THE USE OF TELEREHABILITATION IN PHYSIOTHERAPY IN LOWER-MIDDLE INCOME COUNTRIES: A SCOPING REVIEW

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DECLARATION

I, **Thumbe Muula (MLXTHU005),** hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is submitted for another degree at this or any other university.

Signature: Signed by candidate

Date: 4 September 2024

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABBREVIATION	DEFINITION
COVID-19	Coronavirus Disease 2019
HIC(s)	High-Income Countries
ICF	International Classification of Functioning, Disability, and Health
ICT	Information and Communications Technology
LMIC(s)	Lower- and Middle-Income Countries
PCC	Population, Concept, and Context
PRISMA-ScR	Preferred Reporting Items for Systematic reviews and Meta-Analyses – Scoping Reviews
TR	Telerehabilitation
USA	United States of America
WHO	World Health Organisation

GLOSSARY OF TERMS

TERM	DEFINITION
Audio-based Technology	Use voice or audio to provide telerehabilitation remotely (Ongvisatepaiboon et al., 2016; Pramuka & Van Roosmalen, 2009).
Lower- and Middle-Income Countries (LMICs)	The World Bank Group assigns the world's economies to four income groups, namely low, lower-middle, upper-middle, and high. The classifications are updated each year on July 1, based on the GNI per capita of the previous calendar year, as a broadly available indicator of economic capacity. The most recent data (1 July 2023 to 30 June 2024) defines lower-middle income countries (for Gross National Income per capita in current US$, Atlas method) as US$ 1135 to US$ 4465 annually (Hamadeh et al., 30 June 2023).
Physiotherapy	Physiotherapy, also known as physical therapy, is directed towards movement needs of individuals, providing treatment and rehabilitation to develop, maintain, and restore maximum movement and functional ability throughout the lifespan (Higgs et al., 2001).
Rehabilitation	Rehabilitation is a set of interventions designed to optimise functioning and to reduce disability in individuals with health conditions (Cullen, 2013).
Telerehabilitation	The use of technology to provide rehabilitation services remotely (Albahrouh & Buabbas, 2021).
Telemedicine	The broad use of information and technology to provide healthcare from a distance (Hjelm, 2017).
Textual-based Technology	The use of text to provide telerehabilitation, for example, text messages or email (Pramuka & Van Roosmalen, 2009).
Web-based Technology	The use of websites to provide telerehabilitation, where technology-based interactions may occur in different forms, such as audio, text, or video (Morimoto et al., 2022; Pramuka & Van Roosmalen, 2009).
Wireless-based Technology	The use of wireless technology to provide telerehabilitation, such as personal digital assistants (Macedo et al., 2014; Pramuka & Van Roosmalen, 2009).

Glossary of Terms continued.

TERM	DEFINITION
Virtual-based Technology	The use of simulation to provide tactile, auditory and visual input. Goggles or screen projection is used to stimulate the four senses depending on the area that needs to be rehabilitated (Pramuka & Van Roosmalen, 2009; Varela-Aldás et al., 2021).
Vision-based Technology	The use of video to provide telerehabilitation. Webcams or phone cameras may be used to facilitate interactions (Krishnan, 2021; Pramuka & Van Roosmalen, 2009).

ABSTRACT

Introduction

Health systems in lower- and middle-income countries (LMICs) often have limited access to rehabilitation services. Telerehabilitation (TR) has the potential to be an alternative or adjunct to rehabilitation services in underserved communities in LMICs and can also assist with continuation of care to patients with chronic conditions or injuries requiring ongoing rehabilitation. The aim of this scoping review was to explore the use of TR in physiotherapy in LMICs.

Objectives

The specific objectives of the scoping review were to:

- describe the range of impairments, activity limitations, participation restrictions, and disease or health conditions that are being addressed using TR by physiotherapists in LMICs,
- describe the nature, mode of delivery, and outcomes of TR interventions used by physiotherapists for patient care in LMICs, and
- explore the perceived benefits, facilitators, and barriers associated with the implementation and use of TR by physiotherapists in LMICs.

Methods

The PRISMA-ScR guideline for reporting was used in the scoping review. Literature focussing on the use of TR in LMICs were extracted from EBSCOhost, Web of Science, Scopus, and PubMed. Full-text articles included in the review were published in English between 2000 to 2024. Literature reviews, editorials, systematic reviews, meta-analyses, and single case studies were excluded from the study.

Results

Twenty-six articles were included in the review. Most of these studies focused on musculoskeletal or neurological conditions, with a smaller number of studies involving COVID-19, cardiorespiratory conditions, and diseases of lifestyle. Telerehabilitation was mostly used to address impairments including pain, muscle weakness, anxiety, depression, and fatigue, with little reporting on the impact on activity levels and participation restrictions. The mode of TR varied and primarily involved videoconferences followed by phone calls, with some studies also reporting recorded videos of exercises and messaging. The nature of TR only included treatment in most studies, with three studies including both treatment and assessment.

Conclusion

Telerehabilitation is a potentially viable alternative or adjunct to expand access to rehabilitation in LMICs to help address the burden of disease where access to rehabilitation services is limited. The results from the scoping review show that TR is feasible and effective in physiotherapy to provide rehabilitation in LMICs. While most literature has considered the impact on impairments, successful implementation of TR would need to investigate the impact on activity levels and participation restrictions in these populations. The barriers to the use of TR in LMICs should be addressed by promoting technology literacy through training and installing modern TR infrastructure or using low bandwidth technologies to reduce slow internet connections during TR sessions. Future research should be conducted that includes a larger pool of data to investigate the value and feasibility of the use of TR in physiotherapy in LMICs. The adoption of TR use in the field of physiotherapy should be encouraged with the findings from this review supporting its feasibility and value in promoting access to rehabilitation.

CHAPTER ONE: INTRODUCTION AND SCOPE OF THE DISSERTATION

1.1 Introduction

Lower- and middle-income countries (LMICs) face numerous healthcare challenges (Nizeyimana et al., 2022), including a quadruple burden of disease (Bowry et al., 2015; Prüss-Ustün et al., 2019). Communicable and non-communicable diseases pose an elevated risk to populations in LMICs (Winkler, 2020). The disease burden includes tuberculosis, HIV/AIDS, malaria, diabetes, cancer, cardiovascular disease, and chronic respiratory diseases (Bhutta et al., 2014). Despite the burden of disease, the shortage of healthcare workers in LMICs also places pressure on health systems and service delivery (Haque et al., 2020; Tsolekile et al., 2015). The unmet healthcare needs and disease burden in LMICs contribute to secondary complications, and rehabilitation interventions are required to prevent mortality and disability (Ebrahim et al., 2013; Kumurenzi et al., 2015).

Rehabilitation forms part of the essential healthcare services in LMICs (World Health Organization, 2017). Rehabilitation assists individuals that experience difficulties with mobility, vision, hearing, speech, swallowing, and cognition (Cheville et al., 2019; Hebert et al., 2016). Rehabilitation also maximises the outcome measures of other health services such as surgical interventions, trauma care, and the medical management of non-communicable diseases (Krug & Cieza, 2017). Rehabilitation is comprised of three phases, namely the acute phase that is hospital-based, the post-acute phase that may be managed as part of outpatient health services or home-based, and the long-term phase where intensive and home-based therapy is required (Bunketorp-Käll et al., 2017). However, poor access to rehabilitation services is one of the main challenges at primary healthcare level in LMICs (Kayola et al., 2023; World Health Organization, 2018). Other challenges include ineffective referral systems, a shortage of healthcare workers, limited access to assistive devices, and a lack of organisation and leadership (Kamenov et al., 2019; Kodali, 2023; Ntsiea, 2019).

One way of expanding access to rehabilitation is through the utilisation of telerehabilitation (TR) as a model of healthcare delivery (Pramuka & Van Roosmalen, 2009). Telerehabilitation refers to the provision of rehabilitation services remotely, through the use of information and communication technologies (Agostini et al., 2015). Telerehabilitation provides easy access to rehabilitation specialists, flexible appointment scheduling, and a reduction in travel costs (Brennan & Barker, 2008; Capin et al., 2022; Cottrell et al., 2017; Shaw et al., 2021). Telerehabilitation is one of many forms of digital technologies that are available to improve the accessibility of rehabilitation services (Oduor et al., 2023).

Synchronous TR allows real-time communication between a rehabilitation specialist and patient, while asynchronous TR uses remote non-real-time communication between a physiotherapist and patient to provide rehabilitation services (Werneke et al., 2022). Telerehabilitation allows for all aspects of patient care to take place including assessment, treatment, education, and monitoring using different modes of delivery (Cottrell et al., 2017; Maresca et al., 2019; Masic et al., 2009). Modes of TR delivery include vision-based technology, web-based technology, audio-based technology, textual-based technology, wireless-based technology, and virtual-based technology (Pramuka & Van Roosmalen, 2009).

Despite the advantages of TR in providing access to specialists, flexible scheduling of patients, and the reduction of travelling costs, there are multiple challenges in its implementation in LMICs (Brennan & Barker, 2008; Capin et al., 2022; Shaw et al., 2021). These challenges may be human, technical, organisational, and clinical in nature (Baroni et al., 2023). Human challenges that act as a hindrance to the implementation of TR include a lack of literacy skills among rehabilitation personnel and patients, resistance to change from traditional modes of rehabilitation delivery, and negative attitudes and misconceptions about TR (Mahmoud et al., 2022). The technical challenges faced in the implementation of TR services in LMICs include a lack of access to technology and technical knowledge, and connectivity issues such as slow internet speeds and equipment-related challenges (Mahmoud et al., 2022; Mohamad & Defi, 2022). Organisational challenges associated with TR use include a lack of human and financial resources and the lack of secure platforms for the provision of TR services (Bairapareddy et al., 2021). Clinical challenges associated with the use of TR services include limited patient physical examination and a limited scope of exercises to prescribe to patients (Nizeyimana et al., 2022).

All of these challenges regarding the implementation of TR services in LMICs can be addressed (Bonnechère et al., 2023). Human challenges can be addressed by using technology with a user-friendly interface in terms of operating and language, normalising the use of TR services that are familiar to patients and rehabilitation personnel such as WhatsApp and telephone calls, and training rehabilitation personnel in general and specific TR services to improve technological literacy (Chan et al., 2023; Mohamad & Defi, 2022). Organisation challenges can be tackled by sourcing TR funding from appropriate governing bodies or stakeholders, appointing champions of TR such as information and communications technology (ICT) support staff to ensure sustainability, the enforcement of clinical governance, and the reorganisation or sharing of working space with TR services at departmental level (Nizeyimana et al., 2022).

Technical challenges can be addressed by the ongoing maintenance of TR equipment to ensure safety and efficacy, investment in ICT infrastructure by stakeholders and government, and enforcing the use of licensed applications in TR to avoid medicolegal implications (Mohamad & Defi, 2022). The clinical challenges, such as difficulty performing physical examinations and limited scope of exercise to prescribe to patients, can be addressed by the provision of online measurement application software to augment assessment and treatment. Addressing the barriers to the implementation of TR services may contribute to the integration and expansion of remote rehabilitation to reach underserved communities in LMICs (Mohamad & Defi, 2022).

The spread of the COVID-19 pandemic has further advanced the use of technology by rehabilitation personnel, including physiotherapists (Renu, 2021). As a result of the enforced periods of lockdown and limited physical contact, the pandemic facilitated the rapid adoption of TR to ensure continuation of care for patients that needed rehabilitation services. Physiotherapists had to learn to assess, diagnose, and treat neurological, musculoskeletal, and cardiorespiratory conditions through the use of TR (Junaid et al., 2022). Therefore, there is a need to reinforce the adoption of TR in health systems as a sustainable method of rehabilitation delivery post-pandemic as it has yielded several benefits in patient management.

Therefore, through a scoping review, we aim to explore the use of TR by physiotherapists in LMICs and to build on our current understanding of the accessibility and utility of TR in LMICs. We also hope to establish whether TR may be considered as a viable and sustainable approach towards achieving the World Health Organisation's (WHO) Rehabilitation 2030 initiative that advocates for the integration and expansion of rehabilitation in all healthcare systems (Gimigliano & Negrini, 2017).

1.2 International Classification of Functioning, Disability, and Health as a Conceptual Framework

The International Classification of Functioning, Disability, and Health (ICF) is the international standard for framing, describing, recording, and measuring functioning and disability, and will be used as the conceptual framework for this dissertation (see Figure 1 below). The ICF is comprised of functional, disability, and contextual components (Stucki et al., 2007). The components are further divided into four relatable constructs, namely body functions, structures, activity, and participation (Kostanjsek, 2011). The body function and structure components focus on anatomical and physiological changes, while the activity and participation components focus on the capacity and performance of individuals as impacted by their health or diseases (Kostanjsek, 2011).

If an individual has a health condition, it has the potential to affect them by targeting the four constructs of body function, structures, activity, and participation. The manner in which a health condition impacts an individual's functioning will also dictate how they navigate environmental and personal factors (Stucki et al., 2007).

