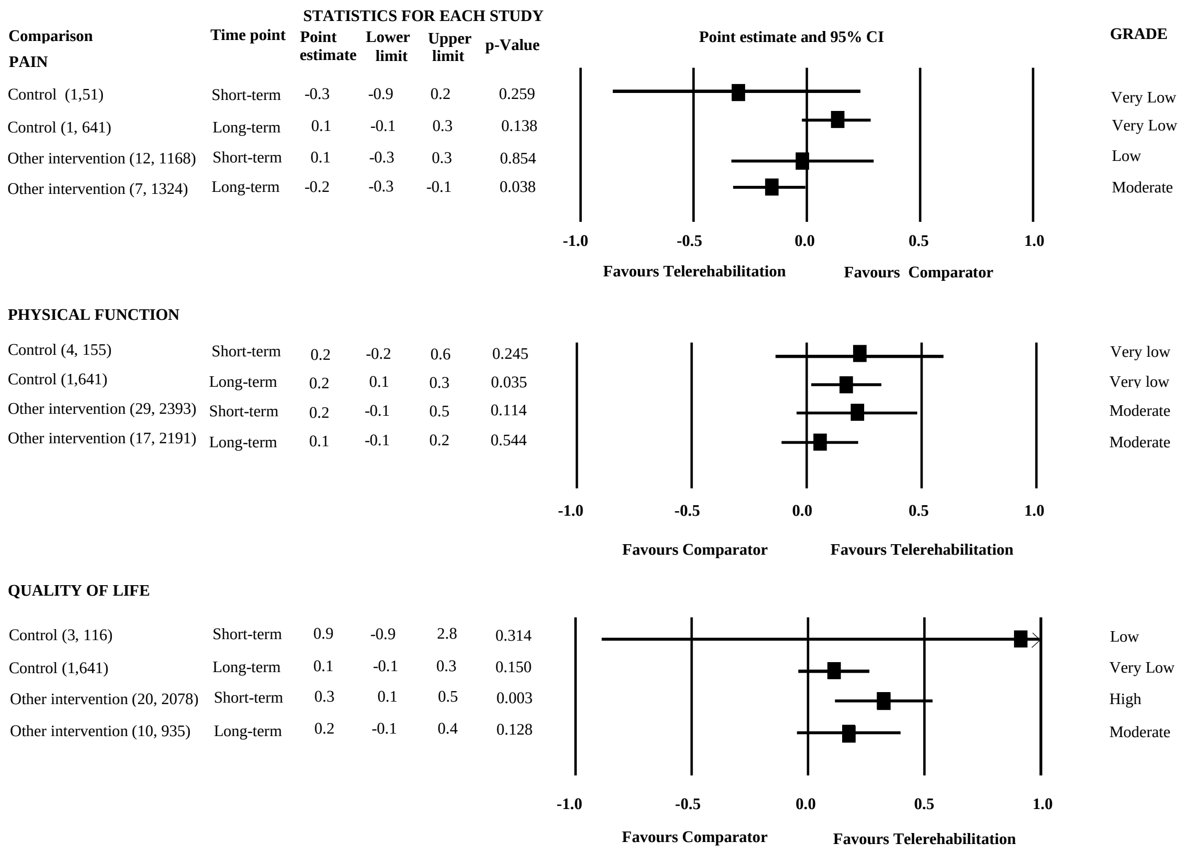


Figure 2. Overall effects of telerehabilitation on pain, physical function and quality of life. In parentheses: number of trials; total number of participants.

Pain Other intervention Short-term: (I^2 = 56.4%; Z = -0.2; random-effects). Pain Other intervention Long-term: (I^2 = 0.9%; Z = -2.1; random-effects). Function Control Short-term: (I^2 = 0.0%; Z = 1.2; random-effects). Physical function Other intervention Short-term: (I^2 = 26.3%; Z = 1.6; random-effects). Physical function Other intervention Long-term: (I^2 = 31.6%; Z = 0.6; random-effects). Quality of life Control Short-term: (I^2 = 27.7%; Z = 1.0; random-effects). Quality of life Other intervention Short-term: (I^2 = 0.3%; Z = 2.9; random-effects). Quality of life Other intervention Long-term: (I^2 = 14.0%; Z = 1.5; random-effects).
Pain Control Short-term, Pain Control Long-term, Physical function Control Long-term and Quality of life Control Long-term: Individuals trials

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

Pain

In the overall effect analysis for pain, moderate-quality evidence showed a small effect of telerehabilitation on pain when compared with other intervention at long-term (SMD: -0.2; 95% CI: -0.3 to -0.1; p = 0.038; 7 trials;[24-28,43,45] n = 1324 participants). The strength of recommendation was low and very low when telerehabilitation was compared with control at all timepoints and with other intervention at short-term (Figure 2).

Physical function

Overall effect analysis showed moderate-quality evidence of no difference between telerehabilitation and other intervention on physical function at short- and long-term. SMD of 0.2 (95% CI: -0.1 to 0.5; p = 0.114; 29 trials;[21,22,37,38,40–48,50,58–62,65,66,71–75,85,86,90] n = 2393) and SMD of 0.1 (95% CI: -0.1 to 0.2; p = 0.544; 17 trials;[30–34,49,52–54,67–70,87–89] n = 2191) for short- and long-term, respectively. The strength of recommendation was very low when telerehabilitation was compared with control at any timepoint (Figure 2).

Quality of life

Overall effect analysis showed high-quality evidence of a small effect of telerehabilitation at short-term (SMD: 0.3; 95% CI: 0.1 to 0.5; $p = 0.003$; 20 trials;[22,37,40,41,43,45,48,50,58–60,62,63,65,66,71,73–75,90] n = 2078) and moderate-quality evidence of no difference at long-term when compared with other intervention (SMD: 0.2; 95% CI: -0.1 to 0.4; $p = 0.128$; 10 trials;[31,33,34,51,53,54,67–70] n = 935). The strength of recommendation was low and very low when telerehabilitation was compared with control at any timepoint (Figure 2).

PAIN

Clinical Categories	Comparison	Time point	Point estimate	Lower limit	Upper limit	p-Value	GRADE
Musculoskeletal (1,51)	Control	Short-term	-0.3	-0.9	0.2	0.259	Very Low
Oncology (1,641)	Control	Long-term	0.1	-0.1	0.3	0.138	Very Low
Musculoskeletal (4,344,0.0)	Other intervention	Short-term	0.2	-0.1	0.4	0.106	Low
Postoperative Orthopaedic Conditions (4,545,58.2)	Other intervention	Short-term	-0.4	-0.7	0.1	0.054	Low
Cardiovascular (2,170,0.0)	Other intervention	Short-term	1.3	-0.7	3.4	0.209	Low
Oncology (1,76)	Other intervention	Short-term	-0.7	-1.2	-0.3	0.002	Very Low
Rheumatologic (1,33)	Other intervention	Short-term	-0.7	-1.4	0.1	0.055	Very Low
Musculoskeletal (5,1031,12.2)	Other intervention	Long-term	-0.2	-0.4	-0.1	0.039	High
Oncology (2,293,0.0)	Other intervention	Long-term	-0.1	-0.3	0.2	0.756	Low

PHYSICAL FUNCTION

Clinical Categories	Comparison	Time point	Point estimate	Lower limit	Upper limit	p-Value	GRADE
Oncology (1,38)	Control	Short-term	-0.2	-0.8	0.5	0.618	Very Low
Cardiovascular (1,44)	Control	Short-term	0.1	-0.5	0.6	0.913	Very Low
Musculoskeletal (2,73,0.0)	Control	Short-term	0.6	0.1	1.0	0.022	Very Low
Oncology (1,641)	Control	Long-term	0.2	0.1	0.3	0.035	Very Low
Pulmonary (5,619, 0.0)	Other intervention	Short-term	0.1	-0.1	0.3	0.183	High
Neurology (3,124,0.0)	Other intervention	Short-term	0.2	-0.2	0.5	0.299	Moderate
Oncology (2,152,0.0)	Other intervention	Short-term	0.8	0.3	1.2	0.001	Moderate
Postoperative Orthopaedic Conditions (5,577,65.7)	Other intervention	Short-term	0.2	-0.9	1.3	0.681	Moderate
Musculoskeletal (5,370,33.5)	Other intervention	Short-term	-0.1	-0.5	0.3	0.658	Low
Cardiovascular (7,503,9.5)	Other intervention	Short-term	0.2	-0.3	0.7	0.407	Low
Multiple conditions (1,15)	Other intervention	Short-term	0.2	-0.7	1.2	0.660	Very Low
Rheumatologic (1,33)	Other intervention	Short-term	-0.4	-1.0	0.3	0.296	Very Low
Musculoskeletal (5,1031,0.0)	Other intervention	Long-term	0.1	-0.2	0.3	0.598	High
Cardiovascular (2,223,0.0)	Other intervention	Long-term	0.4	0.1	0.7	0.003	Moderate
Multiple conditions (2,177,0.0)	Other intervention	Long-term	0.2	-0.6	1.1	0.622	Moderate
Oncology (2,293,0.0)	Other intervention	Long-term	0.3	-0.2	0.8	0.251	Low
Endocrine (1,302)	Other intervention	Long-term	0.1	-0.2	0.2	0.942	Low
Postoperative Orthopaedic Conditions (1,29)	Other intervention	Long-term	-0.1	-0.7	0.7	0.953	Very Low
Pulmonary (1,39)	Other intervention	Long-term	-1.0	-1.7	-0.3	0.002	Very Low
Neurology (3,97,0.0)	Other intervention	Long-term	-0.4	-0.8	0.1	0.053	Very Low

QUALITY OF LIFE

Clinical Categories	Comparison	Time point	Point estimate	Lower limit	Upper limit	p-Value	GRADE
Oncology (1,38)	Control	Short-term	-0.7	-1.3	-0.1	0.042	Very low
Cardiovascular (1,44)	Control	Short-term	0.5	-0.1	1.1	0.080	Very low
Urology (1,34)	Control	Short-term	3.1	2.1	4.0	0.000	Very low
Oncology (1,641)	Control	Long-term	0.1	-0.1	0.3	0.150	Very low
Pulmonary (5,619, 0.0)	Other intervention	Short-term	0.1	-0.1	0.2	0.396	High
Cardiovascular (7,503,6.9)	Other intervention	Short-term	0.5	0.1	0.9	0.012	Moderate
Postoperative Orthopaedic Conditions (2,385,0.0)	Other intervention	Short-term	0.1	-0.1	0.2	0.396	Moderate
Musculoskeletal (2,201,0.0)	Other intervention	Short-term	-0.0	-0.3	0.3	0.953	Low
Neurology (1,242)	Other intervention	Short-term	0.1	-0.2	0.3	0.583	Low
Urology (1,19)	Other intervention	Short-term	-0.3	-1.2	0.6	0.514	Very low
Rheumatologic (1,33)	Other intervention	Short-term	-0.2	-0.8	0.5	0.624	Very low
Oncology (1,76)	Other intervention	Short-term	0.8	0.4	1.3	0.000	Low
Musculoskeletal (2,225,0.0)	Other intervention	Long-term	-0.1	-0.4	0.2	0.493	Low
Cardiovascular (1,140)	Other intervention	Long-term	0.4	0.1	0.7	0.017	Low
Oncology (2,293,0.0)	Other intervention	Long-term	0.1	-0.3	0.5	0.661	Low
Multiple conditions (2,177,0.0)	Other intervention	Long-term	0.5	0.1	0.9	0.047	Very low
Pulmonary (1,27)	Other intervention	Long-term	1.1	0.2	1.9	0.010	Very low
Neurology (2,73,0.0)	Other intervention	Long-term	-0.2	-0.7	0.2	0.362	Very low

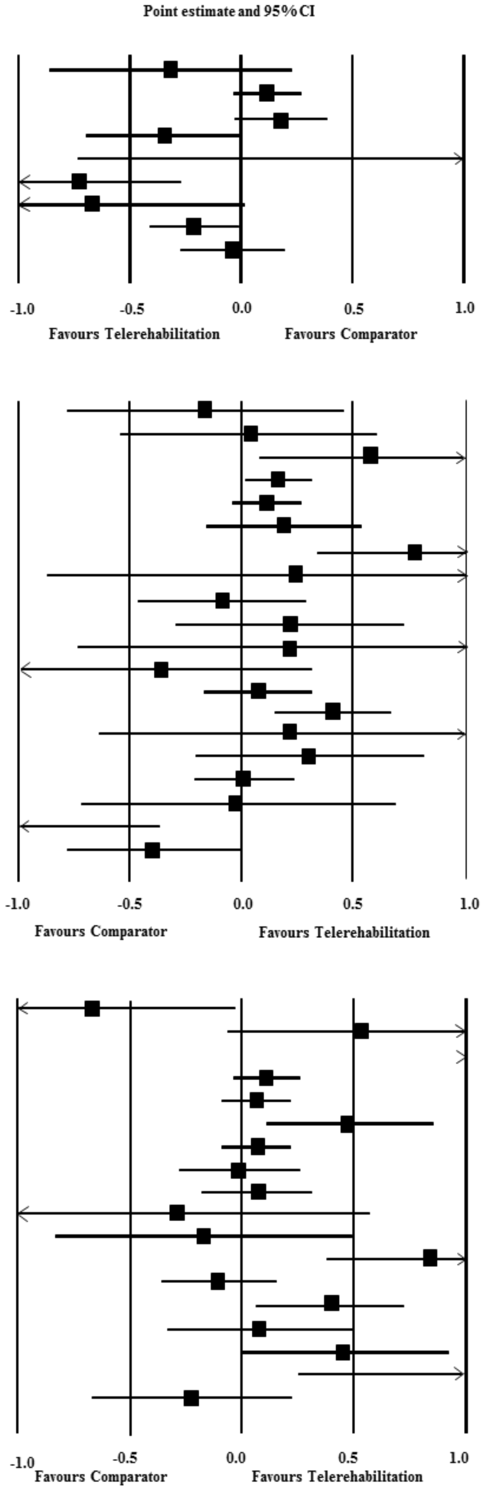


Figure 3. Subgroup analysis by clinical categories for pain, physical function and quality of life. In parentheses: number of trials; total number of participants; I².

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

Pain

Subgroup analysis of investigated clinical categories assessed effects of telerehabilitation on pain compared with control (i.e. clinical categories: musculoskeletal conditions, oncology) and other intervention (i.e. clinical categories: musculoskeletal conditions, oncology, postoperative orthopaedic conditions, cardiovascular, rheumatology) (Figure 3). For musculoskeletal conditions, high-quality evidence showed a small effect of telerehabilitation on pain when compared with other intervention at long-term (SMD: -0.2; 95% CI: -0.4 to -0.1; p = 0.039; 5 trials;[30–32,49,51] n = 1031). The strength of recommendation was low and very low for all the other comparisons.

Physical function

Subgroup analysis assessed effects of telerehabilitation on physical function compared with control (i.e. clinical categories: oncology, cardiovascular, musculoskeletal conditions) and other intervention (i.e. clinical categories: pulmonary conditions, neurological conditions, musculoskeletal conditions, oncology, postoperative orthopaedic conditions, cardiovascular, rheumatology, multiple conditions, endocrine conditions) (Figure 3). High-quality evidence showed no difference between telerehabilitation and other intervention on physical function at short-term for pulmonary conditions and for musculoskeletal conditions at long-term. SMD of 0.1 (95% CI: -0.1 to 0.3; p = 0.183; 5 trials;[22,58–60,62] n = 619) and SMD of 0.1 (95% CI: -0.2 to 0.3; p = 0.598; 5 trials;[30–32,49,51] n = 1031) for pulmonary and musculoskeletal conditions, respectively. When compared with other intervention, moderate-quality evidence showed a large effect of telerehabilitation at short-term for oncology (SMD: 0.8; 95% CI: 0.3 to 1.2; p = 0.001; 2 trials;[73,86] n = 152), a small effect of telerehabilitation at long-term for cardiovascular conditions (SMD: 0.4; 95% CI: 0.1 to 0.7; p = 0.003; 2 trials;[54,88] n = 223), and no effect of telerehabilitation at short-term for neurological (SMD: 0.2; 95% CI: -0.2 to

0.5; *p* = 0.299; 3 trials; [21,42,43] n = 124) and at short-term for postoperative orthopaedic conditions (SMD: 0.2; 95% CI: -0.9 to 1.3; *p* = 0.681; 5 trials;[37,38,50,61,85] n = 577). At long-term, moderate-quality evidence also showed no effect of telerehabilitation when compared with other intervention for multiple conditions (SMD: 0.2; 95% CI: -0.6 to 1.1; *p* = 0.622; 2 trials;[69,70] n = 177). The strength of recommendation was low and very low for all the other comparisons.

Quality of life

For quality of life, subgroup analysis assessed effects of telerehabilitation compared with control (i.e. clinical categories: oncology, cardiovascular, urological conditions) and other intervention (i.e. clinical categories: pulmonary conditions, cardiovascular conditions, postoperative orthopaedic conditions, musculoskeletal conditions, neurological conditions, urological conditions, oncology, rheumatology, multiple conditions) (Figure 3). High-quality evidence showed no difference between telerehabilitation and other intervention on quality of life for pulmonary at short-term (SMD: 0.1; 95% CI: -0.1 to 0.2; *p* = 0.396; 5 trials;[22,58–60,62] n = 619). Moderate-quality evidence showed a medium effect and no effect of telerehabilitation on quality of life at short-term when compared with other intervention for cardiovascular and postoperative orthopaedic conditions, respectively. SMD of 0.5 (95% CI: 0.1 to 0.9; *p* = 0.012; 7 trials;[40,41,65,66,74,75,90] n = 503) for cardiovascular conditions and SMD of 0.1 (95% CI: -0.1 to 0.2; *p* = 0.396; 2 trials;[37,50] n = 385) for postoperative orthopaedic conditions. The strength of recommendation was low and very low for all the other comparisons.

Sensitivity analysis

We conducted sensitivity analysis to investigate the impact of risk of bias on the estimates for overall effects by removing trials with methodological quality <6 on the 0-10 PEDro scale

(Appendix 3). Removing poor quality trials changed effects of telerehabilitation on pain at long-term to no difference when compared with other intervention (SMD= -0.2 [95% CI -0.4 to 0.1]). Besides, a no effect of telerehabilitation on physical function at long-term changed to statistically significant when compared with other intervention, but it was smaller than the benchmark (i.e. ≥0.2) for small effect considered in the current review (SMD: 0.1 [95% CI 0.0 to 0.3]). Other estimates were not impacted by the methodological quality of included trials.

DISCUSSION

To our knowledge, this is the first systematic review with meta-analysis that investigated the effects of telerehabilitation in this population and outcomes, when compared with control and other intervention.

The methodological quality of the RCTs was relatively high, greater than six points on the PEDro scale 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 a maximum score, which can be explained by the difficulty of blinding the participants and therapists, due to the characteristics of the interventions by telerehabilitation. Two other limitations found in 50% of the trials analysed were the absence of allocation secrecy and of intention-to-treat analysis. These strategies have been recommended to preserve the integrity of randomization and prevent bias caused by loss of participants.[91,92] Without these, the benefits of randomization may be lost.[92]

In some trials, it was possible to verify that telerehabilitation received more accurate follow-up than the comparison group, with more elaborate interventions preceded by conventional rehabilitation or periodic meetings during the intervention period. Hailey et al.[93] pointed out in their review on telerehabilitation in routine care that in most studies telerehabilitation intervention was more elaborate than the comparator, with more additional services and frequency of contacts between patients and professionals. Thus, the authors argue that the positive results found in some studies can be attributed to the use of more elaborate interventions and not to the delivery method of these interventions.

Our results suggest that telerehabilitation may be considered superior to other interventions at long-term improvement of pain with small effect size. In this analysis, only the musculoskeletal and oncologic subgroups were included. The result was significant only in the group of musculoskeletal conditions. A possible mechanism to explain this finding is that regular physical exercise can promote the reduction of pain in patients with chronic musculoskeletal pain by reducing central facilitation and the use of endogenous inhibitory systems.[94] The study by Cottrell et al.[93] corroborates our findings by showing that in musculoskeletal conditions, real-time telerehabilitation interventions were effective in improving physical function, disability, and pain.

In most trials of the musculoskeletal conditions subgroup, interventions focused not only on the exercise protocol, but incorporated other treatment strategies as an incentive to increase physical activity, self-management, education and behavioral changes.[30–32,35,39,46,49,51,71,72] Multicomponent interventions have been employed in different contexts to facilitate self-management of the disease and to involve the patient in their treatment.[95,96] This type of intervention has shown better results when compared with single component interventions in chronic patients.[96] Pietrzak et al.[92] identified in their review that self-management programs, education and physical therapy 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.

Overall, for physical function outcome, our results showed evidence of moderate quality for no difference between telerehabilitation and other interventions at short- and long-term, i.e., telerehabilitation is equivalent to other forms of care. The evidence was considered of moderate quality due to sample size, low inconsistency (heterogeneity) and low risk of bias (good methodological quality) of the included trials. The only factor that led to the reduction of the quality of this evidence was the possibility of publication bias, identified by the interpretation of the funnel plot.

Regarding quality of life, the general results showed that telerehabilitation can be considered superior to other intervention in the increase of quality of life at short-term with small effect size and still, equivalent to other intervention at long-term. The analysis of quality of life at short-term included eight clinical categories, but only in the cardiovascular group the result revealed a moderate quality of evidence in favour of telerehabilitation. Exercise-based interventions should be part of the treatment plan for patients with heart failure because they significantly improve physical fitness, functional ability to perform daily tasks, independence, psychosocial well-being, and consequently quality of life.[97] 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.[98]

Specific studies of cardiac populations have shown similar results. Hwang et al.[99] reported in the results of 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 in relation to the baseline. Chan et al.[100] 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 benefits similar to usual care and without reports of adverse effects.

Finally, due to the low quality of the evidence and the small number of trials comparing exercise protocols offered by telerehabilitation with control groups without any intervention, it is still not possible to state the efficacy of telerehabilitation in reducing pain, function and quality of life at short 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 <300 participants), risk of bias (PEDro score <5) and / or inconsistency (i^2> 50%).

Our findings point to the need for further high-quality trials comparing telerehabilitation with control groups without intervention. In addition, it is possible to affirm that, for some clinical categories (musculoskeletal, oncologic, cardiovascular), telerehabilitation is effective or more effective than other intervention in improving pain, physical function and quality of life. It is promising in other groups (pulmonary, neurological, postoperative orthopaedic and multiple conditions), but high-quality evidence is needed to state its benefit and effect.

Conclusions

This systematic review with meta-analysis was developed to support decision-making related to public policies and health programs. Policies based on scientific evidence have ensured that decisions are based on the best available scientific evidence. The present study identified a substantial number of articles comparing exercise programs delivered by telerehabilitation with control and other intervention. The results of this study indicate that telerehabilitation may have clinical results similar to other intervention, with positive impacts in some clinical groups of patients. However, more robust evidence is needed to support decisions for the use of telerehabilitation.

What is already known?

- Telereabilitation 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 main findings?

- The results of this systematic review indicate moderate quality evidence of small effects of telerehabilitation in reducing pain intensity at long-term and high quality evidence of small effects of telerehabilitation in the improvement of the quality of life at short-term. Estimates also showed moderate quality of evidence for no difference between telerehabilitation and other intervention in the improvement of physical function at short-term and long-term, and quality of life at long-term.
- The telerehabilitation can lead to clinical results similar to other interventions, with positive impacts in some clinical categories.
- Few studies compared the exercise protocols offered 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 at short and long term in adults with physical disabilities.

REFERENCES

1 Organização Mundial da Saúde, Banco Mundial. *Relatório Mundial sobre a Deficiência*. 2011. doi:10.1111/j.1468-3148.2012.00693.x

2 Barreto ML, Carmo EH. Padrões de adoecimento e de morte da população brasileira: os renovados desafios para o Sistema Único de Saúde. *Cien Saude Colet* 2007;**12**:1179–790. doi:10.1590/S1413-81232007000700003

3 Mendes A da CG, Sá DA de, Miranda GMD, *et al.* Assistência pública de saúde no contexto da transição demográfica brasileira: exigências atuais e futuras. *Cad Saude Publica* 2012;**28**:955–64. doi:10.1590/S0102-311X2012000500014

4 Souza MAP de, Dias JF, Ferreira FR, *et al.* Características e demandas funcionais de usuários de uma rede local de reabilitação: análise a partir do acolhimento. *Cien Saude Colet* 2016;**21**:3277–86. doi:10.1590/1413-812320152110.11192016

5 Pinheiro RS, Viacava F, Travassos C, *et al.* Gênero, morbidade, acesso e utilização de serviços de saúde no Brasil. *Cien Saude Colet* 2002;**7**:687–707. doi:10.1590/S1413-81232002000400007

6 Darzi AJ, Officer A, Abualghaib O, *et al.* Stakeholders' perceptions of rehabilitation services for individuals living with disability: A survey study. *Health Qual Life Outcomes* 2016;**14**. doi:10.1186/s12955-016-0406-x

7 Seelman KD, Hartman LM. Telerehabilitation: Policy Issues and Research Tools. *Int J*

Telerehabilitation Published Online First: 2009. doi:10.5195/IJT.2009.6013

8 Cooper RA, Fitzgerald SG, Boninger ML, *et al.* Telerehabilitation: Expanding access to rehabilitation expertise. *Proc IEEE* 2001;**89**:1174–90. doi:10.1109/5.940286

9 Russell TG. Physical rehabilitation using telemedicine. *J Telemed Telecare* Published Online First: 2007. doi:10.1258/135763307781458886

10 Zampolini M, Todeschini E, Guitart MB, *et al.* Tele-rehabilitation: Present and future. Ann. Ist. Super. Sanita. 2008;**44**:125–34.