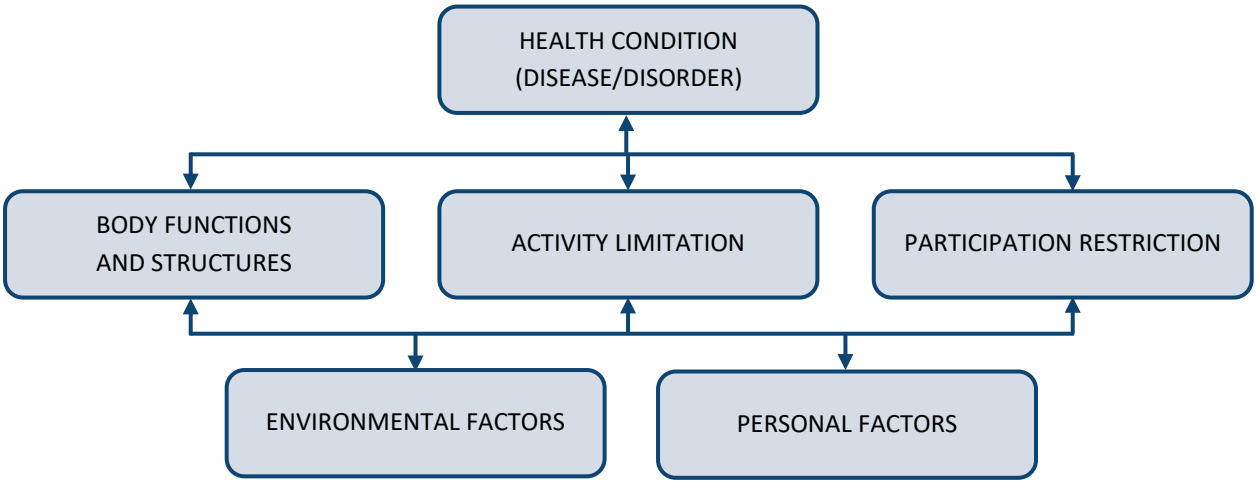

Figure 1.International Classification of Functioning, Disability, and Health (ICF) framework.
Adapted from Kostanjsek (2011).

The ICF will be used to provide a conceptual framework for the scoping review to describe the range of impairments, activity limitations, participation restrictions, and disease or health conditions that may be addressed by physiotherapists using TR in LMICs. Environmental and personal factors will be used to group potential barriers and facilitators to the use of TR by physiotherapists in LMICs.

1.3 Aim and Objectives

The aim of this scoping review was to explore the use of TR in physiotherapy in LMICs. The specific objectives were to:

- describe the range of impairments, activity limitations, participation restrictions, and disease or health conditions that are being addressed using TR by physiotherapists in LMICs,
- describe the nature, mode of delivery, and outcomes of TR interventions used by physiotherapists for patient care in LMICs, and
- understand the perceived benefits, facilitators, and barriers associated with the implementation and use of TR by physiotherapists in LMICs.

1.4 Plan of Development

A scoping review that will explore the use of TR in physiotherapy in LMICs will be presented in Chapter Two. This will be followed by a summary and conclusion chapter that will complete this dissertation (Chapter Three).

CHAPTER TWO: THE USE OF TELEREHABILITATION IN PHYSIOTHERAPY IN LOWER- AND MIDDLE-INCOME COUNTRIES: A SCOPING REVIEW

2.1 Introduction

The global demand for rehabilitation has increased by 63% from 1990 to 2019, with over two billion people presenting with conditions that would, at some point, benefit from rehabilitation services (Jesus & Landry, 2021). However, rehabilitation access in LMICs is challenging due to the remote geographical position of communities or people, the lack or absence of rehabilitation personnel, and sociocultural issues such as unemployment, religious beliefs, and issues around language and literacy (Mohamad & Defi, 2022). Broadband coverage is increasing worldwide and has reached more than 90% of the world's population (Kalula et al., 2022). That is a good prospective to enhance the use of TR in LMICs as most of the area is covered by broadband internet (Kalula et al., 2022). However, a usage gap defined as the amount of the population who are still not connected despite living within a broadband zone still exists. This usage gap has decreased to approximately 40% of the population in LMICs but it remains substantial (Walbank, 2022). Populations most affected by this lack of access live within LMICs, particularly in sub-Saharan Africa. The trend is higher in rural versus urban areas and amongst women. This usage gap is due to a multitude of reasons including the affordability of services and handsets, as well as a lack of the digital literacy skills needed to utilise mobile internet services. The relevance of applications to LMICs needs to be considered and the use of local languages for content and applications requires review (Walbank, 2022). This calls for multiple stakeholders within both industry and government to look for ways to improve use and access.

Engaging with these barriers would enhance the feasibility of the use of TR as a strategy for improving healthcare access and outcomes. This was emphasised by the Digital Physical Therapy Task Force (2020) recommendations around TR use. This included the need for the advocacy of TR services through improved infrastructure, and the encouragement of training to enable digital practice. Furthermore, there is need for regulatory rules and licencing so as not to hinder the use of TR in physiotherapy, and for a fair reimbursement policy to encourage physiotherapists delivering rehabilitation by means of TR (Lee, 2020). Digital practice should be emphasised and encouraged among physiotherapists to promote the use of technology in physiotherapy practice. Individuals in leadership positions should be technologically trained to ensure the promotion of digital practice and collaboration with health professionals for its advancement (Dantas et al., 2020). The WHO reported that TR is effective, feasible, and acceptable to use (Labrique et al., 2020).

The WHO stressed that TR or any digital practice should complement rather than replace the traditional methods of healthcare delivery (Mehl et al., 2021). The patients' safety and privacy should also be maintained (Mehl et al., 2021). Where traditional methods are not feasible on a regular basis, TR can act as one of the tools to promote health for all by providing access to rehabilitation to all who need it both in rural and urban areas (Kodali, 2023).

Telerehabilitation is an emerging mode of healthcare delivery and may be used to facilitate access to rehabilitation services and to complement face-to-face rehabilitation (Bettger & Resnik, 2020; Nizeyimana et al., 2022). Telerehabilitation may assist to improve efficiency in service delivery by reducing travelling times needed for healthcare workers to provide face-to-face community-based or home-based care in remote locations (Labrique et al., 2020; Nizeyimana et al., 2022). However, the broad utility of TR in LIMCs is unclear. In addition, while there are many potential benefits associated with the use of TR, the barriers and facilitators to using TR in LMICs need to be established. Therefore, the aim of this scoping review was to explore the use of TR in physiotherapy in LMICs. The specific objectives have been described in Section 1.3 above.

2.2 Methodology

2.2.1 Study Design

A scoping review is defined as a summary of the literature that aims to identify, map, and summarise different types of evidence and critical concepts related to a research field (Arksey & O'Malley, 2005). This scoping review was used to explore the use of TR in physiotherapy in LMICs from 2000 to 2024. A six-step methodological framework was followed during the review process (Arksey & O'Malley, 2005). These steps included: identifying the research question, identifying relevant studies, study selection, charting, collating, and summarising the data, reporting results, and consultation. The final consultation step was not conducted as part of this scoping review due to constraints in the research timelines.

2.2.2 Search Strategy

An initial systematic search of the literature using MeSH terms and keywords was conducted by the reviewer on 28 July 2023, and a second search was conducted on 20 March 2024 targeting articles published from 29 July to 20 March 2024. Four databases (PubMed, Web of Science, Scopus, and EBSCOhost) were included in this scoping review.

Within the EBSCOhost database, the following databases were searched: Academic Search Premier, Africa Wide information, CINAHL, and Health Source Nursing/Academic Edition. Grey literature was searched for using Google Scholar, ProQuest, and LexisNexis Online (South Africa). The search date range was 1 January 2000 to 20 March 2024. The date range was selected as it represents a period of rapid advancement in the use of technology in healthcare in the 21st century, and even more so since the COVID-19 pandemic, which necessitated a rapid shift towards using digital technology in many areas of healthcare including rehabilitation services.

2.2.3 Search Terms and Types of Sources

The search terms included: 'virtual rehabilitation' OR 'remote rehabilitation' OR 'telerehabilitation' (MeSH term) AND 'physical therapy' OR 'physiotherapy' OR 'physical therapist' OR 'physiotherapist.' A search filter for LMICs was included (August 2021) for PubMed, EBSCOhost, Web of Science, and Scopus. The search filter for LMICs was used instead of search terms like 'lower-middle income countries' and 'middle-income countries' which was developed by UCT library. The search filter had words that define LMICs and a list of all countries that fall in the category of LMICs. The words that define LMICs and list of countries that are categorised under LMICs were used according to each databases unique requirements for the retrieval of articles. A senior librarian from the University of Cape Town's Bongani Mayosi Health Sciences Library assisted in identifying search terms for each database, which has been included in Appendix A. All qualitative and quantitative study designs were included. Scoping reviews, narrative reviews, and systematic reviews were excluded. Editorials, case reports, commentaries, and opinion pieces were also excluded.

2.2.4 Inclusion and Exclusion Criteria

The inclusion and exclusion criteria were developed in accordance with the population, concept, and context (PCC) framework developed by the Johanna Briggs Institute (JBI) framework (Peters et al., 2020) and are presented in Table 1 below.

Table 1. Inclusion and Exclusion Criteria.

PCC FRAMEWORK	ARTICLES SELECTED AND INCLUDED IN THE REVIEW
POPULATION	Studies conducted on TR in physiotherapy or physical therapy in LMICs were included. Studies that reported the use of TR by any other health professional, namely medical doctors, nurses, occupational therapists, social workers, psychologists, speech and language therapists, audiologists, and dentists were excluded.
CONCEPT	Studies that focussed on impairments, activity limitations, participation restrictions of conditions or diseases being addressed through TR by physiotherapists were included. Studies that described the nature and modes of delivery of TR interventions used by physiotherapists for patient care were included. Studies that reported barriers and facilitators to the implementation and use of TR by physiotherapists were also included. Only data sources in English were included. Case series, randomised controlled trials, and quantitative and qualitative studies were included. Single case reports, pilot studies, systematic reviews, scoping reviews, editorials, and commentaries were excluded. We elected to exclude single case reports and pilot studies due to small sample sizes and limitations in generalisability.
CONTEXT	Studies conducted in LMICs were included. Studies conducted on TR in physiotherapy in High Income Countries (HICs) were excluded from the scoping review.

2.2.5 Article Selection

Electronic databases and grey literature sources were searched. A search of the electronic databases retrieved 669 articles, with 304 results from EBSCOhost, 59 results from PubMed, 82 results from Scopus, and 224 results from Web of Science. All records from electronic databases were imported from EndNote20 into Rayyan, a web application used for screening abstracts in systematic reviews. Using the process of semi-automation, duplicate detection was performed, and duplicate records were manually checked by the student researcher before being excluded (n = 147). Title and abstract screening were performed on the remaining records (n = 522) by the student researcher and two research assistants, who were both qualified physiotherapists, and had undergraduate training in research methods. The two research assistants however had no prior experience with scoping review methodology. Two research assistants were used to cover the initial (July 2023) and updated (March 2024) searches. This was needed as the first research assistant was unavailable in March 2024 due to unforeseen circumstances. The two research assistants were informed of the eligibility criteria and the objectives of the scoping review two weeks prior to the screening process and familiarised themselves with the Rayyan software. The blinding of both reviewers' selections was turned on in Rayyan for the title and abstract screening.

Once the abstract screening was completed, the blinding was turned off, which allowed the primary reviewer to check the discrepancies between reviewers (n = 108). All discrepancies between the reviewers were discussed, and a decision was made on whether to include or exclude these records. Once all discrepancies were resolved, the remaining records (n = 53) were exported into EndNote20 for full-text review. Full-text articles were screened independently by the two reviewers for inclusion and exclusion criteria, discrepancies were discussed and resolved, and a final decision was made for articles from electronic databases to be included in this scoping review (n = 26). A grey literature search was performed by the student researcher and 19 potential records were identified on title and abstract screening. Four records were exported into EndNote20 for full-text review, but all were subsequently identified as literature reviews and were excluded. Therefore, the final number of articles included in this review was 26.

2.2.6 Data Extraction

Data from the articles selected for full-text analysis were extracted into an Excel spreadsheet. The extracted data included: country of origin, number of participants receiving TR, patient characteristics (i.e., age and sex) and health conditions, impairments, activity limitations, and participation restrictions addressed by TR. In addition, data on the TR mode of delivery, duration, and frequency of the TR intervention, as well as the perceived benefits, facilitators, and barriers to TR, and the outcomes of the TR intervention were also extracted. The data extraction sheet was not piloted but was refined during the extraction process. Minor amendments were made to the order and grouping of items in the data extraction sheet. The scoping review data is available from the researchers upon reasonable request as the scoping review protocol has not been published or made available on a repository such as the Open Science Framework.

2.3 Results

The screening process is outlined in the PRISMA-ScR diagram below (Figure 2). Twenty-seven records could not be retrieved, as these were unavailable on databases accessible to UCT staff and students. These sources could also not be retrieved by UCT librarians.