11 Block VAJ, Pitsch E, Tahir P, *et al.* Remote Physical Activity Monitoring in Neurological Disease: A Systematic Review. *PLoS One* 2016;**11**:e0154335. doi:10.1371/journal.pone.0154335

12 Frederix I, Vanhees L, Dendale P, *et al.* A review of telerehabilitation for cardiac patients. *J Telemed Telecare* 2015;**21**:45–53. doi:10.1177/1357633X14562732

13 Cottrell MA, Galea OA, O'Leary SP, *et al.* Real-time telerehabilitation for the treatment of musculoskeletal conditions is effective and comparable to standard practice: A systematic review and meta-analysis. Clin. Rehabil. 2017;**31**:625–38. doi:10.1177/0269215516645148

14 Shukla H, Nair S, Thakker D. Role of telerehabilitation in patients following total knee arthroplasty: Evidence from a systematic literature review and meta-analysis. *J Telemed Telecare* 2017;**23**:339–46. doi:10.1177/1357633X16628996

15 Roux L, Pratt M, Tengs TO, *et al.* Cost Effectiveness of Community-Based Physical

Activity Interventions. *Am J Prev Med* 2008;**35**:578–88. doi:10.1016/j.amepre.2008.06.040

16 Müller-Riemenschneider F, Reinhold T, Willich SN. Cost-effectiveness of interventions promoting physical activity. *Br J Sports Med* 2009;**43**:70–6. doi:10.1136/bjsm.2008.053728

17 Heath GW, Parra DC, Sarmiento OL, *et al.* Evidence-based intervention in physical activity: Lessons from around the world. *Lancet* 2012;**380**:272–81. doi:10.1016/S0140-6736(12)60816-2

18 Kairy D, Lehoux P, Vincent C, *et al.* A systematic review of clinical outcomes, clinical process, healthcare utilization and costs associated with telerehabilitation. Disabil. Rehabil. 2009;**31**:427–47. doi:10.1080/09638280802062553

19 Russell TG, Buttrum P, Wootton R, *et al.* Internet-based outpatient telerehabilitation for patients following total knee arthroplasty: a randomized controlled trial. *J Bone Joint Surg Am* 2011;**93**:113–20. doi:10.2106/JBJS.I.01375

20 Hwang R, Bruning J, Morris NR, *et al.* Home-based telerehabilitation is not inferior to a centre-based program in patients with chronic heart failure: a randomised trial. *J Physiother* 2017;**63**:101–7. doi:10.1016/j.jphys.2017.02.017

21 Chen J, Jin W, Dong WS, *et al.* Effects of home-based telesupervising rehabilitation on physical function for stroke survivors with hemiplegia: A randomized controlled trial. *Am J Phys Med Rehabil* 2017;**96**:152–60. doi:10.1097/PHM.0000000000000559

22 Tsai LLY, McNamara RJ, Moddel C, *et al.* Home-based telerehabilitation via real-time

videoconferencing improves endurance exercise capacity in patients with COPD: The randomized controlled TeleR Study. *Respirology* 2017;**22**:699–707. doi:10.1111/resp.12966

23 Agostini M, Moja L, Banzi R, *et al.* Telerehabilitation and recovery of motor function: a systematic review and meta-analysis. *J Telemed Telecare* 2015;**21**:202–13. doi:10.1177/1357633X15572201

24 Moher D, Liberati A, Tetzlaff J, *et al.* Systematic Reviews and Meta-Analyses: The PRISMA Statement. *Annu Intern Med* 2009;**151**:264–9. doi:10.1371/journal.pmed1000097

25 COCHRANE CH for SR of I, 2019 entions. D em: http://handbook-5-1. cochrane. org. A in J. No Title.

26 Price DD, McGrath PA, Rafii A, *et al.* The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain* Published Online First: 1983. doi:10.1016/0304-3959(83)90126-4

27 Butland RJ, Pang J, Gross ER, *et al.* Two-, six-, and 12-minute walking tests in respiratory disease. *Br Med J (Clin Res Ed)* 1982.

28 Brazier E, Harper R, Jones NMB, *et al.* Validating the SF-36 health survey questionnaire : new outcome. *Clin Res ed* 1992;**305**:160–4.

29 Morey MC, Snyder DC , Sloane R, Cohen HJ , Peterson B , Hartman TJ , Miller P , Mitchell DC D-WW. Effects of Home-Based Diet and Exercise on Functional Outcomes Among Older, Overweight Long-Term Cancer Survivors: The RENEW:

Randomized Clinical Trial. 2009;**301**:1883–91. doi:10.1001/jama.2009.643.Effects

30 Allen KD, Jr WSY, Bosworth HB, *et al.* A Combined Patient and Provider Intervention for Management of Osteoarthritis in Veterans. 2016;**164**. doi:10.7326/M15-0378

31 Bennell KL, Campbell PK, Egerton T, *et al.* Telephone coaching to enhance a home-based physical activity program for knee osteoarthritis : A randomised clinical trial. Published Online First: 2016. doi:10.1002/acr.

32 Damush TM, Weinberger M, Perkins SM, *et al.* Randomized Trial of a Self-Management Program for Primary Care Patients With Acute Low Back Pain : Short-Term Effects. 2003;**49**:179–86. doi:10.1002/art.10995

33 Hayes SC, Rye S, Disipio T, *et al.* Exercise for health : a randomized , controlled trial evaluating the impact of a pragmatic , translational exercise intervention on the quality of life , function and treatment-related side effects following breast cancer. 2013;:175–86. doi:10.1007/s10549-012-2331-y

34 Ligibel JA, Meyerhardt J, Pierce JP, *et al.* Impact of a telephone-based physical activity intervention upon exercise behaviors and fitness in cancer survivors enrolled in a cooperative group setting. 2012;:205–13. doi:10.1007/s10549-011-1882-7

35 Goode AP, Taylor SS, Hastings SN, *et al.* Effects of a Home-Based Telephone-Supported Physical Activity Program for Older Adult Veterans With Chronic Low Back Pain. 2018;**98**:369–80.

36 Hong J, Rn JK, Kim SW, *et al.* Effects of home-based tele-exercise on sarcopenia among communitydwelling elderly adults: Body composition and functional fitness.

EXG Published Online First: 2016. doi:10.1016/j.exger.2016.11.002

37 Chen M; Li P; Lin F. Influence of structured telephone follow-up on patient compliance with rehabilitation after total knee arthroplasty. 2016;:257–64.

38 Piqueras M, Marco E, Coll M, *et al.* Effectiveness of an Interactive Virtual Telerehabilitation System in Patients after Total Knee Arthroplasty : A Randomized Controlled Trial. 2013;:392–6. doi:10.2340/16501977-1119

39 Buhrman M, Fältenhag S, Ström L AG. Controlled trial of Internet-based treatment with telephone support for chronic back pain. 2004;**111**:368–77. doi:10.1016/j.pain.2004.07.021

40 Kraal JJ, Peek N, Marle MEVDA, *et al.* Effects of home-based training with telemonitoring guidance in low to moderate risk patients entering cardiac rehabilitation : short-term results of the FIT @ Home study. Published Online First: 2014. doi:10.1177/2047487314552606

41 O'Brien J, Finlayson K, Kerr G EH. Evaluating the effectiveness of a self-management exercise intervention on wound healing, functional ability and health-related quality of life outcomes in adults with venous leg ulcers : a randomised controlled trial. 2016;:1–8. doi:10.1111/iwj.12571

42 Chumbler NR, Quigley P , Li X , Morey M , Rose D , Sanford J , Griffiths P HH. Effects of Telerehabilitation on Physical Function and Disability for Stroke Patients. 2012;:2168–75. doi:10.1161/STROKEAHA.111.646943

43 Fjeldstad-pardo C, Thiessen AMY. Telerehabilitation in multiple sclerosis: results of a

randomized feasibility and efficacy pilot study. 2018;**10**:55–64.

44 Odole AC, Ojo OD. A Telephone-based Physiother apy Intervention for Patients with Osteoarthritis of the Knee. 2013;**5**.

45 Azma K, Rezasoltani Z, Rezaeimoghaddam F. Efficacy of tele-rehabilitation compared with office-based physical therapy in patients with knee osteoarthritis : A randomized clinical trial. 2017;**0**:1–6. doi:10.1177/1357633X17723368

46 Iles R, Taylor NF, Davidson M, *et al.* Telephone coaching can increase activity levels for people with non-chronic low back pain : a randomised trial. *J Physiother* 2011;**57**:231–8. doi:10.1016/S1836-9553(11)70053-4

47 Jackson JC, Ely EW, Morey MC, *et al.* Cognitive and physical rehabilitation of intensive care unit survivors: Results of the RETURN randomized controlled pilot investigation. 2012;**40**. doi:10.1097/CCM.0b013e3182373115

48 Piga M, Tradori I, Pani D, *et al.* Telemedicine Applied to Kinesiotherapy for Hand Dysfunction in Patients with Systemic Sclerosis and Rheumatoid Arthritis : Recovery of Movement and Telemonitoring Technology Telemedicine Applied to Kinesiotherapy for Hand Dysfunction in Patients with Syst. Published Online First: 2014. doi:10.3899/jrheum.130912

49 Allen KD, Oddone EZ, Coffman CJ, Datta SK, Juntilla KA, Lindquist JH, Walker TA, Weinberger M BH. Telephone-Based Self-management of Osteoarthritis A Randomized Trial. 2010.

50 Moffet H; Tousignant M; Nadeau S; Mérette C; Boissy P; Corriveau H 2

MFCFRPBÉDR. In-Home Telerehabilitation Compared with Face-to-Face Rehabilitation After Total Knee Arthroplasty. 2015;:1129–41.

51 Calner T, Nordin C, Eriksson MK, *et al.* Effects of a self-guided , web-based activity programme for patients with persistent musculoskeletal pain in primary healthcare : A randomized controlled trial. 2017;:1–11. doi:10.1002/ejp.1012

52 Bini SA, Mahajan J. Clinical outcomes of remote asynchronous telerehabilitation are equivalent to traditional therapy following total knee arthroplasty : A randomized control study. 2016;**0**:1–9. doi:10.1177/1357633X16634518

53 Paul L, Coulter EH, Miller L, *et al.* Web-based physiotherapy for people moderately affected with Multiple Sclerosis; quantitative and qualitative data from a randomized, controlled pilot study. Published Online First: 2014. doi:10.1177/0269215514527995

54 Frederix I, Hansen D, Coninx K, Vandervoot P, Vandijck D, galinhas N, Van Craenenbroeck E, Van Driessche N DP. Medium-Term Effectiveness of a Comprehensive Internet-Based and Patient-Specific Telerehabilitation Program With Text Messaging Support for Cardiac Patients : Randomized Controlled Corresponding Author : 2015;**17**:1–15. doi:10.2196/jmir.4799

55 Alibhai SMH, Neill SO, Fisher-schlombs K. A pilot phase II RCTof a home-based exercise intervention for survivors of AML. 2013;:881–9. doi:10.1007/s00520-013-2044-8

56 Chien C, Lee C, Wu Y, *et al.* Home-based exercise improves the quality of life and physical function but not the psychological status of people with chronic heart failure :

a randomised trial. *J Physiother* 2011;**57**:157–63. doi:10.1016/S1836-9553(11)70036-4

57 Sar, D KL. The Effects of Pelvic Floor Muscle Training on Stress and Mixed Urinary Incontinence and Quality Of Life. 2009;**36**:429–35.

58 Bourne S, Devos R, North M, *et al.* Online versus face-to-face pulmonary rehabilitation for patients with chronic obstructive pulmonary disease : randomised controlled trial. Published Online First: 2017. doi:10.1136/bmjopen-2016-014580

59 Demeyer H, Louvaris Z, Frei A, *et al.* Physical activity is increased by a 12-week semiautomated telecoaching programme in patients with COPD : a multicentre randomised controlled trial. 2017;:1–9. doi:10.1136/thoraxjnl-2016-209026

60 Holland AE, Mahal A, Hill CJ, *et al.* Home-based rehabilitation for COPD using minimal resources : a randomised , controlled equivalence trial. 2017;:57–65. doi:10.1136/thoraxjnl-2016-208514

61 Pastora-bernal JM, Baro FJ. Telerehabilitation after arthroscopic subacromial decompression is effective and not inferior to standard practice : Preliminary results. 2017;**0**:1–6. doi:10.1177/1357633X17706583

62 Hornikx M, Demeyer H, Camillo CA, *et al.* The effects of a physical activity counseling program after an exacerbation in patients with Chronic Obstructive Pulmonary Disease : a randomized controlled pilot study. *BMC Pulm Med* 2015;:1–8. doi:10.1186/s12890-015-0126-8

63 Carrion Perez F, Mestre Rodriguez Moreno, Carnerero Cordoba L, Romero Garrido MC, Quintana Tirado L GMI. Tratamiento de la incontinencia urinaria de esfuerzo

mediante telerrehabilitacion. Estudio piloto. 2015;**144**:445–8. doi:10.1016/j.medcli.2014.05.036

64 Hwang R, Bruning J, Morris NR, *et al.* Home-based telerehabilitation is not inferior to a centre-based program in patients with chronic heart failure: a randomised trial. *J Physiother* Published Online First: 2017. doi:10.1016/j.jphys.2017.02.017

65 Peng X, Su Y, Hu Z, *et al.* Home-based telehealth exercise training program in Chinese patients with heart failure. 2018;**35**.