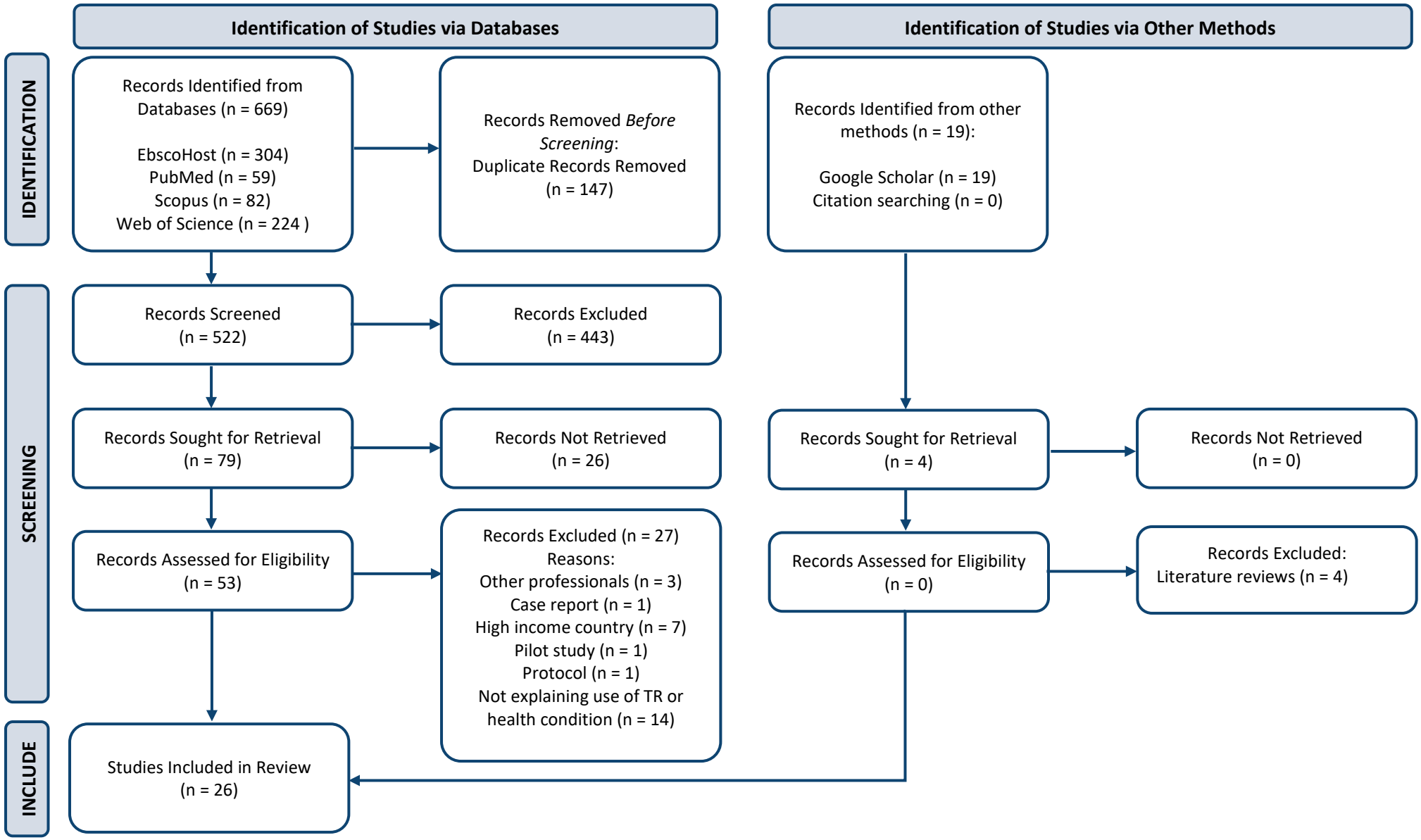

Figure 2. PRISMA-ScR Diagram of Studies Included and Excluded in the Scoping Review.

2.3.1 Overview of Studies

The articles included for the final analysis (n = 26) were published across seven LMICs, with most studies conducted in Türkiye (n = 16) and Brazil (n = 4), followed by Nigeria (n = 2), India (n = 1), Sri Lanka (n = 1), Iran (n = 1), and Thailand (n = 1). Since the review only included LMICs, a small number of countries with a limited pool of data were available for comparison. The patient-based study participants (n = 1266) comprised of infants to older adults ranging from three months to 80 years of age. Male (n = 482) and female (n = 684) patients were represented across the studies included for review. The gender of 100 participants was not reported but added to the total (Schlichting et al., 2022). Most studies did not report on the digital literacy characteristics of the patients receiving TR interventions. Where the digital literacy of patients was reported, this focused on criteria related to access to digital devices such as computers or smartphones, and internet accessibility. In addition, although the researcher planned to extract data to describe the characteristics of the physiotherapists providing the TR intervention, this was inconsistently reported and it was not possible to synthesise sufficient data for reporting purposes.

The mode of TR varied among the included studies, with 15 studies reporting utilising videoconferences only, four using phone calls only, and two reporting on the use of recorded videos of exercises only. The remaining studies reported a combination of some of these modes as well as messaging. The nature of TR only included treatment in 23 studies and treatment and assessment in three studies. A variety of health conditions were targeted during TR. Twelve studies focused on musculoskeletal conditions and 10 on neurological conditions. Two studies involved COVID-19, with one study focusing on cardiorespiratory conditions and the other on diseases of lifestyle. Table 2 provides an overview of the articles included for analysis and their focus aligned to the ICF.