66 Varnfield M, Karunanithi M, Lee CK, Honeyman E, Arnold D, Ding H, Smith C WD. Smartphone-based home care model improved use of cardiac rehabilitation in postmyocardial infarction patients : results from a randomised controlled trial. 2014;:1–10. doi:10.1136/heartjnl-2014-305783

67 Brooks D, Krip B, Mangovski-Alzamora S GR. The effect of postrehabilitation programmes among individuals with chronic obstructive pulmonary disease. 2002;:20–9. doi:10.1183/09031936.02.01852001

68 Ellis TD, Cavanaugh JT, Deangelis T, *et al.* mHealth-Supported Exercise Compared With Exercise Alone for People With Parkinson Disease : Randomized Controlled Pilot Study. 2019;**99**:203–16. doi:10.1093/ptj/pzy131

69 Jansons P, Robins L, Brien LO, *et al.* Gym-based exercise and home-based exercise with telephone support have similar outcomes when used as maintenance programs in adults with chronic health conditions : a randomised trial. *J Physiother* Published Online First: 2017. doi:10.1016/j.jphys.2017.05.018

70 Bernocchi P, Vitacca H, La Rovere MT, Volterrani M, Galli T, Baratti D, Paneroni H, Campolongo L, Sposato B SS. Home-based telerehabilitation in older patients with chronic obstructive pulmonary disease and heart failure : a randomised controlled trial. 2017;:1–7. doi:10.1093/ageing/afx146

71 Cuperus N, Hoogeboom TJ, Kersten CC, *et al.* Randomized trial of the effectiveness of a non-pharmacological multidisciplinary face-to-face treatment program on daily function compared to a telephone-based treatment program in patients with generalized osteoarthritis. *Osteoarthr Cartil* Published Online First: 2015. doi:10.1016/j.joca.2015.04.007

72 Chhabra HS, Sharma S VS. Smartphone app in self - management of chronic low back pain : a randomized controlled trial. *Eur Spine J* Published Online First: 2018. doi:10.1007/s00586-018-5788-5

73 Galiano-Castillo N, Cantarero-Villanueva I, Fernández-Lao C, Ariza-García A, Díaz-Rodríguez L, Del-Moral-Ávila R8 A-MM. Telehealth System : A Randomized Controlled Trial Evaluating the Impact of an Internet-Based Exercise Intervention on Quality of Life , Pain , Muscle Strength , and Fatigue in Breast Cancer Survivors. 2016;:1–9. doi:10.1002/cncr.30172

74 Piotrowicz E, Stepnowska M, Leszczynska-iwanicka K, *et al.* Quality of life in heart failure patients undergoing home-based telerehabilitation versus outpatient rehabilitation-a randomized controlled study. Published Online First: 2014. doi:10.1177/1474515114537023

75 Salvetti XM, Oliveira JA, Servantes DM, *et al.* How much do the benefits cost? Effects

of a home-based training programme on cardiovascular fitness, quality of life, programme cost and adherence for patients with coronary disease. Published Online First: 2008. doi:10.1177/0269215508093331

76 de Morton NA. The PEDro scale is a valid measure of the methodological quality of clinical trials: a demographic study. *Aust J Physiother* Published Online First: 2009. doi:10.1016/S0004-9514(09)70043-1

77 Higgins JP GS. Cochrane handbook for systematic reviews of interventions, Version 5.1.0. *Cochrane Collab* 2011;:http://handbook.cochrane.org/.

78 Sampaio RF et al. APLICAÇÃO DA CLASSIFICAÇÃO INTERNACIONAL DE FUNCIONALIDADE , INCAPACIDADE E SAÚDE (CIF) NA PRÁTICA CLÍNICA DO FISIOTERAPEUTA. *Rev Bras Fisioter* 2005.

79 Organização Mundial da Saúde. CID-10 Classificação Estatística Internacional de Doenças e Problemas Relacionados à Saúde. *10a rev São Paulo Univ São Paulo* 1997.

80 1992;112:155-9. CJA power primer. PB. No Title.

81 Guyatt G, Oxman AD, Akl EA, *et al.* GRADE guidelines: 1. Introduction - GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol* Published Online First: 2011. doi:10.1016/j.jclinepi.2010.04.026

82 Guyatt GH, Oxman AD, Kunz R, *et al.* GRADE guidelines 6. Rating the quality of evidence - Imprecision. *J Clin Epidemiol* Published Online First: 2011. doi:10.1016/j.jclinepi.2011.01.012

83 Guyatt GH, Oxman AD, Vist G, *et al.* GRADE guidelines: 4. Rating the quality of evidence - Study limitations (risk of bias). J. Clin. Epidemiol. 2011. doi:10.1016/j.jclinepi.2010.07.017

84 Guyatt GH, Oxman AD, Kunz R, *et al.* GRADE guidelines: 7. Rating the quality of evidence - Inconsistency. *J Clin Epidemiol* Published Online First: 2011. doi:10.1016/j.jclinepi.2011.03.017

85 Kalron A, Tawil H, Peleg-shani S, *et al.* Effect of telerehabilitation on mobility in people after hip surgery : a pilot feasibility study. 2018;:1–7. doi:10.1097/MRR.0000000000000296

86 Galiano-castillo N, Arroyo-morales M, Lozano-lozano M. Effect of an Internet-based telehealth system on functional capacity and cognition in breast cancer survivors : a secondary analysis of a randomized controlled trial. Published Online First: 2017. doi:10.1007/s00520-017-3782-9

87 Conroy SS, Zhan M, Ii WJC, *et al.* Self-directed exercise in multiple sclerosis : Evaluation of a home automated tele-management system. 2017;**0**:1–10. doi:10.1177/1357633X17702757

88 Stewart AV, Eales CJ DK. Effect of a telephonic intervention on the adherence of patients with hypertension. 2003;:29–35.

89 Morey MC, Pieper CF, Edelman DE, Jr Yancy, Green JB, Lum H, Peterson MJ, Sloane R, PA Cowper, Bosworth HB, Huffman KM, Cavanaugh JT, KS Hall, Pearson MP TG. Enhanced Fitness: A Randomized Controlled Trial of the Effects of Home-Based

Physical Activity Counseling on Glycemic Control in Older Adults with Prediabetes. 2012;**60**:1655–62. doi:10.1111/j.1532-5415.2012.04119.x.Enhanced

90 Hwang R, Bruning J, Morris NR, *et al.* Home-based telerehabilitation is not inferior to a centre-based program in patients with chronic heart failure: a randomised trial. *J Physiother* 2017;**63**:101–7. doi:10.1016/j.jphys.2017.02.017

91 Moher D, Hopewell S, Schulz KF, *et al.* CONSORT 2010 explanation and elaboration: Updated guidelines for reporting parallel group randomised trials. *Int J Surg* 2012;**10**:28–55. doi:10.1016/j.ijsu.2011.10.001

92 Otávio Berwanger1, Hélio Penna Guimarães1, Álvaro Avezum2 LSP. Os dez mandamentos do ensaio clínico randomizado – princípios para avaliação crítica da literatura médica The ten commandments of the randomized clinical trial – principles for critical appraisal of the medical literature. 2006;**13**:65–70.

93 Hailey D, Roine R, Ohinmaa A, *et al.* of Benefit From Telerehabilitation. 2011;:281–7.

94 Lima L V., Abner TSS, Sluka KA. Does exercise increase or decrease pain? Central mechanisms underlying these two phenomena. *J Physiol* 2017;**595**:4141–50. doi:10.1113/JP273355

95 Cheng S-T, Chan KL, Lam RWL, *et al.* A multicomponent intervention for the management of chronic pain in older adults: study protocol for a randomized controlled trial. *Trials* 2017;**18**:528. doi:10.1186/s13063-017-2270-3

96 Carnes D, Homer K, Miles C, *et al.* T524 Effective Delivery Styles and Content for Chronic Pain Self-Management Interventions: a Systematic Review. *Eur J Pain Suppl*

2011;**5**:80. doi:10.1016/s1754-3207(11)70272-3

97 Bocalini DS, Santos L dos, Serra AJ. Physical exercise improves the functional capacity and quality of life in patients with heart failure. *Clinics* 2008;**63**:437–42. doi:10.1590/s1807-59322008000400005

98 Rejeski WJ, Mihalko SL. Physical activity and quality of life in older adults. *Journals Gerontol - Ser A Biol Sci Med Sci* Published Online First: 2001. doi:10.1093/gerona/56.suppl_2.23

99 Hwang R, Bruning J, Morris N, *et al.* A systematic review of the effects of telerehabilitation in patients with cardiopulmonary diseases. *J Cardiopulm Rehabil Prev* 2015;**35**:380–9. doi:10.1097/HCR.0000000000000121

100 Chan C, Yamabayashi C, Syed N, *et al.* Exercise telemonitoring and telerehabilitation compared with traditional cardiac and pulmonary rehabilitation: A systematic review and meta-analysis. *Physiother Canada* 2016;**68**:242–51. doi:10.3138/ptc.2015-33

CONSIDERAÇÕES FINAIS

O objetivo do estudo foi investigar se intervenções baseadas em exercício ofertados por telerreabilitação são eficazes na melhora da dor, função física e qualidade de vida de adultos com deficiência física. Para isso foi desenvolvida uma revisão sistemática com metanálise incluindo apenas ensaios clínicos aleatorizados com indivíduos maiores de 18 anos, com diferentes condições de saúde. Estes critérios de inclusão visaram representar o maior número de indivíduos possível, com algum tipo de deficiência física, para que assim pudéssemos ter um panorama ampliado dos benefícios dos exercícios físicos entregues por meio de TIC para indivíduos com características similares a dos usuários dos serviços de reabilitação atualmente.

O número artigos inicialmente encontrados foi surpreendente, especialmente porque a telerreabilitação é uma modalidade de oferta de tratamento relativamente nova. Entre os estudos analisados, a maioria apresentou qualidade metodológica que variou de moderada a alta, ou seja, os estudos possuem validade interna adequada e contém informações estatísticas suficientes para que os seus resultados fossem interpretados. No entanto, algumas questões podem ser aprimoradas no em futuros ensaios clínicos neste tema. Destaca-se em primeiro lugar a necessidade de se avaliar a telerreabilitação comparada a grupo controle sem intervenção. A maioria dos ECA sobre telerreabilitação usa como comparação o controle ativo, aqui nomeado outras intervenções. Além disso, apesar de ser conhecida a dificuldade de cegamento dos terapeutas e participantes nos estudos da área de reabilitação, principalmente em telerreabilitação alguns outros parâmetros relativos à qualidade metodológica, podem ser empregados como a adoção da alocação oculta e a análise da intenção de tratar.

O ponto central deste trabalho foi a análise de protocolos de intervenção que usaram exercícios físicos (aeróbicos e/ou cinesioterapia) entregues por meio de tecnologias de comunicação e informação (telerreabilitação). O exercício físico foi a modalidade de intervenção escolhida por ser a base dos programas de reabilitação para diversas condições de saúde, possuírem eficácia comprovada e serem economicamente vantajosos. Pode-se dizer que, apesar de todos os estudos incluídos nesta revisão terem em comum a oferta de exercícios como, alongamentos, força, calistenia e exercícios aeróbicos, os programas de exercício foram definidos após criteriosas avaliações e atenderam as necessidades específicas de cada grupo de pacientes. No campo da reabilitação, avaliar e personalizar as intervenções são práticas inquestionáveis e imprescindíveis para a condução de qualquer tratamento. Além disso, foi observado que vários estudos empregaram intervenções multicomponentes. Essas intervenções têm sido usadas em diferentes contextos, para aumentar a auto-eficácia, facilitar o autogerenciamento dos problemas de saúde e, consequentemente, potencializar a melhora dos pacientes.