Table 2. Studies Characteristics and International Classification of Functioning, Disability, and Health Considerations.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Arslan and Gültekin (2023)	Türkiye	Randomised controlled trial	Participants: 60 female patients with patellofemoral pain syndrome Age: 18-40 years old Health condition: Patellofemoral pain syndrome Impairments/activity limitations/participation restriction: Pain, muscle weakness, and reduced knee range of motion	The aim was to compare the effectiveness of the outcomes in terms of pain, quality of life and kinesiophobia. Participants were randomly allocated to three groups: online exercise, home exercise, & control group. Online exercise group (n = 20) were supervised by a physiotherapist using videoconference (Zoom), the home exercise group (n = 20) were given similar exercise as the online group but had to do them independently without supervision and the control group (n = 20) were not given any exercise during the study period and the treatment program in both groups was carried out at home. The exercise regimen consisted of strengthening and stretching exercises for the lower limbs. There was pre and post intervention evaluation at baseline and six weeks after treatment.	Videoconferencing	Treatment
Barboza et al. (2022)	Brazil	Prospective case series	Participants: 47 patients with mild to moderate Parkinson's disease, with a score between stage I and stage III classification according to Hoehn and Yahr classification scale. 40 participants: females (n = 14) and (n=26) males completed the study Age: 50 years and above Health condition: Parkinson's disease Impairment/activity limitation/participation restriction: Pain, fatigue, and impaired balance	The aim was to determine the viability of TR in improving impairments associated with Parkinson's disease. The study had four phases: phone calls, social media training, baseline, and post-intervention assessment and a TR intervention. The 47 participants met inclusion criteria for the study during screening, but seven participants dropped out of the study due to not wanting to participate remotely (n = 3) or had internet connection problems (n = 4). During the study six more participants dropped out due to internet connection problems (n=1), 20% absence from the physical therapy interventions (n=3), abdominal surgery (n=1), and voluntarily withdrew (n=1). The TR intervention was supervised by physiotherapist using videoconference. The study had pre- and post-evaluation assessment at baseline and at 20 weeks post intervention.	Videoconferencing and phone calls	Treatment
Celikel et al. (2023)	Türkiye	Randomised controlled trial	Participants: 30 patients with spastic paraparesis due to cerebral palsy with a Gross Motor Function Measure of I and II. Nine males and 16 females Age: 3-17 years old Health condition: Cerebral palsy (spastic paraparesis) Impairments/Activity limitation/Participation restriction: Pain and fatigue	This study aimed to compare the effect of motor-based learning on quality of life of children with spastic paraparesis using TR and face to face management. The children were randomized into control group (n = 15) and TR group (n = 15). In the TR group, the motor learning intervention was followed by a physiotherapist using videoconferencing at home, while face to face management was clinic-based. Five participants were lost on follow up, the reasons were due to loss on contact during the intervention (n = 4) in the TR group and not able to come to the clinic in the control group (n=1). The children were followed for two months and had pre-test and post-test intervention evaluation.	Videoconferencing	Treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Eldemir et al. (2023)	Türkiye	Randomised controlled trial	Participants: 32 patients participated with mild to moderate Parkinson's disease according to Hoehn and Yahr scale of classification of stage I and stage III. There were 11 females and 19 males Age: 45 to 70 years old Health condition: Parkinson's disease Impairments/Activity limitation/Participation restriction: Muscle weakness	The aim was to determine the effectiveness of task-oriented circuit training-based TR in improving upper extremity motor function in Parkinson's disease. Participants were randomised into a TR group (n=16) and control group (n=16). Two patients dropped out due to hospitalisation (n=1) and risk of COVID-19 outbreak (n=1). The TR group did exercise under supervision of a physiotherapist using videoconference while the control group had a booklet with exercise. Both groups did the exercises at home. The study had pre- and post-evaluation assessment at baseline and six weeks after intervention.	Videoconferencing	Treatment
Gondim et al. (2017)	Brazil	Single randomised controlled trial	Participants: 28 patients with mild to moderate Parkinson's disease according to Hoehn and Yahr stage I and III scale. The study had 12 females and 16 males Age: 50 to 80 years old Health condition: Parkinson's disease Impairment/Activity limitation/Participation restriction: Muscle weakness and challenges with activities of daily living	The objective was to investigate the effects of individualised orientation and monitoring using a telephone self-supervised home exercise program on Parkinson's disease. The trial involved systematically choosing participants weekly who came for consultation as outpatients. One of the two patients with Parkinson's disease scheduled per day participated in the study. The participants were randomly assigned to the control group (n=14) and the treatment group (n=14). The study involved weekly phone calls from a physiotherapist to check on progress of the exercises, to clarify on the exercise programme and encourage continuation of the exercise for a period of 12 weeks in the TR group while the control group received a lecture on physiotherapy exercises twice in two months during the consultation days and the physiotherapy treatment programme was done at home in both groups. There was pre-intervention evaluation during the first week and post-intervention evaluation in the 12th week.	Phone calls	Treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Haciabbasoğlu et al. (2023)	Türkiye	Single blind randomised controlled trial	Participants: 44 patients with Benign Paroxysmal Positional Vertigo. The study had 24 females and 18 males Age: 18 to 65 years old Health condition: Benign Paroxysmal Positional Vertigo Impairments/Activity limitation/Participation restriction: Impaired balance and anxiety	The main objective was to find out which treatment technique was effective between traditional vestibular rehabilitation and vestibular rehabilitation exercises administered through TR. The participants were recruited using convenience sampling technique. A random computer number generator R was used to allocate participants into control and treatment group. Two participants out of 44 did not continue with the study hence ended up with allocating 21 participants in the control and treatment group (n=21) and both interventions were done at home and both participants were recruited as outpatients at a hospital. The TR group had supervision by a physiotherapist via videoconference of each exercise session twice in a day while the control group was given exercises in an electronic PDF format with details on how to do them and were called twice a week using a phone to check if they were adhering to the exercise programme for a period of six weeks. The study had a pre- and post-evaluation of the interventions at baseline and after six weeks of treatment.	Videoconference	Assessment and treatment
Kayabınar et al. (2021)	Türkiye	Quantitative study	Participants: 40 teachers were recruited with 31 females and nine males, but 18 teachers were involved in the TR programme as other teachers did not consent to participate in the TR intervention Health condition: Neck pain, hip pain, and back pain Impairments/Activity limitation/Participation restriction: Pain, muscle weakness, anxiety, depression, and work discomfort	The aim was to investigate the changes in musculoskeletal conditions and psychosocial status of teachers providing online education during the COVID-19 pandemic and preventive measures to reduce musculoskeletal conditions through TR. The study had 40 participants but only 18 participants did a TR intervention as other teachers did not consent but were only involved in the initial online assessment. The programme involved posture and ergonomics for teachers who were doing online teaching and there were pre- and post-intervention assessments of the musculoskeletal and psychosocial outcomes during the 1st and 4th weeks.	Videoconference	Treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Khruakhorn et al. (2023)	Thailand	Single centre, single blind, randomised controlled trial	Participants: 23 female participants with Kyphosis, and a thoracic angle of more than 45 degrees were recruited Age: 60 years and above Health condition: Kyphosis Impairments/Activity limitations/Participants restriction: Poor posture and muscle weakness	The aim was to evaluate the effects of TR and face-to-face management of elder people with Kyphosis in terms of muscle strength, cost-effectiveness, and posture correction of abnormal kyphotic angle. The participants were randomised into control group (n = 11) and TR group (n = 12). There was loss on follow up (n=1) in the TR group. The exercises were supervised at home by a physiotherapist using videoconference while the control group had a physiotherapist providing them with exercise face-to-face for eight weeks. The study had a pre-and post-assessment at baseline and after eight weeks of intervention.	Videoconference	Treatment
Lima et al. (2022)	Brazil	Single blind randomised controlled trial	Participants: 49 patients with low and moderate risk of physical exercise, with seven females and 42 males Age: 18 years and above Health condition: Post myocardial infarction, post percutaneous coronary intervention, and coronary bypass graft operation Impairments/Activity limitation/Participation restriction: Depression	The main objective was to compare effectiveness, cost, and adherence of cardiac TR with face-to-face cardiac rehabilitation. Participants were randomised into two groups: traditional cardiac group (n = 23) and TR group (n = 26). Seven participants were lost on follow up due to financial constraints (n = 1) and voluntarily withdrawal (n = 6). Of those, two were from the TR group who voluntary withdrew as they lost interest in the cardiac rehabilitation treatment. The home cardiac group had two supervised exercise sessions and 58 unsupervised sessions at home. The TR cardiac rehabilitation group had 24 supervised sessions and 36 unsupervised sessions at home. The study had a pre- and post-intervention evaluations at baseline and 12 weeks.	Phone call	Treatment
Manzak Dursun et al. (2024)	Türkiye	Single blind randomised controlled trial	Participants: 32 adolescents with Scoliosis and a Cobb angle between 25 degrees and 50 degrees, with 30 females and 10 males Age: 10 to 18 years old Health condition: Adolescent Idiopathic Scoliosis Impairment/Activity limitation/Participation restriction: Muscle weakness	The study evaluated the effects of a Pilates-based exercise programme using TR on patients with scoliosis. Participants were randomised to control (n = 16) and TR group (n = 16). The control group received a list of exercise weekly via an electronic book while the TR group had three sessions of Pilates exercise per week under supervision of a physiotherapist via videoconference and the remaining days they did the exercise alone. There was loss in follow up (n = 1) in the control group as patient attended a different exercise therapy to the study. All exercise interventions were done at home by the participants. The study had a pre- and post-evaluation assessment at baseline and after 12 weeks of intervention.	Videoconference	Treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Mbada et al. (2019)	Nigeria	Quantitative study	Participants: 56 patients with lower back pain with a McKenzie extension preference, with 34 females and 13 males Age: 20 to 60 years old Health condition: Chronic back pain Impairments/Activity limitation/Participation restriction: Pain	The aim was to compare the effects of TR-based McKenzie exercise vs traditional McKenzie exercise among patients with lower back pain. Participants were randomly allocated to treatment and control groups (n=56). During the study, five participants voluntarily withdrew while four did not finish with the intervention. The 47 participants completed the study with 26 participants in the control group and 21 participants in the TR group. The outcome measure was done during first week, 4th week, and 8th week to compare the results of the two groups.	Videoconference and messaging	Treatment
Odole and Ojo (2013)	Nigeria	Randomised controlled trial	Participants: 50 patients were recruited at three outpatient clinics, with 24 females and 26 males Age: 37 to 72 years old Health condition: Knee osteoarthritis Impairments/Activity limitations/Participation restriction: Pain	The main objective was to evaluate the effects of a six-week telephone-based intervention on the pain intensity and physical function in patients with knee osteoarthritis. Patients with knee osteoarthritis attending therapy at three hospitals as outpatients were allocated to intervention and control groups using a computer random number generator. The study involved phone calls to supervise and educate the patients with knee osteoarthritis on exercise programme in the TR group while the control group did their exercises at the hospital. The study had pre- and post-intervention evaluation of pain and physical function at baseline, 2nd week, 4th week, and 6th week.	Phone calls	Treatment
Otadi (2022)	Iran	Case series	Participants: Six participants with torticollis, Erb's palsy and general muscle weakness, with four females and two males Age: eight months to eight years old Health condition: Torticollis, Erb's palsy Impairment/Activity limitation/Participation restriction: -	The aim was to find out the satisfaction rate of patients using TR and face-to-face rehabilitation in children during the COVID-19 pandemic. Three patients with torticollis, one patient with general muscle weakness, and two with Erb's palsy. The exercise programmes were done at home with the assistance of the caregivers and under videoconference supervision of a physiotherapist. The study did not have pre- and post-evaluation assessment.	Videoconference	Treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Özden et al. (2023)	Türkiye	Randomised controlled trial	Participants: 40 patients with Cervical pain not less than 3 months duration, without radicular symptoms, with 29 females and 11 males Age: 18 to 65 years old Health condition: Chronic neck pain Impairments/Activity limitation/Participation restriction: Pain	The study investigated the effectiveness of incorporating exercise and education together through TR compared to exercise alone on pain, disability, kinesiophobia, quality of life, exercise adherence, and patient satisfaction. The participants were randomised into a TR group (n = 22) and a control group (n = 23). There were five participants that dropped out of the study: three from the control group and reasons being loss of contact and voluntarily withdrawal while in the TR group two dropped out due to pregnancy and one relocated. The TR group had in personal exercise coaching before the same exercises were sent to them in the form of videos to their phones using an online platform that also had messaging abilities. The control group received a booklet with exercise pictures having the same exercise as the TR group to use at home. The study had a pre- and post-assessment evaluation at baseline and eight weeks after intervention.	Messaging and asynchronous (video recorded exercises)	Treatment
Özden et al. (2024)	Türkiye	Single blind randomised controlled trial	Participants: 52 patients with chronic back pain for at least three months, without radicular symptoms, with 25 females and 19 males Age: 18 to 65 years old Health condition: Chronic back pain Impairments/Activity limitation/Participation restriction: Pain	The study aimed to evaluate the impact of visual feedback of physio-analyst application on pain, physical fitness, health related quality of life, satisfaction, and adherence in patients with chronic low back pain. The study involved online assessment of chronic low back pain patients and providing a video-exercise programme depending on the outcome of the online assessment that was created using the physio-analyst application. In total, 52 participants were eligible to participate in the study but eight were excluded due to not consenting to the study (n = 4) and had radicular symptoms (n = 4). The 44 participants who remained were randomised to a TR (n = 22) and control group (n = 22). The TR group had exercise with graphic visual feedback while the control group had the same exercise without visual feedback. The study had baseline, 4th week, and 8th week evaluation. The exercises were done at the participants homes.	Asynchronous (recorded videos exercises)	Assessment and treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Ozturk and Duruturk (2022)	Türkiye	Randomised controlled trial	Participants: 41 participants who were either obese or overweight with a Body Mass Index (BMI) of more than +25kg/m^2, with 21 females and 20 males Age: 18 to 65 years old Health condition: Obesity and overweight Impairment/Activity limitation/Participation restriction: -	The aim was to evaluate the effects of exercise training on physical fitness and quality of life in obese and overweight individuals during the COVID-19 pandemic. Participants were randomly allocated to a control (n = 20) and TR group (n = 21). Participants in both groups did their exercise programme at home but the TR had support and videoconference by a physiotherapist during their sessions. The study had pre- and post-evaluation at baseline and the 6th week.	Videoconference	Treatment
Pastana Ramos et al. (2023)	Brazil	Parallel group, single centre, single blind randomised controlled trial	Participants: 19 patients with mild Parkinson's disease stage II or less than II according to Hoehn and Yahr classification, with nine females and 10 males Age: 30 to 80 years old Health condition: Parkison's disease Impairment/Activity limitation/Participation restriction: Muscle weakness, challenges with walking, and coming from sitting to standing	The aim was to find out viability and effectiveness of using TR in an Amazon community with Parkinson's disease. Participants were randomly allocated to a TR (n = 8) and control group (n = 11). During the intervention three participants were lost on follow up, and four participants did not complete evaluation at the 4th and 8th week of the study. The TR group involved doing exercises using videoconference under supervision of a physiotherapist while the control group was provided with a booklet of similar exercises and had the exercise demonstrated by a physiotherapist. The control group had a telephone call once a week for feedback from the physiotherapist. The participants from both groups had assessments at the start of the study, 4th week, and 8th week on follow up after intervention.	Videoconference	Treatment
Pehlivan et al. (2022)	Türkiye	Prospective, single centre, randomised controlled trial	Participants: 40 patients with COVID-19 post-hospital discharge were randomly recruited, with nine females and 25 males Age: 18 to 75 years old Health condition: COVID-19 Impairment/Activity limitation/Participation restriction: Pain and fatigue	To evaluate the effectiveness of exercises done through TR on COVID-19 patients randomly allocated to a TR (n = 20) and control group (n = 20) four weeks post COVID-19 discharge. It was a double-blind study of participants and a physiotherapist. Participants dropped out due to hospitalisation (n = 1), internet and telephone access problems (n = 3), and missing data (n = 1). The TR group did the exercise using videoconference under supervision of a physiotherapist while the control group received a booklet with education and exercise. The training programme was done at home and evaluation via videoconference in both groups due to the COVID-19 pandemic. Outcome measures were done at baseline and at six weeks after the training programme.	Videoconference	Treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Sahin et al. (2023)	Türkiye	Randomised controlled trial	Participants: 42 patients with COVID-19 were recruited after being discharged from the hospital, with 14 females and 28 males Age: 57 to 70 years old Health condition: COVID-19 Impairment/Activity limitation/Participation restriction: Pain, fatigue, and dyspnoea	The aim was to examine the effects of home-based pulmonary rehabilitation exercises with or without tele-coaching on health outcomes in post COVID-19 patients. Participants were allocated to control (n = 24) and intervention groups (n=24). Participants dropped out of the TR group (n = 3) due to not answering phone calls and control group (n = 3) as they did not go for post-evaluation assessment. Both groups were involved in home exercise programmes, education, breathing exercises, regular walking, and strength exercises for eight weeks. The intervention group had phone calls once a week from a physiotherapist. The study had pre- and post-evaluation at baseline and eight weeks after intervention.	Phone calls	Treatment
Schlichting et al. (2022)	Brazil	Quantitative study	Participants: 100 children with risk of cerebral palsy Age: Three months to 18 months old Health condition: Cerebral palsy Impairment/Activity limitation/Participation restriction: Muscle weakness	The aim was to examine the effects of TR exercises on infants with risk of cerebral palsy. Non-probabilistic convenience sampling was used. Gross Motor Function-88 (GMFM) and Alberta Infant Motor Scale (AIMS) were used to assess gross motor skills in infants pre- and post-intervention. One hundred infants at risk of motor delay were recruited for the first stage of the study but only 62 participants consented to participate. The first stage involved motor and neurological assessments to identify children at risk of cerebral palsy and 44 children were excluded as they did not have risk of cerebral palsy while 18 children remained who were identified with risk of cerebral palsy. The children with risk of cerebral palsy did the second stage of the study that involved motor assessment using AIMS but three withdrew before starting the second stage of the study due to lack of time. The 15 participants that remained proceeded to the third stage of the study which was the TR phase. Before the commencement of the stage three children dropped out due to lack of time and 12 participants proceeded with the TR intervention. As the intervention proceeded two children dropped out as their caregivers went to work which left 10 children to finish the TR stage. The study had pre- and post-evaluation at baseline and after 12 weeks and the intervention happened in the participants respective homes.	Videoconference	Treatment and assessment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Supe et al. (2023)	India	Double blind randomised controlled trial	Participants: 70 patients with knee osteoarthritis were recruited, with 64 females and six males Age: 50 years and above Health condition: Knee osteoarthritis Impairment/Activity limitation/Participation restriction: Pain	The aim was to evaluate the combined effects of Pain Neuroscience Education with conventional physiotherapy using TR with conventional physiotherapy alone. The participants were randomly allocated to a TR (n = 35) and control group (n = 35). The study involved online education of Pain Neuroscience Education with conventional therapy in the TR group while the control group did conventional therapy only. Both groups were taught conventional exercise in person by a physiotherapist at an outpatient clinic. All interventions were done at home. The study had pre- and post-evaluation assessments at baseline and after two weeks.	Videoconference	Treatment
Tahran et al. (2023)	Türkiye	Case series	Participants: 3 patients with fibromyalgia were recruited, with two females and one male Age: 40 to 45 years old Health condition: Fibromyalgia Impairment/activity limitation/Participation restriction: Pain	The aim of the case study was to investigate viability and initial outcomes of an online based basic body awareness therapy (BBAT) with fibromyalgia. The basic body awareness therapy was taught online by a physiotherapist using videoconference. The study had a pre- and post-evaluation assessment at baseline and eight weeks after intervention.	Asynchronous (pre-recorded video exercises)	Treatment
Tarakci et al. (2021)	Türkiye	Single blind randomised controlled trial	Participants: 49 patients with the most usual form of multiple sclerosis (relapsing-remitting) were recruited, with 23 females and 7 males Age: 39 years old and above average Health condition: Multiple sclerosis Impairment/Activity limitation/Participation restriction: Challenges doing activities of daily living and fatigue	The aim was to examine the effectiveness of organised TR on fatigue, health status and quality of life, and activity of daily living and compare the effects of structured supervised exercise programmes among patients with multiple sclerosis. Forty-nine participants were eligible for the study, but eight were excluded due to having comorbid conditions (n = 4), pregnancy (n = 1), and medical conditions that made participants not fit for exercise (n = 3). The remaining 41 were randomly assigned to intervention (n = 20) and control groups (n = 21). As the intervention proceeded, 11 dropped out due to personal reasons (n = 5), non-adherence to 80% of the intervention (n = 3), and not showing up for post intervention assessment (n = 3). The TR group did the exercises at home and received phone/video calls from a physiotherapist while the control group did the exercise at an outpatient clinic under the supervision of a physiotherapist. The study had pre- and post-evaluation assessments at baseline and 12 weeks after treatment.	Videoconference and phone calls	Treatment

Table 2 continued.

AUTHORS	COUNTRY OF ORIGIN	STUDY DESIGN	PARTICIPANTS AND ICF CONSIDERATIONS	STUDY OVERVIEW	MODE OF DELIVERY	NATURE OF TELEREHABILITATION
Tekin and Cetisli-Korkmaz (2022)	Türkiye	Randomised controlled trial	Participants: 255 patients with depression, with 117 females and 138 males Age: 65 years and above Health condition: Depression Impairment/Activity limitation/Participation restriction: Impaired balance and depression	The purpose was to evaluate the effects of callisthenic exercises delivered through TR on physical performance, depression, and risk of falling in older adults. Participants were allocated to a TR (n = 133) or control group (n = 133). The TR group had 10 dropouts due to missing or wrong data while the control group had one. The study involved sending videos of exercises to the TR group and after each exercise session the participants were sending back pre-recorded videos of them doing exercise for feedback while the control group did not do any exercises but did only pre- and post-assessments. The study had pre- and post-evaluation at baseline and end of intervention (4 weeks).	Videoconference and asynchronous	Treatment
Timurtaş et al. (2024)	Türkiye	Randomised controlled trial	Participants: 60 patients with non-specific neck pain symptoms for not less than two months were recruited from an outpatient clinic, with 38 females and 22 males Age: 18 to 65 years old Health condition: Non-specific neck pain Impairment/Activity limitation/Participation restriction: Pain	The purpose was to compare effectiveness of synchronous and asynchronous TR in terms of pain, functional disability, kinesiophobia, and mobility in patients with non-specific neck pain. The participants were randomised into synchronous group (n = 30) and asynchronous group (n = 30). There was loss in follow up (n = 3) in the asynchronous group at the 16th week and were not included in final analysis of results. The synchronous involved use of videoconference to provide exercises under supervision of a physiotherapist while asynchronous involved use of pre-recorded videos of exercises and the participants did the exercises at home. The study had evaluation assessment at 4th week, 8th week, and 16th week.	Synchronous and asynchronous videoconference	Treatment
Tore et al. (2023)	Türkiye	Randomised controlled trial	Participants: 50 patients diagnosed with mild to moderate knee osteoarthritis were recruited, with 43 females and five males Age: Average age of 55 years and above Health condition: Knee osteoarthritis Impairment/Activity limitation/Participation restriction: Pain, muscle weakness, and fatigue	The aim was to compare the effects of TR versus home-based exercise in management of knee osteoarthritis. Participants with mild to moderate knee osteoarthritis were selected. The TR group (n = 25) did exercise under supervision of a physiotherapist via video conference while the control group (n = 25) was given a brochure that illustrated how the exercises were to be done, and participants did the exercises on their own without a physiotherapist. The treatment programme in both groups was done in their own homes. Two participants dropped out of the study due to internet access problem and lost on follow up. The study had pre- and post-evaluation assessment at baseline and after eight weeks of treatment.	Videoconferencing	Treatment

2.3.2 Telerehabilitation Delivery in Relation to the International Classification of Functioning, Disability, and Health Considerations

Improvement in pain was reported for various musculoskeletal conditions including patellofemoral pain syndrome (Arslan & Gültekin, 2023), knee osteoarthritis (Odole & Ojo, 2013; Supe et al., 2023), the neck (Kayabınar et al., 2021; Özden et al., 2023), wrist (Kayabınar et al., 2021), fibromyalgia (Tahran et al., 2023), and back (Kayabınar et al., 2021; Mbada et al., 2019). Improvement in pain after TR intervention was reported in patients who had COVID-19 infections (Pehlivan et al., 2022), as well as improvement in perceived fatigue in patients who had COVID-19 following six and eight weeks of TR respectively (Pehlivan et al., 2022). Significant improvement in fatigue was also reported by Tarakci et al. (2021) in patients with multiple sclerosis after 12 weeks, and in patients with knee osteoarthritis after eight weeks of TR (Tore et al., 2023).