As evidências encontradas no presente estudo apontaram para a viabilidade e efetividade da telerreabilitação na melhora da dor, função física e qualidade de vida de indivíduos com deficiência física, tendo resultados similares ou ligeiramente superiores que outras intervenções. Quando avaliamos separadamente por categoria clínica (análise de subgrupos) observamos que apenas em algumas categorias clínicas musculoesquelética (dor a longo prazo), oncológica (função física a curto prazo) e cardiovascular (função física a longo prazo e qualidade de vida a curto prazo) a telerreabilitação pode ser considerada mais eficaz que outras intervenções. Além disso, a telerreabilitação mostrou-se promissora em outros grupos como pulmonar (função física e qualidade de vida a curto prazo), musculoesquelético (função física a longo prazo), neurológico (função física a curto prazo), pós-operatório ortopédico (função física e qualidade de vida a curto prazo) e múltiplas condições (função física a longo prazo), para melhora de desfechos específicos, visto que apresentaram resultados semelhantes a outras intervenções. Na prática, esses achados demonstram que telerreabilitação tem potencial para suprir as necessidades dos pacientes com diversas condições de saúde, bem como outras intervenções tradicionalmente conhecidas e utilizadas. No entanto, os resultados ainda não são robustos o suficiente para suportar políticas públicas.

Portanto, juntamente com outros benefícios em relação à redução de custos e a ampliação do acesso aos tratamentos para a população, não analisados no presente estudo, programas de exercícios por telerreabilitação mostraram-se eficazes na melhora de desfechos como dor, função física e qualidade de vida, em indivíduos com deficiência física. Além desses achados, este trabalho contribuiu para a fundamentação de um projeto de pesquisa denominado:

"Programa de telerreabilitação para manutenção do condicionamento muscular em idosos em fila de espera para tratamento ambulatorial de fisioterapia: Um ensaio clínico pragmático". Pretende-se também, desenvolver um protocolo de reabilitação a ser testado no Sistema Único de Saúde brasileiro, utilizando uma intervenção de baixo custo como o exercício físico por telerreabilitação.

Síntese dos principais resultados para os profissionais da clínica:

Dor:

- A curto prazo: As evidências não possuem qualidade suficiente para afirmar quanto a eficácia da telerreabilitação comparada com outras intervenções.
- A longo prazo: Há evidências de moderada qualidade indicando que a telerreabilitação apresenta resultados ligeiramente superiores que outras intervenções.
- Nas categorias clínicas: Há evidências de alta qualidade indicando que nas condições musculoesqueléticas a telerreabilitação apresenta resultados ligeiramente superiores que outras intervenções na melhora da dor a longo prazo.

Função física:

- Há evidências de moderada qualidade indicando que não há diferença entre telerreabilitação e outras intervenções a curto e longo prazo.
- Nas categorias clínicas: Há evidências de moderada qualidade indicando que nas condições oncológicas (a curto prazo) e condições cardiovasculares (a longo prazo), a telerreabilitação apresentou resultados superiores a outras intervenções na melhora da função física.

Qualidade de vida:

- A curto prazo: Há evidências de alta qualidade indicando que a telerreabilitação apresenta resultados ligeiramente superiores a outras intervenções.
- A longo prazo: Há evidências de moderada qualidade indicando que não há diferença entre telerreabilitação e outras intervenções.
- Nas categorias clínicas: Há evidências de moderada qualidade indicando que nas condições cardiovasculares, a telerreabilitação apresenta resultados superiores a outras intervenções na melhora da qualidade de vida a curto prazo.

REFERÊNCIAS

ASSIS, Marluce Maria Araújo; JESUS, Washington Luiz Abreu De. Acesso aos serviços de saúde: abordagens, conceitos, políticas e modelo de análise. *Ciência & Saúde Coletiva*, 2012.

BARRETO, Mauricio Lima; CARMO, Eduardo Hage. Padrões de adoecimento e de morte da população brasileira: os renovados desafios para o Sistema Único de Saúde. *Ciência & Saúde Coletiva*, v. 12, n. suppl, p. 1179–1790, 2007. Disponível em: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-81232007000700003&lng=pt&tlng=pt>.

BARRETO, Mayckel da Silva; CARREIRA, Lígia; MARCON, Sonia Silva. Envelhecimento populacional e doenças crônicas : Reflexões sobre os desafios para o Sistema de Saúde Pública. *Revista Kairós Gerontologia*, v. 18, n. 1, p. 325–339, 2015. Disponível em: <file:///D:/Administrador/Downloads/26092-68118-1-SM (1).pdf>.

BLOCK, Valerie A. J. *et al.* Remote Physical Activity Monitoring in Neurological Disease: A Systematic Review. *Plos One*, v. 11, n. 4, p. e0154335, 2016. Disponível em: <http://dx.plos.org/10.1371/journal.pone.0154335>.

CAUCHIOLI RODRIGUES, Maira Pinto; DE ARAUJO, Tereza Cristina Cavalcanti Ferreira. Internet como Suporte à Pessoa com Lesão Medular: Padrões de Uso e Reabilitação. = Internet as a support for people with spinal cord injuries: Usage patterns and rehabilitation. *Paidéia*, 2012.

CHAN, Christen *et al.* Exercise telemonitoring and telerehabilitation compared with traditional cardiac and pulmonary rehabilitation: A systematic review and meta-analysis. *Physiotherapy Canada*, v. 68, n. 3, p. 242–251, 2016.

CHEN, Jing *et al.* Effects of home-based telesupervising rehabilitation on physical function for stroke survivors with hemiplegia: A randomized controlled trial. *American journal of physical medicine & rehabilitation*, v. 96, n. 3, p. 152–160, 2017. Disponível em: <http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L617869399%0Ahttp://dx.doi.org/10.1097/PHM.0000000000000559%0Ahttp://sfx.library.uu.nl/utrecht?sid=EMBASE&issn=15377385&id=doi:10.1097%2FPHM.0000000000000559&atitle=Effects+of+Home-b>.

COOPER, Rory A. *et al.* Telerehabilitation: Expanding access to rehabilitation expertise.

Proceedings of the IEEE, v. 89, n. 8, p. 1174–1190, 2001.

COTTRELL, Michelle A. *et al.* Real-time telerehabilitation for the treatment of musculoskeletal conditions is effective and comparable to standard practice: a systematic review and meta-analysis. *Clinical Rehabilitation*. [S.l: s.n.]. , 2017

DARZI, Andrea J. *et al.* Stakeholders' perceptions of rehabilitation services for individuals living with disability: A survey study. *Health and Quality of Life Outcomes*, v. 14, n. 1, 2016.

GOULART, FAA. Doenças crônicas não transmissíveis: estratégias de controle e desafios e para os sistemas de saúde. *Organização Pan-Americana da Saúde/ Organização Mundial da Saúde*, p. 96, 2011.

HADDAD, Ana Estela. Experiência Brasileira do Programa Nacional Telessaude Brasil. *Gold book [recurso eletrônico]: inovação tecnológica em educação e saúde*, n. November 2012, p. 12–44, 2012. Disponível em: <http://www.telessaude.uerj.br/resource/goldbook/pdf/2.pdf>.

HWANG, Rita *et al.* Home-based telerehabilitation is not inferior to a centre-based program in patients with chronic heart failure: a randomised trial. *Journal of Physiotherapy*, 2017.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. *Acesso à internet e à televisão e posse de telefone móvel celular para o uso pessoal:* 2017 [Access to the internet and television and mobile phone possession for personal use: 2017]. p. 12, 2018. Disponível em: <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2101631>.

KEMP, Simon. Digital in 2018 Essential Insights Into Internet, Social Media, Mobile, and Ecommerce Use Around the World. *Hootsuite: We Are Social*, 2018.

KIM, Jung A. Telehealth in the Developing World. *Healthcare Informatics Research*, 2010.

LLORÉNS, Roberto *et al.* Effectiveness, usability, and cost-benefit of a virtual reality-based telerehabilitation program for balance recovery after stroke: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, v. 96, n. 3, p. 418- 425.e2, 2015. Disponível em: <http://dx.doi.org/10.1016/j.apmr.2014.10.019>.

MARQUES, Mariana Ribeiro *et al.* Aplicações e benefícios dos programas de Telessaúde e Telerreabilitação: uma revisão da literatura e. *Rev. Eletron. de Comun. Inf. Inov. Saúde*, v. 8, n. 1, p. 43–52, 2014.

MENDES, Antonio da Cruz Gouveia *et al.* Assistência pública de saúde no contexto da transição demográfica brasileira: exigências atuais e futuras. *Cadernos de Saúde Pública*, v. 28, n. 5, p. 955–964, 2012. Disponível em: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2012000500014&lng=pt&tlng=pt>.

MIRANDA, Gabriella Morais Duarte; MENDES, Antonio da Cruz Gouveia; SILVA, Ana Lucia Andrade Da. O envelhecimento populacional brasileiro: desafios e consequências atuais e futuras. *Revista Brasileira de Geriatria e Gerontologia*, 2016.

MORETTI, Eduarda Correia. O uso de aplicativos móveis nas disfunções pélvicas. *Revista Pesquisa em Fisioterapia*, 2017.

ORGANIZAÇÃO MUNDIAL DA SAÚDE; BANCO MUNDIAL. *Relatório Mundial sobre a Deficiência*. [S.l: s.n.], 2011.

PINHEIRO, Rejane Sobrino *et al.* Gênero, morbidade, acesso e utilização de serviços de saúde no Brasil. *Ciência & Saúde Coletiva*, 2002.

PINOCHET, Luis Hernan Contreras. Tendências de Tecnologia de Informação na Gestão da Saúde. *O Mundo da Saúde*, v. 35, n. 4, p. 382–394, 2017.

RUSSELL, Trevor G. Physical rehabilitation using telemedicine. *Journal of Telemedicine and Telecare*, 2007.

SEELMAN, Katherine D.; HARTMAN, Linda M. Telerehabilitation: Policy Issues and Research Tools. *International Journal of Telerehabilitation*, 2009.

SOUZA, Mariana Angélica Peixoto De *et al.* Características e demandas funcionais de usuários de uma rede local de reabilitação: análise a partir do acolhimento. *Ciência & Saúde Coletiva*, v. 21, n. 10, p. 3277–3286, 2016. Disponível em: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-81232016001003277&lng=pt&tlng=pt>.

THEODOROS D, Russell T. *Telerehabilitation: current perspectives.* [S.l: s.n.], 2008.

TSAI, Ling Ling Y. *et al.* Home-based telerehabilitation via real-time videoconferencing improves endurance exercise capacity in patients with COPD: The randomized controlled TeleR Study. *Respirology*, v. 22, n. 4, p. 699–707, 2017.

VERAS, Renato. Envelhecimento populacional contemporâneo: demandas, desafios e inovações. *Revista de Saude Publica*. [S.l: s.n.]. , 2009

WORLD HEALTH ORGANIZATION. Atlas of eHealth country profiles. The use of eHealth in support of universal health coverage. *WHO, Geneva*, p. 392, 2016a. Disponível em: <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Atlas+of+eHealth+Country+Profiles#0>.

WORLD HEALTH ORGANIZATION. Global diffusion of eHealth : making universal health coverage achievable. Report of the third global survey on eHealth. *Global Observatory for eHealth*, 2016b.

WORLD HEALTH ORGANIZATION. WHO eHealth Resolution. n. 4, p. 121–123, 2005. Disponível em: <http://www.who.int/healthacademy/news/en/>.