Increased muscle strength was reported in patients with Parkinson's disease in the lower limb after 20 weeks of TR intervention (Barboza et al., 2022), in the upper limb after six weeks of TR intervention (Eldemir et al., 2023), and overall after 12 weeks of TR intervention (Gondim et al., 2017). Muscle strength also increased in patients with kyphosis (Khruakhorn et al., 2023) and in patients with lower back pain after eight weeks of TR intervention respectively (Mbada et al., 2019). Manzak Dursun et al. (2024) reported improvement in respiratory muscle strength in adolescents with idiopathic scoliosis after 12 weeks of TR intervention. Following COVID-19 infection, significant improvement in muscle strength in the deltoid and quadriceps muscles were reported after eight weeks of TR intervention (Sahin et al., 2023). Schlichting et al. (2022) reported improvement in general muscle strength in children with cerebral palsy after 12 weeks of TR intervention. Improvement in balance were reported in patients with Benign Paroxysmal Position Vertigo after six weeks of TR intervention (Haciabbasoğlu et al., 2023) and in an elderly group of patients with depression after four weeks of TR intervention (Tekin & Cetisli-Korkmaz, 2022).

Improvement in psychological outcome measures including anxiety and depression were reported in patients with a range of conditions following different durations of TR (Barboza et al., 2022; Celikel et al., 2023; Eldemir et al., 2023; Gondim et al., 2017; Pastana Ramos et al., 2023; Supe et al., 2023; Tore et al., 2023). This included patients with Parkinson's disease after 20 weeks of TR treatment (Barboza et al., 2022), patients with Benign Paroxysmal Position Vertigo after six weeks of TR intervention (Haciabbasoğlu et al., 2023), and patients with COVID-19 after six weeks (Pehlivan et al., 2022). Improvements were also noted after four weeks of TR intervention in teachers and the elderly respectively (Kayabınar et al., 2021; Tekin & Cetisli-Korkmaz, 2022).

Improvements in anxiety, depression, and fear of movement (kinesiophobia) were reported in patients with knee osteoarthritis after eight weeks of TR (Tore et al., 2023). Özden et al. (2023) reported significant improvement in fear of movement in patients with chronic neck pain after eight weeks of TR intervention compared to the control group. Improvements in quality of life were reported for patients with Parkinson's disease after six weeks (Eldemir et al., 2023), 12 weeks (Gondim et al., 2017), and 20 weeks (Barboza et al., 2022) of TR respectively. Haciabbasoğlu et al. (2023) also reported improvement of quality of life in patients with Benign Paroxysmal Position Vertigo after six weeks of TR intervention, whereas Özden et al. (2023) reported significant improvement in quality of life after eight weeks of TR. Ozturk and Duruturk (2022) reported a statistically significant improvement of quality of life among obese and overweight individuals following TR intervention compared to the control group after six weeks, whereas Tarakci et al. (2021) reported significant improvement in quality of life in patients with multiple sclerosis after four weeks of TR. Tahran et al. (2023) reported a decrease in functional disability and improvement of body awareness in patients with fibromyalgia after eight weeks of TR intervention, whereas Timurtaş et al. (2024) reported a decrease in functional disability and fear of movement in patients with non-specific neck pain using both asynchronous and synchronous TR.

Improvement in functional activities were reported for various conditions following different durations of TR (Celikel et al., 2023; Eldemir et al., 2023; Gondim et al., 2017; Pastana Ramos et al., 2023; Supe et al., 2023; Tore et al., 2023). Functional improvement were reported in patients with Parkinson's disease after four, six, 12, and 20 weeks of TR intervention respectively (Barboza et al., 2022). Children with cerebral palsy who presented with spastic paraparesis showed functional improvements following two months of TR (Celikel et al., 2023). Functional improvements were also reported in patient who had COVID-19 infection after six weeks of TR (Pehlivan et al., 2022). In patients with knee osteoarthritis improvements in general function following eight weeks of TR and in local knee function following two weeks of TR were reported (Supe et al., 2023; Tore et al., 2023). Tekin and Cetisli-Korkmaz (2022) also reported statistical significant improvement of physical function in a group of elderly patients with depression following four weeks of TR compared to a control group, whereas Tarakci et al. (2021) reported significant improvement in activities of daily living in patients with multiple sclerosis after 12 weeks of intervention. Lima et al. (2022) reported improvement in physical fitness in patients undergoing cardiac rehabilitation following TR intervention, whereas Manzak Dursun et al. (2024) reported significant improvement in the pulmonary function and respiratory muscle strength of adolescents with idiopathic scoliosis after 12 weeks of TR.

The mode of delivery and nature of TR alongside the outcome measures and results of each study are presented in Table 3 below.

Table 3. Summary of Telerehabilitation, Intervention Duration, Outcomes, and Results.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Arslan and Gültekin (2023)	Exercise program was done three times a week for six weeks	▪ Visual analog scale was used to evaluate pain	▪ Significant improvement of pain at rest using Visual Analog Scale with a mean score of -2.25 ± 2.15; p<0.001 with a significant level of p value which was set at p < 0.05
		▪ Handheld dynameter was used to evaluate muscle strength	▪ Significant improvement of muscle strength in TR group pre-post intervention in hamstring, quadriceps, and hip muscles at p=0.000
		▪ Universal goniometer was used to evaluate knee range of motion	▪ Significant increase in range of motion of the knee flexion pre-post intervention with a mean score of 4.20 ± 5.43; p=0.049
		▪ Quality of life was evaluated by Short Form-36	▪ Significant improvement in quality of life in patients with patellofemoral pain syndrome in TR with a total mean score of 16.94 ± 13.17; p=0.000 after pre-post intervention scored using Short Form-36 Quality of Life Scale
Barboza et al. (2022)	20 exercise sessions, once weekly, 1 hour each; 50 minutes of exercise and 10 minutes of stretching, 30 seconds position hold and 30 seconds for recovery	▪ Hospital Anxiety and Depression Scale was used to evaluate anxiety and depression	▪ Improvement in depressive symptoms from a mean score of 5.62 to 5.69 after intervention with a no statistical significance p value of 0.796 from a significance level of p<0.05. Improvement in anxiety symptoms from a mean score of 5.44 to 5.46 with a no statistically significant p value 0.695 from a significance level of p<0.05
		▪ Movement Disorder Society Unified Parkinson's Disease Rating Scale was used to evaluate activities of daily living	▪ Improvement in functional activities from a mean score of 14.31 to 14.18 according to Movement Disorder Society Unified Parkinson's disease Rating Scale part II with no statistically significant p value 0.940 from a significance level of p<0.05
		▪ Falls Efficacy Scale International was used to evaluate risk of falling	▪ Improvement in risk of falling from a mean score of 22 to 41 on Falls Efficacy scale with a no statistically significant p value of 0.702 from a significance level of p<0.05
		▪ Verbal Fluency was used to evaluate semantics and phonemic fluency in 1 minute	▪ Significant improvement in verbal fluency from a mean score of 15.64 to 17.23 with a statistical significance p value of 0.027 from a significance level of p<0.05
		▪ Parkinson's Disease Questionnaire-39 was used to evaluate quality of life	▪ Improvement of quality of life from a mean score of 30.51 to 30.31 according to Parkinson's Disease Questionnaire-39 with a no statistically significant p value of 0.761 from a significance level of p<0.05.
		▪ 5 Time Sit to Stand test	▪ Improvement in Lower limb muscle strength from a mean score of 15.11 seconds to 13.72 seconds according to 5 Times Sit to Stand test with a statistically significant p value of 0.010 from a significance level of p<0.05

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Celikel et al. (2023)	Motor learning treatment was done twice in a week each session lasted 40 minutes under supervision of a physiotherapist both online for TR group and in person for face-to-face patients	▪ Pediatric Quality of Life Inventory under activities of daily life subscale	▪ There was improvement in daily life activities from a lowest median value of 33.3 to 52.7 after treatment on a subscale of Pediatric Quality of Life Inventory with a no statistically significant p value of 0.247 after TR from a significance level of p<0.05
		▪ Pediatric Quality of Life Inventory under play activities subscale	▪ Increase in play activities from a lowest median value of 46.88 to 56.2 after treatment on a subscale of Pediatric Quality of Life Inventory with a statistically significant p value 0.018 from significance level of p<0.05
		▪ Pediatric Quality of Life Inventory under walking balance subscale	▪ Improvement in walking balance from a lowest median value of 55 to 65 after treatment on a subscale of movement balance on Pediatric Quality of Life Inventory with a no statistically significant p value of 0.110 from a significance level of p<0.05
		▪ Pediatric Quality of Life Inventory under pain subscale	▪ Improvement of pain from a lowest median value of 81.25 to 87.5 after treatment on the subscale of pain-hurt of Pediatric Quality of Life Inventory with a statistically significant p value of 0.023 from a significance level of p<0.05
		▪ Pediatric Quality of Life Inventory under fatigue subscale	▪ Improvement in fatigue from a lowest median value of 43.75 to 62.5 after treatment on a subscale of fatigue on a Pediatric Quality of Life Inventory with a statistically significant p value of 0.015 from a significance level of p<0.05
		▪ Pediatric Quality of Life Inventory under eating activities subscale	▪ Improvement in eating activities from a lowest median value of 43.25 to 65 after treatment on a subscale of Pediatric Quality of Life Inventory with a statistically significant p value of 0.026 from a significance level of p<0.05
		▪ Pediatric Quality of Life Inventory under speech subscale	▪ Improvement of speech communication activities on Pediatric Quality of Life Inventory Scale with a statistically significant p value of 0.008 from a significance level of p<0.05
Eldemir et al. (2023)	Task oriented circuit training three times a week for 6 weeks	▪ Nine Hole Peg Test(dexterity), Jebsen Hand Function Test (fine and gross motor skills), J-Tech Grip strength device (hand grip strength), Baseline Hydraulic Pinch Meter (pinch strength)	▪ Improvement of muscle strength like dexterity with a statistically significant p<0.001, hand fine motor and gross motor skills with a statistically significant p<0.001, hand grip strength with a statistically significant p<0.001 and pinching strength p<0.015 in TR group with a significance level p<0.05
		▪ Movement Disorder Society Unified Parkinson's Disease Rating Scale part II (activities of daily life)	▪ Improvement in activities of daily life with a statistically significant p<0.001 in both TR and control group with a significance level p<0.05
		▪ Parkinson's Disease Questionnaire-8	▪ Improvement of quality of life with a statistically significant p=0.005 in patients with Parkinson's disease in both TR and control group with a significance level p<0.05

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Gondim et al. (2017)	60 min Exercise session at home three times a week, for 12 weeks. Participants had phone calls weekly to monitor, encourage and clarify any challenges faced during exercises.	▪ Movement Disorder Society Unified Parkinson's Disease Rating Scale part II (activities of daily life) ▪ Movement Disorder Society Unified Parkinson's Disease Rating Scale part III (motor examination) ▪ Parkinson's Disease Questionnaire-39	▪ Improvement in ADLS in Parkinson's disease patients in TR group from a mean score of 14 to 9 according to Movement Disorder Society Unified Parkinson's Disease Rating Scale for activities of daily life with a statistically significant Wilcoxon p value of 0.002 with a significance level of p<0.05 ▪ Improvement in muscle strength in TR group from a decrease in mean score 19 to 13 according to Movement Disorder Society Unified Parkinson's Disease Rating Scale- Motor examination section with a statistically significant Wilcoxon p value of 0.001 with a significance level p<0.05 ▪ Improvement in health-related quality of life in TR group with a total mean score of 30 to 19 on Parkinson's Disease Questionnaire-39 after intervention with a statistically significant Wilcoxon p value of 0.005 with a significance level of p<0.05
Haciabbasoğlu et al. (2023)	Twice daily Exercise session of 25-30 minutes session for six weeks	▪ Romberg Test, Tandem Test, and Semi-Tandem Test ▪ Vertigo Severity Scale ▪ Dizziness Handicap Inventory ▪ Becky Anxiety Inventory ▪ Vertigo Dizziness Imbalance Questionnaire	▪ TR group had a statistically significant improvement in balance (tandem, semi-tandem) at p<0.0001, except Romberg test p=0.173 from a significance level of p<0.05 ▪ Decrease in severity of vertigo in TR group from 32.33±12.22 to 9.29±9.24 on Vertigo Severity Scale after treatment with a significant p value of 0.0001 from a significance level of p<0.05 ▪ Decrease in disability level due to vertigo from 69.19±10.49 to 16.71±10.53 after treatment using a Dizziness Handicap inventory with a statistically significant p value of 0.0001 in the TR group with a significance level of p<0.05 ▪ Decrease in anxiety from 36.1±11.47 to 15.19±8.79 after treatment on Becky Anxiety Inventory mean score with a statistically significant p value of 0.0001 in the TR group with a significance level of p<0.05 ▪ Improvement of health-related quality of life using Vertigo Dizziness Imbalance Questionnaire with a statistically significant p value of 0.0001 in the TR group with a significance level of p<0.05