ZAMPOLINI, Mauro *et al. Tele-rehabilitation:* present and future. Annali dell’Istituto Superiore di Sanita. [S.l: s.n.]. , 2008

APÊNDICE

Appendix 1. Search strategy

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

Appendix 2. Table characteristics of the included trials and table methodological quality of the included studies using the PEDro scale

Table 1. Characteristics of the included trials (n = 54). † 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: subscale the Arthritis Self-Efficacy Scale (AIMS2) *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 *Age= 61.1 (9.2)	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 monthly for the last 6	n=149 *OI: Usual care	*Pain: subscale Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) *Physical Function: subscale WOMAC *Quality of life: NE

	*Sex= 9% female/91%male	months. Participants were given written educational materials to intervention topics, and exercise video, and an audio CD of relaxation exercises.		* 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: subscale WOMAC *Physical function: WOMAC *Quality-of-life: AQoL-6D. * Time-point: 6 months (Long-term)
Bernocchi, P., et al. (2017)	n= 112 *Source= NI, 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 and the exercise.	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)

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/ 69male	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: 6MWD *Quality of life: ST Georges Respiratory Questionnaire (SGRQ) *Time-point: 7 weeks (Short-term)
Brooks, D., et al. (2002)	n= 85 *Source= Inpatient and outpatient programmes were recruited, CA. *Health condition= COPD *Age= 68 (0.8) *Sex= 41%female/59%male	n=37 *Telephone *The program consisted of patient education, psychosocial support and supervised exercises, of which breathing exercises, interval training, upper extremity training, leisure walking and treadmill or cycle exercise comprised the main	n=48 * OI: Usual care	*Pain: NE *Physical function: 6-min walk test. *Quality of life: SGRQ *Time-point: 12 months (Long-term)

		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.		
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: subscale Short Form Health Survey-36 (SF-36) *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	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	n= 9 *OI: Traditional rehabilitation	*Pain: NE Physical function: NE *Quality of life: International Consultation on Incontinence Questionnaire (ICIQ-SF)

	incontinence *Age= Interventional group †: 49 [46-49,75] OI group †: 46 [47-56] *Sex= 100% female	transmits wireless pressure variations (bluetooth). Treatment was at home with the telerehabilitation device through a customized program.		* 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= Interventional group: 68%female/32%male OI group: 73%female/ 27%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 activity log and were followed up by telephone every 1–2 weeks to monitor progress.	n=27 *CWI: Participants maintained their usual lifestyle	*Pain: NE *Physical function: 6MWT *Quality of life: MLHFQ *Time-point: 8 week (short-time)
Chumbler, N., et al. (2012)	n= 52 *Source= Veterans Affairs Medical	n=25 *Televisits; Telephone	n=23 *OI: Usual care	*Pain: NE *Physical function: The

	Center, USA. *Health condition= Stroke *Age= Interventional group: 67.1 (9.5) OI group 67.7 (10.0) *Sex= Interventional group: 4% female/96%male OI group: 100% male	* 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.		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, etc.) were emphasized.	n=8 *OI: Traditional rehabilitation	*Pain: NE *Physical function: 6MWT *Quality of life: NE *Time-point: 6 month (Long-term)
Cuperus, N., et al. (2015)	n= 147 *Source= Rheumatology departments of the Sint Maartenskliniek Nijmegen and	n=72 *Telephone *Patients allocated to the telephone-based treatment attended two face-to-face group	n=75 *OI: Traditional rehabilitation	*Pain: subscale SF-36 *Physical function: Subscale SF-36 * Quality of life: SF-36

	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	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.		*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	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	n=171 *OI: Usual care	*Pain: NE *Physical function: 6MWT *Quality of life: COPD Assessment Test (CAT) * Time-point: 3 months (short-time)

	OI group: 37%female/63% male	project-tailored coaching application. This application was specifically designed for use by patients with COPD in the present project.		
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: subscale HeartQol (HRQL) *Quality of life: HRQL *Time-point: 24weeks (Long-term)
Galiano-Castillo, N., et al. (2017)	n= 76 *Source= Virgen de las Nieves Hospital, ES. *Health condition= Breast Cancer *Age= 48. 30 (± 8.80) *Sex= 100% female	n= 39 *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	n= 37 *OI: Usual care	*Pain: NE *Physical function: 6MWT *Quality of life: NE *Time-point: 8 weeks (short-time)

		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.		
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: subscale EORTC *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	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)

		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.		
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	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)

		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.		
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 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.	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)
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)	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	n=15 *OI: Usual Care	*Pain: NE *Physical function: 6MWT *Quality of life: CAT *Time-point: 1 month (Short-term)

	*Sex= Interventional group: 47%female/53%male OI group: 40%female/60%male	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.		
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	n= 15 *OI: Traditional rehabilitation	*Pain: NE *Physical function: Patient Specific Functional Scale *Quality of life: NE *Time-point: 12 weeks (Short-term).

		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.		
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	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	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)

	OI group: 54%female/46%male	included community walking or, if participants had access to their own exercise equipment such as a stationary bike, this was incorporated.		
Chen Jet. 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= Intervention group: 33,3%female/66,7%male OI group: 44%female/56%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 (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	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-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	n=25 *OI: 12-week exercise program with at least two training sessions per week + Traditional rehabilitation	*Pain: NE *Physical function: subscale MacNew questionnaire *Quality of life: MacNew questionnaire *Time-point: 12 weeks (short-time)

		environment. They received feedback on training frequency, duration and intensity from the physical therapist once a week via telephone.		
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 pedometer (New Lifestyle Digi-Walker) and asked to wear this daily.	n=60 *OI: Usual care	*Pain: Pain subscale EORTC QLQ C-30 *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)
Moffet, H., et al. (2015)	n= 205 *Source= Eight hospitals, CA. *Health condition= TKA *Age= Intervention group: 65 (8) OI group: 67 (8) *Sex=	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	n= 101 OI: Traditional rehabilitation	*Pain: Subscale WOMAC *Physical function: 6MWT *Quality of life: score quality of life (KOOS) *Time-point: 2 months (Short-term)

	Intervention group: 45%female/55%male OI group: 58%female/42%male	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.		
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 OI group: 3%female/97% 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 reduced telephone calls received telephone calls every other month during the final 6 months.	n= 122 *OI: Usual Care	*Pain: NE *Physical function: subscale SF-36 *Quality of life: NE *Time-point: 12 months (Long-term)
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)	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	n=322 *CWI: Waiting list control	*Pain: subscale SF-36 *Physical function: subscale SF-36 *Quality of life: SF-36 *Time-point: 12 month (Long-term)

	CWI group: 73.1 (5.1) *Sex= Intervention group: 54%female/46%male CWI group: 55%female/45%male	strength exercises. Each telephone session was 15–30 minutes in duration.		
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= OA of the Knee *Age= 55.50 (7.55) *Sex= 48%female/52%male	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 seg. The therapists employed uniform statements from a structured telephone intervention guide three times per week.	n=25 OI: Traditional rehabilitation	*Pain: VAS *Physical function: Ibadan Knee/Hip Osteoarthritis Outcome Measure (IKHOAM) *Quality of life: NE *Time-point: 6 weeks (Short-term)
Pastora-Bernal JM (2018)	n= 18 *Source= Rehabilitation service, ES. *Health condition= Arthroscopic	n=8 * Web application *Customized exercises program through a web application that allows the physiotherapist to	n=10 OI: Traditional rehabilitation	*Pain: Pain subscale Constant–Murley Test (CM) *Physical function: Physical function subscale CM

	sub acromial decompression *Age †= 52.50 [33–65] *Sex= 44%female/56%male	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.		*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. *Age= Intervention group: 57.0 (10.0) OI group: 57.4 (11.7) *Sex= 50%female/50%male	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 conducted at home by patients using the Recovery of Movement and Telemonitoring (Re.Mo.Te.).	n= 20 *OI: Traditional rehabilitation	*Pain: VAS *Physical function: Dreiser's index *Quality of life: SF-36 *Time-point: 12 weeks (Short-term)
Piotrowicz, E., et al. (2015)	n= 131 *Source= Department of Cardiac Rehabilitation and Noninvasive Electrocardiolog, PL. *Health condition= Heart failure	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	n=56 *OI: Traditional rehabilitation	*Pain: Subscale SF-36 *Physical function: Subscale SF-36 *Quality of life: SF-36

	*Age= 56.4 (10.9) *Sex= Intervention group: 15%female/85%male OI group: 5%female/95%male	(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.		*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 *Age= Intervention group:53(8) OI group: 54 (9) *Sex= Intervention group: 26%female/74%male OI group: 25%female/75%male	n=19 *Telephone *2 supervised exercise classes including a 10-minute warm-up consisting of walking and stretching 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	n=20 *OI: Usual care	*Pain: subscale SF-36 *Physical function: subscale SF-36 *Quality of life: SF-36 *Time-point: 3-month (Short-term).

		adherence and provide support.		
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=NI	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)	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:	n=17 *OI: Usual care	*Pain: NE *Physical function: 6MWT *Quality of life: The Chronic Respiratory Disease Questionnaire (CRDQ) *Time-point: 8 weeks

	*Sex= Intervention group: 37%female/63%male OI group: 65%female/35%male	15min, 20min, 30min), walking training (Intensity: 80% of 6MWT speed; Duration: 15min, 20min, 30min) and strengthening exercises.		(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 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.	n=27 *OI: Traditional rehabilitation	*Pain: VAS *Physical function: WOMAC *Quality of life: KOOS *Time-point: 6 weeks (Short-term).

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= NI, 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) *Sex= 45%female/55%male	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 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.	n=20 *OI: Traditional rehabilitation	*Pain: NE *Physical function: TUG *Quality of life: NE *Time-point: 6 weeks (Short-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 (14.2) OI group: 41.0 (14.2) *Sex= NI	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 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	n= 48 *OI: Traditional rehabilitation	*Pain: Numeric Pain Rating Scale (NPRS) *Physical function: Modified Oswestry Disability Index (MODI) *Quality of life: NE *Time-point: 12 weeks (Short-term)

		activities, without pain.		

Appendix 3. Sensitivity analysis (removing poor-quality studies, PEDro <5 out of 10) by pain, physical function and quality of life.

PAIN LONG TERM — **STATISTICS FOR EACH STUDY**

Study name	Stddiff in means	Lower limit	Upper limit	Relative weight
Morey. M. C., et al. (2009) (Z = 1.5; p = 0.138; individual trial)	0.1	-0.1	0.3	100.0

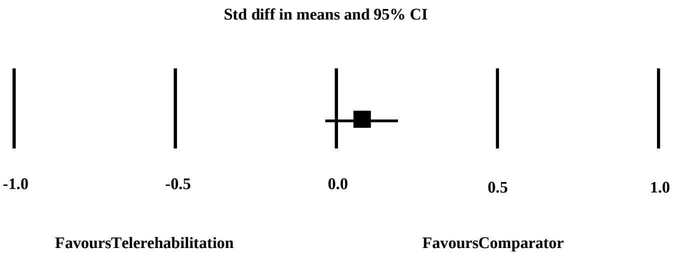


Figure 1.1 Telerehabilitation compared to control at pain long-term.

PAIN SHORT-TERM — **STATISTICS FOR EACH STUDY**

Study name	Std diff in means	Lower limit	Upper limit	Relative weight
Chen. M., et al. (2016)	-0.4	-0.6	-0.1	16.2
Moffet. H., et al. (2015)	-0.2	-0.5	0.1	16.3
Pastora-Bernal J. M. (2018)	-2.0	-3.1	-0.8	9.4
Cuperus. N., et al. (2015)	0.3	0.0	0.6	16.0
Chhabra. H. S., et al. (2018).	0.0	-0.4	0.5	15.4
Galiano-Castillo. N., et al. (2016)-0.2	-0.7	-1.2	-0.3	15.0
Salvetti. X. M., et al. (2008)	2.5	1.6	3.3	11.8
Pooling (I²= 65.5%; Z=-0.2; p = 0.874; random-effects)	-0.0	-0.6	0.5	

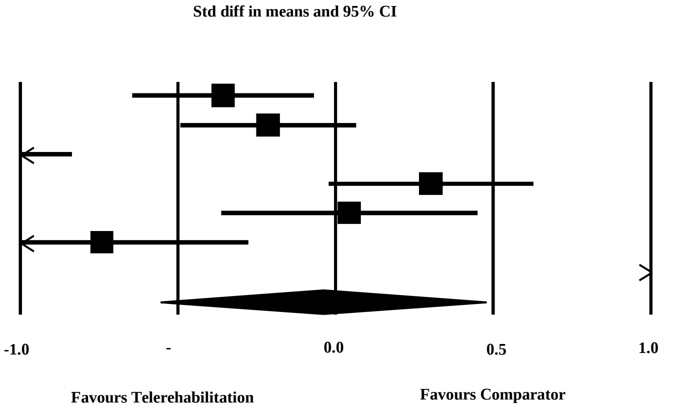


Figure 1.2 Telerehabilitation compared to other interventions at pain short-term.

PAIN LONG TERM — **STATISTICS FOR EACH STUDY**

Studyname	Stddiff inmeans	Lower limit	Upper limit	Relative weight
Allen. K. D., et al. (2010)	-0.4	-0.6	-0.2	24.4
Allen. K. D., et al. (2016)	-0.2	-0.4	0.1	23.7
Bennell. K. L., et al. (2017)	-0.5	-0.8	-0.1	18.1
Calner. T., et al. (2017)	0.2	-0.2	0.6	13.8
Hayes. S. C., et al. (2013)	-0.1	-0.3	0.3	19.9
Pooling (I² = 11.7%; Z = -1.8; p = 0.074; random-effects)	-0.2	-0.4	0.1	

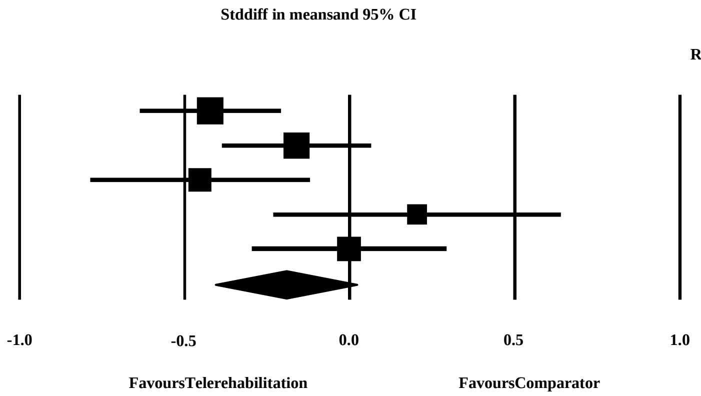


Figure 1.3 Telerehabilitation compared to other interventions at pain long-term.

PHYSICAL FUNCTION SHORT-TERM **STATISTICS FOR EACH STUDY**

Studyname	Stddiff inmeans	Lower limit	Upper limit	Relative weight
Alibhai. S. M. H., et al. (2014)	-0.2	-0.8	0.5	45.9
Chien. C. L., et al. (2011)	0.1	-0.6	0.6	54.0
Pooling (I² = 0.0%; Z = -0.3; p = 0.796; random-effects)	-0.1	-0.5	0.4	

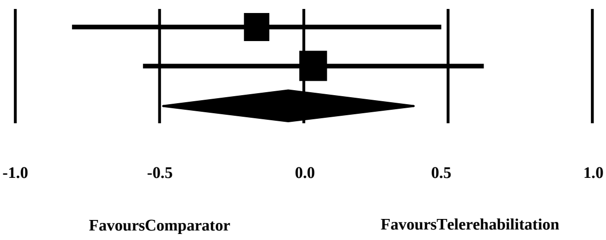


Figure 2.1 Telerehabilitation compared to control at physical function short-term.

PHYSICAL FUNCTION LONG-TERM **STATISTICS FOR EACH STUDY**

Studyname	Stddiff inmeans	Lower limit	Upper limit	Relative weight
Morey. M. C., et al. (2009) (Z = 2.1; p = 0.035; individual trial)	0.2	0.1	0.3	100.0

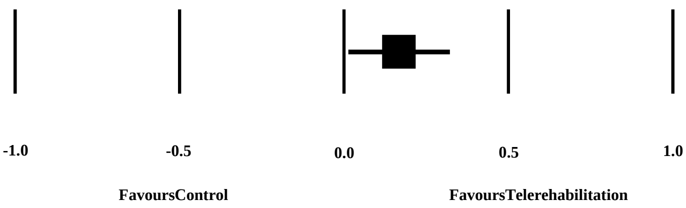


Figure 2.2 Telerehabilitation compared to control at physical function long-term.

PHYSICAL FUNCTION SHORT-TERM **STATISTICS FOR EACH STUDY**

Study name	Std diff in means	Lower limit	Upper limit	Relative weight
Bourne. S., et al. (2017)	-0.1	-0.6	0.4	5.1
Demeyer. H., et al. (2017)	0.1	-0.2	0.3	5.6
Holland. A. E., et al. (2017)	0.3	-0.1	0.6	5.4
Tsai. L. L., et al. (2017)	0.3	-0.4	0.9	4.6
Chen. M., et al. (2016)	-0.1	-0.4	0.2	5.5
Moffet. H., et al. (2015)	1.9	1.6	2.2	5.4
Pastora-Bernal J.M. (2018)	-4.1	-5.7	-2.5	2.2
Kalron. A., et al. (2018)	0.7	-0.0	1.4	4.4
Hwang. R., et al. (2017)	-0.3	-0.8	0.3	4.8
Peng. X., et al. (2018)	1.1	0.7	1.6	5.2
Salvetti. X. M., et al. (2008)	1.1	0.5	1.8	4.5
Varnfield. M., et al. (2014)	-0.2	-0.6	0.3	5.1
Chumbler. N., et al. (2012)	0.3	-0.3	0.9	4.7
Jing. C., et al. (2017)	0.2	-0.3	0.8	4.9
Fjeldstad-Pardo. C., et al. (2018)	-0.0	-0.8	0.8	4.3
Galiano-Castillo. N., et al. (2017)	0.6	0.1	1.0	5.1
Galiano-Castillo. N., et al. (2016)	1.0	0.5	1.5	5.1
Cuperus. N., et al. (2015)	-0.1	-0.4	0.2	5.4
Chhabra. H. S., et al. (2018).	-0.5	-0.9	-0.1	5.2
Iles. R., et al. (2011)	1.1	0.3	1.9	4.1
Jackson. J. C., et al. (2012)	0.2	-0.8	1.3	3.6
Pooling (I² = 35.7%; Z = 1.7; p = 0.088; random-effects)	0.3	-0.0	0.6	

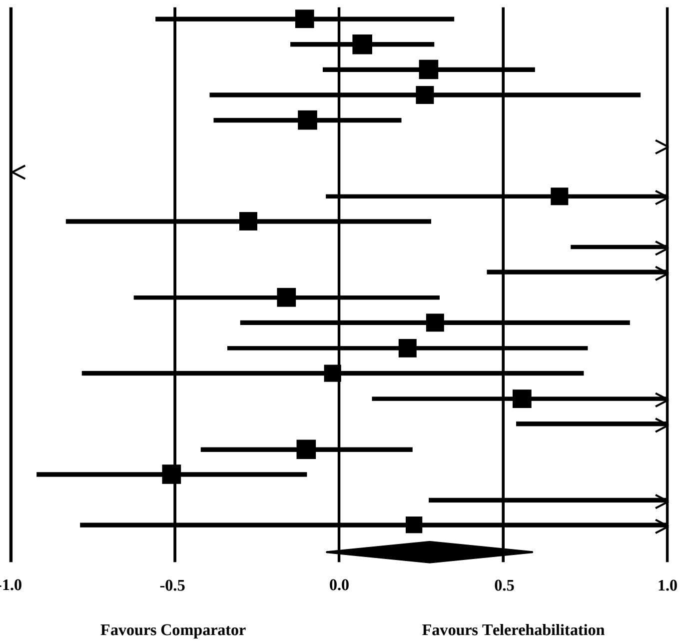


Figure 2.3 Telerehabilitation compared to other interventions at physical function short-term.

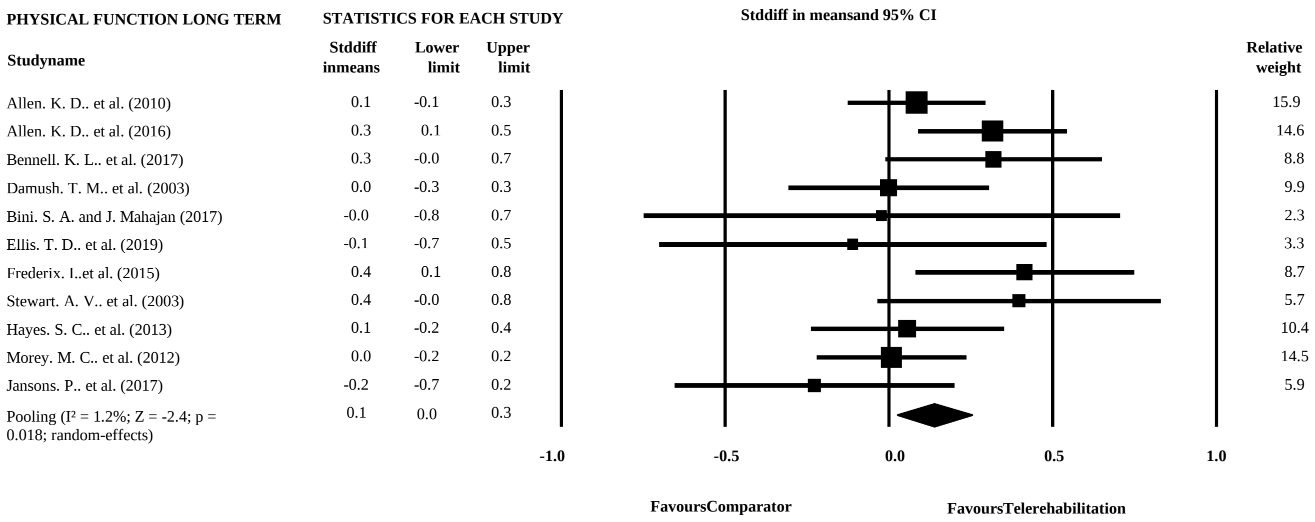


Figure 2.4 Telerehabilitation compared to other interventions at physical function long-term.

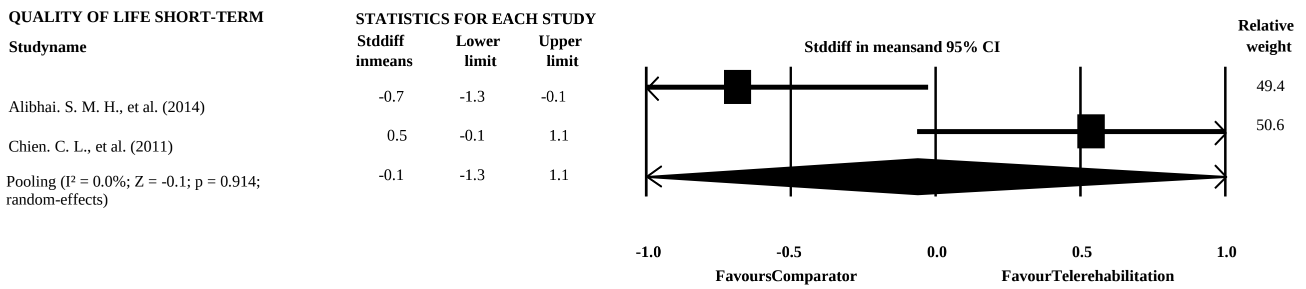


Figure 3.1 Telerehabilitation compared to control at quality of life short-term.

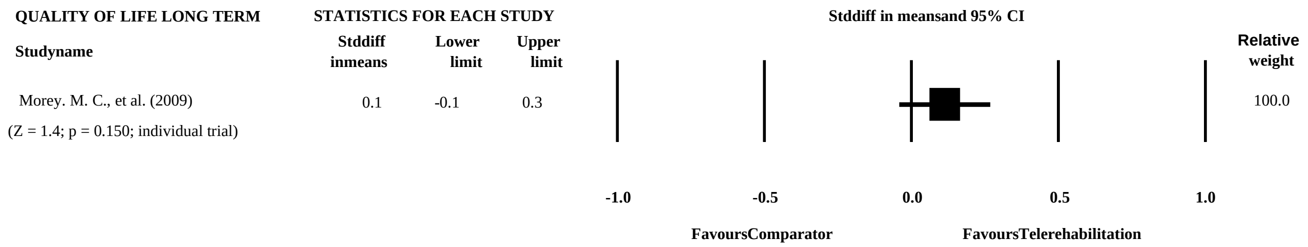


Figure 3.2 Telerehabilitation compared to control at quality of life long-term.

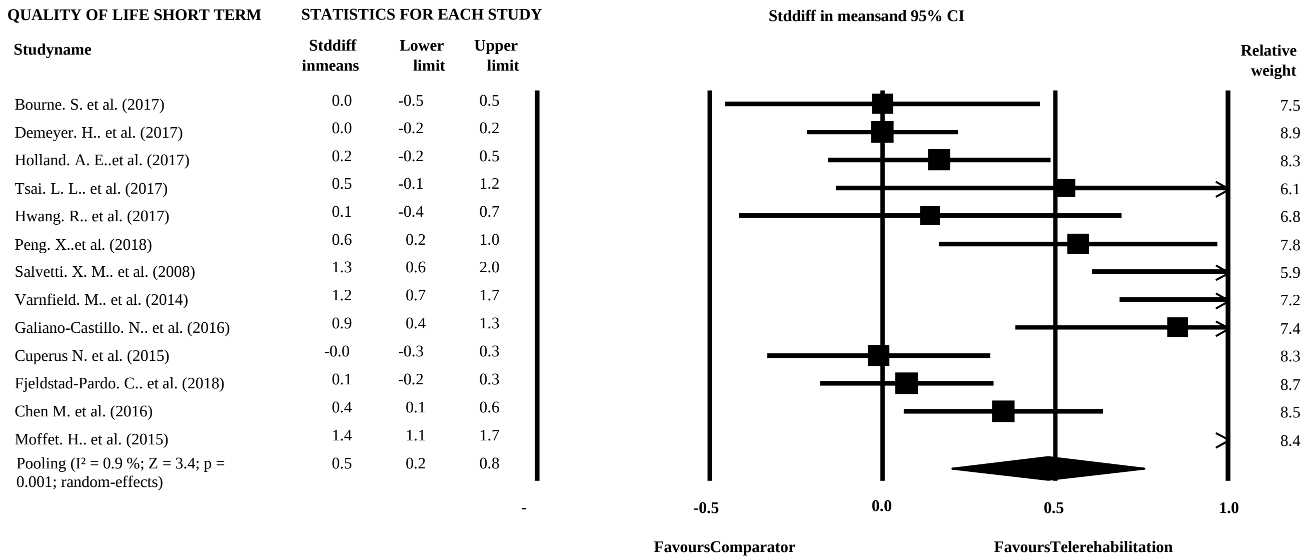


Figure 3.3 Telerehabilitation compared to other interventions at quality of life short-term.