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Kayabınar et al. (2021)	Education and ergonomics during online class session on computer, tablet, and phone	▪ The Cornell Musculoskeletal Questionnaire, The ProfitMap Neck, Upper extremity Functional Index and Oswestry Disability Index evaluated musculoskeletal problems ▪ Becky Anxiety Inventory and Becky Depression Inventory ▪ Work Life Balance Scale	▪ Significant improvement in the neck pain at p=0.002, lower back at p=0.008, hip at p=0.044, right wrist at p=0.050 after training with a significant level p<0.05 in the TR group. No profound improvement in lower legs, upper extremities in the TR group ▪ Significant improvement in anxiety and depression in TR group after treatment at p=0.001 with a significance level p<0.05 ▪ Improvement in work life balance at p=0.002 after treatment in TR group with a significance level p<0.05
Khruakhorn et al. (2023)	60 minutes session, thrice a week for eight weeks and via a real time physiotherapist supervised exercise programme	▪ Dual Digital Inclinometer ▪ Back-Leg-Chest Dynameter ▪ The Tragus to Wall Test	▪ Significant improvement in kyphotic angle in from 52.73 degrees to 46.27 degrees in TR group and 52.73 degrees to 46.64 degrees in clinic-based group with p=0.01 with significance level p<0.05 ▪ Significant improvement in back muscle strength from 42.83 to 51.02 in TR group and 48.96 to 56.34 in clinic-based group evaluated by a back-leg-chest dynameter with a p=0.01 with a significance level of p<0.05 ▪ Significant improvement in forward neck posture from 13.21 to 12.07 in TR group and 13.27 to 12.05 in clinic-based group at p=0.01 when the p value was tested at p<0.05 ▪ TR was cost effective USD 420.15 compared to face-to-face intervention which was USD 555.15
Lima et al. (2022)	12-week exercise programme, including 5-10 minutes warm up, 40 minutes of aerobics exercise, 5-10 minutes of cool down	▪ Patient Health Questionnaire-9 ▪ Duke Activity Status Index Score ▪ Short Form-36	▪ Improvement in adherence to cardiac rehabilitation exercise program by 94.18% of the TR group compared to 79.08% by face-to- face cardiac rehabilitation ▪ TR cardiac group reduced health cost by $59.31 as compared to $135.05 by face-to- face cardiac rehabilitation ▪ Moderate improvement in depressive symptoms in cardiac patient at a significance level p<0.05 ▪ Improvement in physical function in cardiac patients at a significance level at p<0.05 ▪ Improvement in quality of life in cardiac patients at a significance level p<0.05

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Manzak Dursun et al. (2024)	One hour of Pilates-based exercise, including 40 minutes of scoliosis exercise and 10 minutes warm up and cool down, daily for 12 weeks	▪ Respiratory pressure measuring device according to American Thoracic Society/European Respiratory Society ▪ Incremental Shuttle Walk Test ▪ Spirometry evaluated Forced Vital Capacity and Peak Expiratory Flow	▪ Improvement of respiratory muscle strength; Mean inspiratory pressure increase from 51.06±13.85 to 76.50±6.37,95% CI, P=0.021, Mean Expiratory Pressure increase from 67.75±13.05 to 96.43±8.37, 95% CI, P=0.320 ▪ Decrease in cobb angle from 37.50±7.37 to 32.43±7.06 measured in degrees;95% CI, p=0.021 ▪ Increase in functional capacity from mean score of 483.68±106.20 to 517.50±115.78 according to incremental shuttle walk test measured in meters with a statistical significance of p=0.009,95% CI. Improvement in pulmonary function from mean 92.62±11.59 to 94.50±14.13 score of Forced Vital Capacity (FVC) in percentage,95% CI, p=0.029
Mbada et al. (2019)	Education and four types of McKenzie extension exercises, three times a week for eight weeks	▪ Quadruple Visual Analog Scale ▪ Roland Morris Disability Questionnaire ▪ Oswestry Disability Index ▪ Biering-Sorensen Static Muscular Endurance ▪ SF-12 General Health Status Questionnaire	▪ Improvement of back pain intensity on Quadruple Visual Analog Scale Mean Score 10.6±7.86 in Telerehabilitation group and a mean score of 21.2±9.66 in the control group with a statistically significant p=0.001 after 8 weeks of intervention with significance level p<0.05 ▪ Improvement in activity limitation with a mean score of 2.29±2.47 in the TR group and 2.50±1.72 in the control group with a statistically significant in both groups of p=0.001 with a significance level of p<0.05 ▪ Improvement in participation restriction with a mean rank of 22.8 in TR group and mean rank of 25 in control group with a statistically significant p=0.001 in both groups ▪ Improvement of back extensor muscle endurance with a mean score of 40.1±13.6 in TR group and 35.4±11.4 in control group with a statistically significant p=0.001 in both groups ▪ Significant improvement in health-related quality of life in all groups (p=0.001) except role limitation in TR group with p=0.493
Odole and Ojo (2013)	Exercises, three times a week for six weeks	▪ Visual Analog Scale ▪ Ibadan Knee/Hip Osteoarthritis Outcome Assessment Measure evaluated physical function	▪ Significant decrease in knee pain in TR group with a mean score of 55.84±17.83 at baseline to 18.84±15.99 at sixth week of evaluation with a p <0.01 from a significant level of p<0.05 ▪ Improvement of level of physical function in TR group from a mean score at baseline of 72.84±11.44 to 83.70±10.26 at sixth week of evaluation with a p value of 0.27 from a significant level of 0.05
Otadi (2022)	Electrical stimulation, home exercise, advice and effective stretch, 2-3 times in a day	▪ Non reported	▪ TR is feasible in children, but caregivers require combination with hands on therapy

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Özden et al. (2023)	Exercises were done once a day for eight weeks, 10 repetitions using video recorded exercises for TR group and brochure with pictures for control group	▪ Visual Analog Scale evaluated pain	▪ Improvement in pain at rest in TR group from visual Analog Scale mean score of 4.4±1.98 before treatment to a mean score of 2.4±1.81 with a non-significant p value of 0.847 after treatment
		▪ Neck Disability Index evaluated level of disability due to chronic neck pain	▪ Decrease in neck disability from a combination of mean and standard deviation score of 14.45±5.57 to 6.8±4.54 on Neck Disability Index with a non-significant p value of 0.674 after treatment
		▪ Short Form-36 was used to evaluate quality of life in patients with chronic neck pain	▪ There was overall significant improvement of quality of life in all subscales of Short Form-36 that includes role limitation due to physical health and emotional health, discomfort, physical function and vitality and p value showed significant level in all subscales except social function and general health with p values of 0.019, and 0.031 respectively except bodily pain when the significant level was p< 0.05
		▪ TAMPA Scale of Kinesiophobia to evaluate fear of movement.	▪ Significant decrease in fear of movement (kinesiophobia) from A mean score of 38.55±6.58 to 34.6±5.48 with a p value of 0.006 on TAMPA Scale of kinesiophobia
Özden et al. (2024)	Two sets of 10 repetitions daily, for eight weeks. Exercise programme had William flexion exercise, McKenzie exercises, core stabilization exercises, stretching and strengthening exercises that were administered depending on the outcome of the online assessment	▪ Visual Analog Scale	▪ Significant improvement in pain according to Visual Analog Scale mean score from 5.6±1.88 to 1.03±1.03,95% CI, p=0.001, Nottingham Health Profile subscale of pain from a mean score of 46.23±28.62 to 17.19±22.75,95% CI, p=0.006
		▪ Oswestry Disability Index evaluated level of back disability	▪ Decrease in levels of low back pain disability from a mean score -28.40 to -17.33 in TR group and -7.77 to 0.55 in control group using Oswestry Disability Index with p=0.001 and Pain Catastrophizing Scale mean score of -18.23 to -10.76 in TR group and -8.14 to 0.23 in control group with p=0.002 during 3rd interval evaluation assessment
Ozturk and Duruturk (2022)	Exercise training, three times a week for overweight and obese individuals, 45minutes each session, for six weeks	▪ Short Form-36 was used to evaluate quality of life	▪ Significant improvement in health-related quality of life in TR group with significance level p<0.05 when two groups of TR and control group were compared
		▪ Senior Fitness Test Protocol	▪ Significant improvement in physical function in TR group with a significance level p<0.05 when two groups; TR and control groups were compared

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Pastana Ramos et al. (2023)	Exercise was done once a day, thrice in a week for four weeks, each session was 60 minutes	▪ 5 Times Sit to Stand Test for evaluating lower limb muscle strength ▪ Timed Up and Go Test ▪ Activity Specific Balance Confidence Scale ▪ Movement Disorder Society Unified Parkinson's Disease Scale part III (Motor Examination)	▪ Improvement in time taken to do 5 Times Sit to Stand test from 15.8 seconds at baseline to 13.1 seconds at week 8 of evaluation. ▪ Improvement in Timed Up Go test at 14.7 seconds to 13.9 seconds at baseline and week 8 of evaluation ▪ Improvement in activity specific balance confidence in TR group from a mean score of 14.7 at baseline to 13.9 at week 8 of evaluation with a non-significant p value of 0.25 after treatment ▪ Improvement of muscle strength as seen from decrease in score of Movement Disorder Society Unified Parkinson's Disease Scale part III (Motor examination) from a mean score 18.2 at baseline to 15.2 at week 8 of evaluation with a p value 0.55. Adherence to exercise was good making it to be feasible and effective to provide therapy using TR
Pehlivan et al. (2022)	Aerobic exercise, breathing training and range of motion exercises, paced running/self-walking on the corridor, and all exercises were done three times a week for six weeks	▪ Visual Analog Scale was used to evaluate pain and fatigue ▪ Timed Up and Go Test evaluated walking speed ▪ Short Physical Performance Battery to evaluate physical function ▪ Becky Depression Inventory evaluated depression	▪ Improvement of pain from a median of 0-8 in TR group after treatment with a p value of 0.372. Decrease in fatigue with a median of 0-3 in TR group with a p value of 0.123 after treatment ▪ Improvement in walking speed with a median of 7-19 seconds in the TR group with a p value of 0.349 after treatment ▪ Improvement in physical function with a median of 8-14 and with a p value of 0.493 in TR group after treatment ▪ Improvement in depression symptoms on median of 0-41 with a p value of 0.510 in TR group after treatment
Sahin et al. (2023)	Breathing exercise, strength training and walking exercise for an eight-week period and Patient education	▪ Forced Vital Capacity evaluated pulmonary function test ▪ Modified Borg Scale evaluated dyspnoea ▪ Modified BORG Scale evaluated fatigue ▪ Upper and Lower Limb Muscle Strength using a grade scale of (o=no contraction,5=normal Strength)	▪ Improvement in pulmonary function test using Forced Vital Capacity (FVC) with a score of 83.94±3.76 to 90.94±4.11 scored as a percentage with a significant p< 0.014 after treatment from a significance level of p<0.05 ▪ Reduction in symptoms of exertion dyspnoea 2.368±0.38 to 1.368±0.31 after treatment with a statistically significant p< 0.003 after treatment from a significance level of p<0.05 ▪ Significant decrease in fatigue from 2.158±0.27 to 1.263±0.29 using Modified BORG Scale with a p< 0.005 from a significance level of p<0.05 ▪ Improvement in upper limb was non-significant in right and left biceps with a p value of 0.087, 0.089 respectively while the deltoid there was improvement but significant compared to the control group with p values of 0.001 both sides of the deltoid muscles and lower limb muscle power of right and left quadriceps improved with a significant p values of 0.006, 0.009 on the right and left muscle respectively in Telerehabilitation group after treatment.

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Schlichting et al. (2022)	Exercise program five times a week for 12 weeks, 60 minutes of monitored exercise once a week and 20 minutes non supervised exercise four times a week	▪ Gross Motor Function Measure and Alberta Infant Motor Scale evaluated motor development	▪ Improvement in motor development in relation to Gross Motor Function Measure-88 and Alberta Infant Motor Scale among children with mild cerebral palsy
Supe et al. (2023)	Exercises were done every day for two weeks while Pain Neuroscience Education was done in the first week for 30 minutes and two weeks for 20 minutes. The exercises were demonstrated once by a physiotherapist in person and encouraged to do them home under participants supervision	▪ Numerical Pain Rating Scale and Pain Catastrophizing Scale evaluated pain intensity ▪ Patient Specific Function Scale evaluated function	▪ Significant decrease in pain intensity in relation to the control group from a mean score of 6.71±1.18 to 3.17±1.05 on Numerical Pain Rating Scale with a p value of p<0.0001 from a significant level of p 0.05 and Pain Catastrophizing Scale decreased from a mean score of 22.09±6.09 to 10.66±3.46 after 2 weeks of treatment in the TR group with a p=0.0001 from a significant level of p< 0.05 ▪ Improvement in knee functionality in TR group from 6.21±1.04 to 4.62±1.11 on Patient Specific Function Scale after 2 weeks of treatment with a p value of 0.610 from a significant level of p< 0.05
Tarakci et al. (2021)	Three times a week for 12 weeks of ambulating exercise, strengthening, breathing, functional stretching exercise, coordination, balance exercise and range of motion	▪ Function Independence Measure evaluated ADLS ▪ Fatigue Severity Scale evaluated fatigue ▪ Quality of Life Scale and Nottingham Health Profile-I evaluated quality of life	▪ Improvement in function in relation to Activity of Daily living (ADLS) in multiple sclerosis patients from 114±5.61 to 117.80±5.82 on Function Independence Measure total score after treatment ▪ Non-significant decrease in fatigue in the TR group compared to control group from a mean score 39.26±5.65 to 34.13±5.65 on Fatigue Severity Scale after treatment with a p value of p 0.001 from significant level of p >0.05 ▪ Significant improvement in quality of life of multiple sclerosis patients in TR with a mean total score of 169.42±55.49 decreasing to 115.32±52.20 on Nottingham Health Profile Scale in TR group with a p value of 0.044 from significant level of p< 0.05
Tekin and Cetisli-Korkmaz (2022)	The callisthenic exercises were done five times a week for four weeks. First two-week, one set of 10 repetitions and last two-week two sets of 10 repetitions.	▪ Short Physical Performance Battery ▪ Geriatric Depression Scale ▪ Modified Falls Efficacy Scale	▪ Significant improvements in physical performance total score in balance and getting up to stand in TR group at (t (131) = -3.124; p=0.002 but no significant gains in walking ▪ Significant decrease in depressive symptoms after post-test on Geriatric Depressive Scale in TR group (t (131) =11.765; p≤0.001 ▪ Significant improvement in risk of falling in TR group from a mean score of (t (131) =-5.111; p≤0.001 on modified Falls Efficacy Scale

Table 3 continued.

AUTHOR	DURATION AND FREQUENCY OF INTERVENTION	OUTCOME MEASURES	RESULTS
Timurtaş et al. (2024)	The exercises were done three times a week under supervision of a physiotherapist using videoconference in the synchronous group while the asynchronous group used a mobile application with exercise videos three times a week. Each session was 40 minutes in both groups	▪ Numerical Pain Rating Scale evaluated pain ▪ Neck Disability Index evaluated functional disability ▪ TAMPA Scale of Kinesiophobia evaluated fear of movement	▪ Non-significant decrease in pain from mean 5.5 to 2.3 on Numerical Pain Rating Scale at baseline and 16 weeks respectively at a p value of 0.905 when significant level was set at $p < 0.05$ ▪ Functional disability decreased from 15.7 to 7.0 in synchronous group while asynchronous was from 17.8 reduced to 6.5 at baseline and 16 weeks respectively with a p value of 0.337 when significant level was set at $p < 0.05$. ▪ Increase in neck mobility in both asynchronous and synchronous modes of TR after treatment. Fear of neck movement improved in the mean range of 40.6 to 42.9 in both groups on TAMPA Scale of Kinesiophobia with a $p = 0.153$ with significance level set at $p<0.05$

2.3.3 Perceived Benefits, Facilitators, and Barriers to the Use of Telerehabilitation by Physiotherapists in Lower- to Middle-Income Countries

Only eight of the 26 articles reported on perceived benefits, facilitators, and barriers to the use of TR as part of a physiotherapy intervention (Barboza et al., 2022; Kayabınar et al., 2021; Khruakhorn et al., 2023; Lima et al., 2022; Ozturk & Duruturk, 2022; Pehlivan et al., 2022; Schlichting et al., 2022; Tore et al., 2023). Two studies reported regarding the cost-effectiveness of TR compared to clinical-based therapy with eight weeks of TR in patients with kyphosis (Khruakhorn et al., 2023) and in patients undergoing 12 weeks of cardiac rehabilitation via TR (Lima et al., 2022). The facilitators to the use of TR included access to internet connectivity (Schlichting et al., 2022), convenience in accessing rehabilitation services (Kayabınar et al., 2021; Schlichting et al., 2022), and the safety of use of TR in rehabilitation of diseases (Dissanayaka et al., 2022; Ozturk & Duruturk, 2022). One of the main barriers encountered during the use of TR in LMICs were poor internet connectivity which decreased the efficiency of TR as reported in studies conducted in Brazil and Türkiye (Barboza et al., 2022; Pehlivan et al., 2022; Tore et al., 2023). Another barrier included challenges with using technological gadgets and software (Pehlivan et al., 2022). No availability of internet in some areas was also reported as a barrier in a study conducted in Brazil (Schlichting et al., 2022). The barriers, benefits, and facilitators of use of TR are presented in Table 4 below.

Table 4. Barriers and Facilitators to the Use of Telerehabilitation.

AUTHOR	PERCEIVED BENEFITS	FACILITATORS	BARRIERS
Barboza et al. (2022)	Cost-effectiveness	None reported	Poor internet service
Kayabınar et al. (2021)	Cost-effectiveness	Convenience	None reported
Khruakhorn et al. (2023)	Low cost of using TR as compared to clinic-based rehabilitation	None reported	None reported
Lima et al. (2022)	Low cost of using TR as compared to clinic-based rehabilitation	None reported	None reported
Ozturk and Duruturk (2022)	None reported	It is safe to use TR	None reported
Pehlivan et al. (2022)	None reported	None reported	Poor internet service Challenges with technological use
Schlichting et al. (2022)	None reported	Reliable internet Convenience	No access to internet
Tore et al. (2023)	None reported	None reported	Poor internet service

2.4 Discussion

Telerehabilitation interventions, utilising both asynchronous and synchronous methods, have been used to provide assessment and rehabilitation services for various health conditions in LMICs. Videoconferences and phone calls were the most popular mode of providing rehabilitation in studies conducted in LMICs. Overall, it appears that the use of TR resulted in improvements in various impairments related to different conditions. The discussion will compare the use of TR for various health conditions, along with the perceived benefits, facilitators, and barriers related to TR in LMICs to HICs.

2.4.1 Methods of Telerehabilitation Delivery for Various Health Conditions

The modes of TR delivery may differ between LMICs and higher income countries for similar health conditions. However, the following examples illustrate that similar outcomes may be possible regardless of the mode of TR. Patients with patellofemoral pain received TR through videoconferences only in a study conducted in Türkiye, whereas a randomised control trial in South Korea reported using text messaging, video calls, and phone calls (Arslan & Gültekin, 2023; Lee et al., 2023). Improvements in pain and muscle strength were reported in patients with patellofemoral pain in the two studies (Arslan & Gültekin, 2023; Lee et al., 2023). Patients with knee osteoarthritis also received TR through videoconferences (Supe et al., 2023; Tore et al., 2023) and phone calls (Odole & Ojo, 2013). A study in the United States of America (USA) reported using recorded videos of exercises as a mode of TR delivery for patients with knee osteoarthritis (Aily et al., 2023). Improvement in pain was noted in patients from all these studies (Aily et al., 2023; Odole & Ojo, 2013; Supe et al., 2023; Tore et al., 2023). Patients with scoliosis received TR through videoconferences in LMICs (Manzak Dursun et al., 2024), whereas a randomised controlled trial in China (Dong et al., 2022) utilised TR administered through recorded videos of exercises. Both studies reported improvement in posture and back muscle strength after TR intervention (Dong et al., 2022; Manzak Dursun et al., 2024). The management of kyphosis with TR administered through videoconferences were reported in LMICs, compared to recorded videos of exercises in a study conducted in the USA (Katzman et al., 2019). The studies reported similar outcomes with a decrease in kyphotic angle and improvement of posture (Katzman et al., 2019; Khruakhorn et al., 2023). For patients with lower back pain, TR administered through video recordings of exercises and videoconferences were reported in LMICs (Mbada et al., 2019; Özden et al., 2024). Similarly, in the USA, Fritz et al. (2022) performed a longitudinal observational study to investigate the effects of TR on outcomes of physiotherapy in chronic low back pain patients using videoconferences and recorded videos. These studies all reported improvement in pain (Fritz et al., 2022; Mbada et al., 2019; Özden et al., 2024).

For patients with neck pain, TR was administered through videoconferences and recorded videos of exercises in LMICs (Özden et al., 2024; Timurtaş et al., 2024). Similarly, a study by Lin et al. (2023) in China utilised videoconferences to deliver exercises compared to clinic-based rehabilitation for young adults with neck pain. All of these studies reported improvement in pain after TR intervention (Lin et al., 2023; Özden et al., 2023; Timurtaş et al., 2024).

In a multicenter randomised controlled study conducted in Italy, TR was delivered through non-immersive virtual reality for patients with Parkinson's disease (Goffredo et al., 2023), compared to videoconferences and phone calls in studies in LMICs (Barboza et al., 2022; Eldemir et al., 2023). Regardless of the mode of delivery, patients with Parkinson's reported improvements in various factors such as balance, gait, and muscle strength in these studies (Barboza et al., 2022; Eldemir et al., 2023). Videoconferences were used to deliver TR to children with cerebral palsy in three studies in LMICs (Celikel et al., 2023; Cristinziano et al., 2022; Otadi, 2022; Schlichting et al., 2022). Similarly, videoconferences were used in Italy in a study by Cristinziano et al. (2022) conducted during the COVID-19 lockdown to evaluate gross motor function in children from six months to 12 years of age with cerebral palsy. Improvements in impairments related to motor function were reported in all of these studies (Celikel et al., 2023; Cristinziano et al., 2022; Schlichting et al., 2022).

The use of TR for COVID-19 patients was reported through videoconferences and phone calls in LMICs (Li et al., 2021; Pehlivan et al., 2022; Sahin et al., 2023). A randomised controlled trial conducted in China reported the use of voice calls on WeChat and smartphone recordings of exercises to compare the effects of TR to no rehabilitation among patients with COVID-19 (Li et al., 2021). All of these studies reported improvements in dyspnea and muscle strength, whereas only the two studies from LMICs reported improvement in pain (Li et al., 2021; Pehlivan et al., 2022; Sahin et al., 2023). Cardiac rehabilitation administered through phone calls were reported in LMICs, whereas a study in Australia reported the use of videoconferences for TR (Hwang et al., 2017). Similar improvements in the impairment of depression were reported, although the results were not statistically significant (Hwang et al., 2017; Lima et al., 2022).

For patients with multiple sclerosis, TR administered through videoconferences and phone calls were reported in LMICs (Tarakci et al., 2021). In the USA, Fjeldstad-Pardo et al. (2018) conducted a blinded randomised controlled study to investigate the viability of TR in multiple sclerosis patients through videoconferences compared to unsupervised exercises at home and a clinic-based physiotherapy group.

These studies both reported improvement in quality of life, whereas only Fjeldstad-Pardo et al. (2018) reported a meaningful improvement in fatigue. The management of fibromyalgia through TR administered through videoconferences was reported in one study in LMICs (Tahran et al., 2023). In Spain, Hernando-Garijo et al. (2021) conducted an assessor blinded randomised controlled study on the effects of aerobic exercise in women with fibromyalgia using TR. The two studies had similar findings with improvement of pain in patients with fibromyalgia (Hernando-Garijo et al., 2021; Tahran et al., 2023). The study conducted in Spain also reported improvements in anxiety and depression (Hernando-Garijo et al., 2021; Tahran et al., 2023).

Various possible biases were identified in the studies included in the review, which may limit the generalisability of results. This included small sample sizes (Arslan & Gültekin, 2023; Celikel et al., 2023; Gondim et al., 2017; Haciabbasoğlu et al., 2023), attrition bias due to patients lost to follow-up (Mbada et al., 2019), and selection bias related to sampling techniques (Barboza et al., 2022; Otadi, 2022).

2.4.2 Perceived Benefits, Facilitators, and Barriers of Telerehabilitation in Lower- and Middle-Income Countries

The cost effectiveness of TR for the administration of cardiac rehabilitation (Lima et al., 2022), as well as for the management of patients with kyphosis were reported in this review focusing on LMICs (Khruakhorn et al., 2023). Similarly in Poland, Niewada et al. (2021) reported that TR was cost effective in the management of cardiac patients. The convenience of the use of TR for the management of neck pain, hip pain, and right wrist pain were reported for teachers who provided online classes during COVID-19 (Kayabınar et al., 2021), and for the management of children with cerebral palsy (Schlichting et al., 2022). During the COVID-19 pandemic, the use of TR also allowed safe rehabilitation for overweight individuals by eliminating the risk of infection during management (Ozturk & Duruturk, 2022). An additional concern with TR management in children related to the fear of caregivers in doing inaccurate exercises, therefore a preference for a combination of in-person management and TR was indicated (Chivate et al., 2022; Otadi, 2022). The need for reliable internet connections was identified, as this may facilitate or hinder the administration of TR (Schlichting et al., 2022). Barboza et al. (2022) reported poor internet service as a barrier to TR during the management of patients with Parkinson's disease. Likewise, poor internet service and challenges with the use of technological gadgets were reported as barriers to TR in LMICs (Schlichting et al., 2022; Tore et al., 2023). In Italy, Milani et al. (2021) also reported challenges with the use of technological gadgets in patients with physical disabilities in Italy.

In general, barriers related to internet access may be more prevalent in LMICs compared to higher income countries. Despite the challenges reported regarding TR in LMICs, the use thereof should be encouraged due to the range of potential benefits. Effective liaison between the appropriate authorities and other role players should be encouraged.

2.4.3 Limitations and Future Directions

This scoping review provided an overview of the use of TR in physiotherapy for various conditions in LMICs. It was important to focus on the feasibility and value of TR in these countries due to the limitations in the availability of resources and access to rehabilitation anticipation in many communities in these countries. However, restricting the review to studies conducted in LMICs meant that only a small pool of data was available for comparison. Furthermore, only articles published in English were included, which may have further limited the pool of data available. Due to the wide range of TR interventions, health conditions, outcome measures, and other variables reported across studies, an evaluation of the efficiency of specific methods was not feasible. Future systematic reviews, involving a broader pool of data, should be conducted to investigate the efficiency of specific interventions for specific health conditions compared to traditional methods or control conditions. This should include evaluations of the quality of each study. Moreover, the studies in the review primarily focused on various impairments, with very few studies reporting activity limitations and participation restrictions. To ensure the successful implementation of TR in LMIC settings, future studies focusing on the value of TR in promoting activity levels and addressing participation restrictions in these populations are needed.