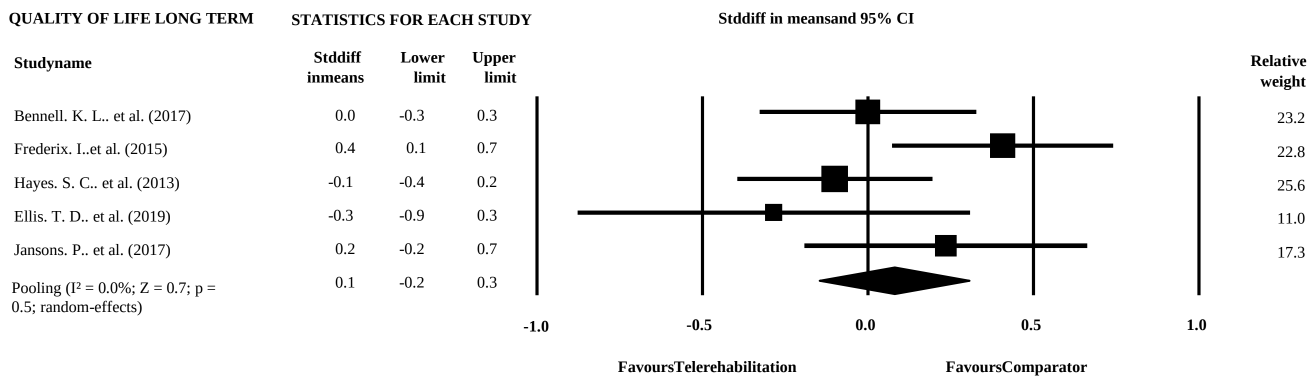


Figure 3.4 Telerehabilitation compared to other interventions at quality of life long-term.

Appendix 4. 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
Musculoskeletal							
Cuperus, N., et al. (2015)	72	-0,96	7,42	75	-3,19	7,33	*Instrument: Subscale pain (SF-36); *Imputed from confidence intervals
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			CG			Comments
	n	Mean	SD	n	Mean	SD	
Oncology							
Morey, M. C., et al. (2009)	319	-0,78	19,11	322	-3,19	21,89	*Instrument: SF- 36 Subscale pain; *Imputed from standard errors

1.3Pain Long-term (Telerehabilitation x Control)

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
Allen, K. D., et al. (2016)	151	-0,5	3,1	149	0	3,1	* Instrument: WOMAC subscale pain; *Imputed from p-values
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							
Hayes, S. C., et al. (2013)	67	12,2	16,71	127	12,2441	17,0184	*Instrument: Neuropathic Pain; *Combined data in the control group (FtF + UC); *Imputed from confidence intervals
Ligibel, J. A., et	48	-4,9	17,5	51	-2,6	27,4	* Instrument:

al. (2012)							EORTC QLQ C-30 subscale pain

1.4 Pain Long-term (Telerehabilitation x Other Interventions)

Study	EG			CG			Comments
	n	Mean	SD	n	Mean	SD	
Musculoskeletal							
Goode, A. P., et al. (2018)	35	1,98	4,76	15	-1,11	4,66	*Instrument: TUG; *Imputed from medians and interquartile ranges; *Combined data in the intervention group (PA + PA CBT-P)
Hong, J., et al. (2017)(sarcopenia)	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
Holland, A. E., et al. (2017)	72	29,39	67,6	76	10,82	68,23	* Instrument: 6MWT; *Imputed from confidence intervals
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.	98	373,2	5,9	100	362	5,9	* Instrument: 6MWT;

(2015)							*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
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
Fjeldstad-Pardo, C., et al. (2018)	10	2,1	23,79	19	2,57	25,95	*Instrument: Berg Balance Scale; *Imputed from p-values; *Grouped the control and physiotherapy group
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
Musculoskeletal							

Cuperus, N., et al. (2015)	72	1,58	6,34	75	2,25	7,09	*Instrument: SF-36 Subscale Physical Function; *Imputed from confidence intervals
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

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

Study	**EG**			**CG**			**Comments**
	n	**Mean**	**SD**	**n**	**Mean**	**SD**	
Oncology							
Morey, M. C., et al. (2009)	319	-2,15	16,07	322	-4,84	16,15	*Instrument: SF-36 Subscale Physical Function; *Imputed from standard errors

2.3 Physical Function Long-term (Telerehabilitation x Control)

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
Allen, K. D., et al. (2016)	151	3,3	10,42	149	0	10,42	* Instrument: WOMAC 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
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
Hayes, S. C., et al. (2013)	67	-11	11,28	127	-11,8	15,39	*Instrument: DASH; *Combined data in the control group (FtF + UC); *Imputed from confidence intervals

Endocrine							
Morey, M. C., et al. (2012)	180	518,3	127,4	122	517,2	129,1	*Instrument: 6MWT
Multiple conditions							
Bernocchi, P., et al. (2017)	48	60	133,62	44	-15	84,78	*Instrument: 6MWT; *Imputed from confidence intervals
Jansons, P., et al. (2017)	39	385	127	46	409	84	*Instrument: 6MWT

2.4 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)
Demeyer, H., et al. (2017)	159	14	7,48	159	14	8,33	*Instrument: CAT; *Imputed from medians and interquartile ranges
Holland, A. E., et al. (2017)	72	2,99	5,54	76	2,09	5,45	*Instrument: CRDQ
Hornikx, M., et al. (2015)	12	-4	9,2246	15	-3,6666	6,5431	*Instrument: CAT; *Imputed from medians and interquartile ranges
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
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
Cuperus N, et al. (2015)	72	1,2	8,345	75	1,295	8,37	*Instrument: SF-36; *Imputed from confidence intervals
Neurology							
Fjeldstad-Pardo, C., et al. (2018)	121	45,64	23,9	121	44,09	19,83	*Instrument: SF-36
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			CG			Comments
	n	Mean	SD	n	Mean	SD	
Oncology							
Morey, M. C., et al. (2009)	319	-0,82	18,74	322	-3,09	21,04	*Instrument: SF-36 ; *Imputed from standard errors

3.3 Quality of life Long-term (Telerehabilitation x Control)

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
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
Bernocchi, P., et al. (2017)	48	10,51	13,08	44	0,44	15,06	*Instrument: MLHFQ; *Imputed from confidence intervals

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

Appendix 5. PROSPERO

Effectiveness of telerehabilitation on pain, physical function and quality of life in people with physical disabilities: a systematic review of randomized controlled trials

Jane Fonseca Dias, Vinícius Cunha Oliveira, Pollyana Ruggio Tristão Borges, Fabiana Caetano Martins Silva e Dutra, Marisa Cotta Mancini, Renata Noce Kirkwood, Rosana Ferreira Sampaio

Citation: Jane Fonseca Dias, Vinícius Cunha Oliveira, Pollyana Ruggio Tristão Borges, Fabiana Caetano Martins Silva e Dutra, Marisa Cotta Mancini, Renata Noce Kirkwood, Rosana Ferreira Sampaio. Effectiveness of telerehabilitation on pain, physical function and quality of life in people with physical disabilities: a systematic review of randomized controlled trials. PROSPERO 2019 CRD42019122824 Available from: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42019122824

Review question: Are telerehabilitation interventions effective in improving quality of life, physical function and pain in adults with physical disabilities?

Searches: The systematic review will follow PRISMA and the Cochrane. Search strategies will be conducted on AMED, MEDLINE, CINAHL, SPORTDiscus, EMBASE, PEDro, Cochrane, PsycINFO without date or language restriction. Descriptors will be related to “randomized controlled trial” and “telerehabilitation”. We will not use any specific descriptor related to our population of interest to increase sensitivity of our search strategy, avoiding exclusions of potential populations that we are not aware of. In addition, we will hand search identified systematic reviews published in the field for potentially relevant full-texts.

Types of study to be included: We will include any published randomized controlled trial investigating effectiveness of telerehabilitation on pain, physical function and quality of life in people with limited function.

Condition or domain being studied: Physical disabilities.

Participants/population: We will include trials investigating adults (i.e. ?18 years old) with limited function caused by any health condition. Trials including adults with mental issues will be excluded.

Intervention(s), exposure(s): Telerehabilitation will be considered in the current review as any take-home exercises provided by telecommunication technologies, such as phone calls, videoconferences and apps. Interventions using virtual reality will not be considered as telerehabilitation.

Comparator(s)/control: Comparators of interest will be supervised exercises and controls (i.e. no intervention, waiting list, placebo or sham).

Main outcome(s): Our primary outcomes of interest will be pain, physical function and quality of life, measured using a valid instrument

Additional outcome(s): None

Data extraction (selection and coding): Two independent reviewers will extract characteristics and outcome data from included trials and discrepancies will be resolved by a third reviewer. Characteristics will include: source of participants; health condition; age; sex; type and dosage for telerehabilitation and comparators; outcomes; and timepoints. For our outcomes of interest, we will extract means, standard deviations (SDs) and sample sizes of all groups to investigate short- and long-term effects. Short-term effect will be considered follow-up up to three months after baseline, and long-term effect will be considered follow-up of over months after baseline. If more than one timepoint is available within the same follow-up period, the one closer to the end of the intervention for any timepoints will be considered. When trials compared more than one dosage of the intervention of interest or comparators, we combined outcome data following the Cochrane recommendations.

Risk of bias (quality) assessment: Two independent reviewers will assess methodological quality of included trials using the 0-10 PEDro scale (http://www.pedro.org.au/). A third reviewer will resolve discrepancies. When available, we will use scores already on the PEDro database.

Strategy for data synthesis: Meta-analysis will be conducted using random-effects model. For our outcomes of interest, standardized mean differences (SMDs) and 95% confidence intervals (CIs) will be presented for each specific health condition in the forest-plots. Estimated effect sizes will be assessed using Cohen's benchmarks: d?0.2 for small; d?0.5 for medium; and ?0.8 for large effects. All analyses will be conducted using Comprehensive Meta-analysis software, version 2.2.04 (Biostat, Englewood, NJ).

Two independent reviewers will assess strength of the current evidence using the GRADE system. According to the four-level GRADE system, evidence may range from high to very-low quality, with low levels indicating that future high-quality trials are likely to change estimated effects. In the current review, evidence will begin from high quality and it will be downgraded in one point for each of the following issues: imprecision when analyzed sample <400; risk of bias when >25% of the participants were from trials with a high risk of bias (i.e. PEDro score <6 out of 10); and inconsistency of results when raw I^2 statistics >50% or when pooling was not possible. Between-reviewer discrepancies will be resolved by a third reviewer.

Analysis of subgroups or subsets: We are planning sensitivity analyses to investigate whether methodological quality, type and dosage of telerehabilitation impact on the estimated effects.

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Type and method of review: Intervention, Meta-analysis, Systematic review

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Conflicts of interest Language: English

Country: Brazil

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Subject index terms: Disabled Persons; Humans; Pain; Quality of Life; Randomized Controlled Trials as Topic; Telerehabilitation

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Details of any existing review of the same topic by the same authors Stage of review at time of this submission:

Stage	Started	Completed
Preliminary searches	Yes	No
Piloting of the study selection process	Yes	No
Formal screening of search results against eligibility criteria	Yes	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

MINI CURRÍCULO

Publicações durante o período do mestrado:

1. DIAS, J. F.; GROSSI, J. B.; COSTA, L. A.; CAVALCANTI, S. R.; MANCINI, M. C.; SAMPAIO, R. F. Atenção domiciliar no âmbito da reabilitação e prática centrada na família: aproximando teorias para potencializar resultados. REVISTA DE TERAPIA OCUPACIONAL DA UNIVERSIDADE DE SÃO PAULO, v. 28, p. 206, 2017.
2. DIAS, J. F.; OLIVEIRA, V. C.; BORGES, P. R. T.; DUTRA, F. C. M. S.; MANCINI, M. C.; Kirkwood, R. N.; SAMPAIO, R. F.Effectiveness of telerehabilitation on pain, physical function and quality of life in people with physical disabilities: a systematic review of randomized controlled trials. PROSPERO 2019 CRD42019122824.

Trabalhos apresentados durante o período do mestrado:

1. DIAS, J. F.; BORGES, P. R. T.; AUAREK L. J.;Kirkwood, R. N.; RESENDE R. A.; SAMPAIO, R. F.Telerreabilitação após artroplastia de joelho: uma síntese das principais evidências. 9ºCongresso Brasileiro de Telemedicina e Telessaúde, 2019.

2. DIAS, J. F.; OLIVEIRA, V. C.; BORGES, P. R. T.; DUTRA, F. C. M. S.; MANCINI, M. C. ; AUAREK L. J.; SAMPAIO, R. F. Eficácia da telerreabilitação na dor, função física equalidade de vida em pessoas com deficiência física: revisão sistemática de ensaios clínicos randomizados. 9ºCongresso Brasileiro de Telemedicina e Telessaúde, 2019.

Participação em congressos durante o período do mestrado:

9º Congresso Brasileiro de Telemedicina e Telessaúde – 9CBTms.

Cursos realizados durante o período do mestrado:

Curso de Revisão Sistemática e Metanálise em formato de EAD ministrado pelo Prof. Daniel Umpirre/ Universidade Federal do Rio Grande do Sul- 16 hs.