2.7 Conclusion

To our knowledge, this is the first scoping review to explore the use of TR in physiotherapy in LMICs. Telerehabilitation has been shown to be an effective, safe, and viable model of rehabilitation delivery that can be used to facilitate or enhance access to rehabilitation services by physiotherapists in LMICs. The findings of this review highlight that TR has been successfully implemented within LMICs to address several health conditions including neurological, musculoskeletal, medical, and other health conditions across a variety of populations from infants to older adults. Telerehabilitation interventions, utilising both asynchronous and synchronous methods, have been used to provide preventive, diagnostic, assessment, and rehabilitative services to communities. Phone calls and videoconference were the most popular mode of providing rehabilitation in LMICs. Many studies reported improvements in various impairments such as pain, quality of life, and function following TR. The benefits of TR include its cost effectiveness and convenience.

Several studies reported challenges related to internet access, the use of technological gadgets, and the fear of inaccurate performance of exercises during TR. These barriers can be mitigated through effective policy development and the involvement of various stakeholders within LMICs. This would require advocacy from physiotherapy bodies in these countries to educate physiotherapists regarding the advantages of TR (Digital Physical Therapy Task Force, 2020). This should help to encourage TR as a more accepted form of rehabilitation (Digital Physical Therapy Task Force, 2020).

CHPATER THREE: DISSERTATION SUMMARY AND CONCLUSION

3.1 Summary of the Findings

The findings of the scoping review provide some evidence that TR has been used successfully to provide rehabilitation services in LMICs across various populations, and across a range of musculoskeletal, neurological, medical, and other health conditions. These conditions form part of the growing burden of disease in these countries and may result in significant impairments, activity limitations, and participation restrictions for affected individuals. Management in the short- and long-term is critical to address these challenges in these populations. Various methods were implemented to deliver TR, with phone calls and videoconferences most frequently reported. Improvements in various impairments such as pain, quality of life, and function were reported following different durations of TR. The evidence that TR can be used reliably and effectively to facilitate rehabilitation for various conditions in both rural and urban areas within LMICs strengthens the value of its use (Mbada et al., 2019; Otadi, 2022; Pehlivan et al., 2022). The cost effectiveness and convenience of TR were also identified in the review. Contextual barriers or facilitators of TR use in LMICs can be summarised into human and technical factors. The human factors relate to digital literacy, whereas the technical factors often relate to internet access (Barboza et al., 2022; Pehlivan et al., 2022; Schlichting et al., 2022; Tore et al., 2023). To make TR more viable and feasible for sustained use, substantial policy and infrastructure development are required to address the human and technical factors.

3.2 Discussion of the Findings

In summary, TR is a viable and reliable method to provide access to rehabilitation in LMICs. There is a need for proper advocacy and collaboration to ensure that TR services are promoted within healthcare systems in LMICs. Physiotherapists using TR as mode of healthcare delivery should remember that TR is not there to remove face-to-face rehabilitation but to complement it. There should be ongoing advocacy to minimise the contextual barriers to its use and advancement within LMICs.

3.3 Future Directions

There is an ongoing need for further studies, with larger sample sizes, to be conducted to strengthen the evidence base for the use of TR in LMICs. The limited pool of data from LMICs with a vast range of health conditions and other variables among studies restricts the generalisability of the present recommendations.

It is possible that there has been a more extensive use of TR in LMICs settings that have not been reported due to the challenges associated with publishing research from developing countries. Surveys of physiotherapists in LMICs through their professional bodies is recommended to investigate the use of TR and to gauge the extent and scope of its use. This would expand on the World Physiotherapy Review in 2020, which reported that 70% of its member countries utilised TR during the COVID-19 pandemic (Digital Physical Therapy Task Force, 2020). Although it was beyond the scope of the current explorative scoping review to establish the efficiency of various methods of TR in physiotherapy for the management of specific musculoskeletal, neurological, medical, and other general health conditions compared to traditional or other methods, future systematic reviews including a wider pool of data across countries is needed.

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APPENDICES

Appendix A: Database Search Terms

EBSCOhost

SEARCH TERMS	RECORDS
Remote rehabilitation or Virtual Rehabilitation or Telerehabilitation **AND** Physiotherapy or Physical therapy or Physiotherapist or Physical therapist **AND** “Deprived Countries” OR "Deprived Population" OR "Deprived Populations" OR "Developing Countries" OR "Developing Country" OR "Developing Economies" OR "Developing Economy" OR "Developing Nation" OR "Developing Nations" OR "Developing Population" OR "Developing Populations" OR "Developing World" OR "LAMI Countries" OR "LAMI Country" OR "Less Developed Countries" OR "Less Developed Country" OR "Less Developed Economies" OR "Less Developed Nation" OR "Less Developed Nations" OR "Less Developed World" OR "Lesser Developed Countries" OR "Lesser Developed Nations" OR LMIC OR LMICS OR Low GDP OR "Low GNP" OR "Low Gross Domestic" OR "Low Gross National" OR "Low Income Countries" OR "Low Income Country" OR "Low Income Economies" OR "Low Income Economy" OR "Low Income Nations" OR "Low Income Population" OR "Low Income Populations" OR "Lower GDP" OR "lower gross domestic" OR "Lower Income Countries" OR "Lower Income Country" OR "Lower Income Nations" OR "Lower Income Population" OR "Lower Income Populations" OR "Middle Income Countries" OR "Middle Income Country" OR "Middle Income Economies" OR "Middle Income Nation" OR "Middle Income Nations" OR "Middle Income Population" OR "Middle Income Populations" OR "Poor Countries" OR "Poor Country" OR "Poor Economies" OR "Poor Economy" OR "Poor Nation" OR "Poor Nations" OR "Poor Population" OR "Poor Populations" OR "poor world" OR "Poorer Countries" OR "Poorer Economies" OR "Poorer Economy" OR "Poorer Nations" OR "Poorer Population" OR "Poorer Populations" OR "Third World" OR "Transitional Countries" OR "Transitional Country" OR "Transitional Economies" OR "Transitional Economy" OR "Under Developed Countries" OR "Under Developed Country" OR "under developed nations" OR "Under Developed World" OR "Under Served Population" OR "Under Served Populations" OR "Underdeveloped Countries" OR "Underdeveloped Country" OR "underdeveloped economies" OR "underdeveloped nations" OR "underdeveloped population" OR "Underdeveloped World" OR "Underserved Countries" OR "Underserved Nations" OR "Underserved Population" OR "Underserved Populations"	304

EBSCOhost continued

SEARCH TERMS	RECORDS
OR Afghanistan OR Albania OR Algeria OR “American Samoa” OR Angola OR Armenia OR Azerbaijan OR Bangladesh OR Belarus OR Byelarus OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Botswana OR Brazil OR Bulgaria OR Burma OR “Burkina Faso” OR Burundi OR “Cabo Verde” OR “Cape Verde” OR Cambodia OR Cameroon OR “Central African Republic” OR Chad OR China OR Colombia OR Comoros OR Comores OR Comoro OR Congo OR “Costa Rica” OR “Côte d'Ivoire” OR Cuba OR “Democratic People’s Republic of Korea” OR Djibouti OR Dominica OR “Dominican Republic” OR Ecuador OR Egypt OR “El Salvador” OR Eritrea OR Ethiopia OR “Equatorial Guinea” OR Fiji OR Gabon OR Gambia OR Gaza OR “Georgia Republic” OR Georgia OR Ghana OR Grenada OR Grenadines OR Guatemala OR Guinea OR “Guinea Bissau” OR Guyana OR Haiti OR Herzegovina OR Hercegovina OR Honduras OR India OR Indonesia OR Iran OR Iraq OR “Ivory Coast” OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyz OR Kirghizia OR Kirghiz OR Kyrgyzstan OR “Lao PDR” OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Macedonia OR Madagascar OR Malawi OR Malay OR Malaya OR Malaysia OR Maldives OR Mali OR “Marshall Islands” OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR “Papua New Guinea” OR Paraguay OR Peru OR Philippines OR Principe OR Romania OR Rwanda OR Ruanda OR Samoa OR “Sao Tome” OR Senegal OR Serbia OR “Sierra Leone” OR “Solomon Islands” OR Somalia OR “South Africa” OR “South Sudan” OR “Sri Lanka” OR “St Lucia” OR “St Vincent” OR Sudan OR Surinam OR Suriname OR Swaziland OR Syria OR “Syrian Arab Republic” OR Tajikistan OR Tadzhikistan OR Tajikistan OR Tadzhik OR Tanzania OR Thailand OR Timor OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmen OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uzbek OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR “West Bank” OR Yemen OR Zambia OR Zimbabwe	

SCOPUS

SEARCH TERMS	RECORDS
Remote rehabilitation or Virtual Rehabilitation or Telerehabilitation **AND** Physiotherapy or Physical therapy or Physiotherapist or Physical therapist **AND** (“Deprived Country“ OR “Deprived Countries” OR “Deprived Population” OR “Deprived Populations” OR “Developing Countries” OR “Developing Country” OR “Developing Economies” OR “Developing Economy” OR “Developing Nation” OR “Developing Nations” OR “Developing Population” OR “Developing Populations” OR “Developing World” OR “LAMI Countries” OR “LAMI Country” OR “Less Developed Countries” OR “Less Developed Country” OR “Less Developed Economies” OR “Less Developed Nation” OR “Less Developed Nations” OR “Less Developed World” OR “Lesser Developed Countries” OR “Lesser Developed Nations” OR LMIC OR LMICS OR “Low GDP” OR “Low GNP” OR “Low Gross Domestic” OR “Low Gross National” OR “Low Income Countries” OR “Low Income Country” OR “Low Income Economies” OR “Low Income Economy” OR “Low Income Nations” OR “Low Income Population” OR “Low Income Populations” OR “Lower GDP” OR “Lower Gross Domestic” OR “Lower Income Countries” OR “Lower Income Country” OR “Lower Income Nations” OR “Lower Income Population” OR “Lower Income Populations” OR “Middle Income Countries” OR “Middle Income Country” OR “Middle Income Economies” OR “Middle Income Nation” OR “Middle Income Nations” OR “Middle Income Population” OR “Middle Income Populations” OR “Poor Countries” OR “Poor Country” OR “Poor Economies” OR “Poor Economy” OR “Poor Nation” OR “Poor Nations” OR “Poor Population” OR “Poor Populations” OR “Poor World” OR “Poorer Countries” OR “Poorer Economies” OR “Poorer Economy” OR “Poorer Nations” OR “Poorer Population” OR “Poorer Populations” OR “Third World” OR “Transitional Countries” OR “Transitional Country” OR “Transitional Economies” OR “Transitional Economy” OR “Under Developed Countries” OR “Under Developed Country” OR “Under Developed Nations” OR “Under Developed World” OR “Under Served Population” OR “Under Served Populations” OR “Underdeveloped Countries” OR “Underdeveloped Country” OR “Underdeveloped Economies” OR “Underdeveloped Nations” OR “Underdeveloped Population” OR “Underdeveloped World” OR “Underserved Countries” OR “Underserved Nations” OR “Underserved Population” OR “Underserved Populations”) **OR** (Afghanistan OR Albania OR Algeria OR “American Samoa” OR Angola OR Armenia OR Azerbaijan OR Bangladesh OR Belarus OR Byelarus OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Botswana OR Brazil OR Bulgaria OR Burma OR “Burkina Faso” OR Burundi OR “Cabo Verde” OR “Cape Verde” OR Cambodia OR Cameroon OR “Central African Republic” OR Chad OR China OR Colombia OR Comoros OR Comores OR Comoro OR Congo OR “Costa Rica” OR “Côte d'Ivoire” OR Cuba OR “Democratic People’s Republic of Korea” OR Djibouti OR Dominica OR “Dominican Republic” OR Ecuador OR Egypt OR “El Salvador” OR Eritrea OR Ethiopia OR “Equatorial Guinea” OR Fiji OR Gabon OR Gambia OR Gaza OR “Georgia Republic” OR Georgia OR Ghana OR Grenada OR Grenadines OR Guatemala OR Guinea OR “Guinea Bissau” OR Guyana OR Haiti OR Herzegovina OR Hercegovina OR Honduras OR India OR Indonesia OR Iran OR Iraq OR “Ivory Coast” OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyz OR Kirghizia OR Kirghiz OR Kyrgyzstan OR “Lao PDR” OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Macedonia OR Madagascar OR Malawi OR Malay OR Malaya OR Malaysia OR Maldives OR Mali OR “Marshall Islands” OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR “Papua New Guinea” OR Paraguay OR Peru OR Philippines OR Principe OR Romania OR Rwanda OR Ruanda OR Samoa OR “Sao Tome” OR Senegal OR Serbia OR “Sierra Leone” OR “Solomon Islands” OR Somalia OR “South Africa” OR “South Sudan” OR “Sri Lanka” OR “St Lucia” OR “St Vincent” OR Sudan OR Surinam OR Suriname OR Swaziland OR Syria OR “Syrian Arab Republic” OR Tajikistan OR Tadzhikistan OR Tajikistan OR Tadzhik OR Tanzania OR Thailand OR Timor OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmen OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uzbek OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR “West Bank” OR Yemen OR Zambia OR Zimbabwe)	82

WEB OF SCIENCE

SEARCH TERMS	RECORDS
Remote rehabilitation or Virtual Rehabilitation or Telerehabilitation **AND** Physiotherapy or Physical therapy or Physiotherapist or Physical therapist **AND** "Deprived Country" OR "Deprived Countries" OR "Deprived Population" OR "Deprived Populations" OR "Developing Countries" OR "Developing Country" OR "Developing Economies" OR "Developing Economy" OR "Developing Nation" OR "Developing Nations" OR "Developing Population" OR "Developing Populations" OR "Developing World" OR "LAMI Countries" OR "LAMI Country" OR "Less Developed Countries" OR "Less Developed Country" OR "Less Developed Economies" OR "Less Developed Nation" OR "Less Developed Nations" OR "Less Developed World" OR "Lesser Developed Countries" OR "Lesser Developed Nations" OR LMIC OR LMICS OR "Low GDP" OR "Low GNP" OR "Low Gross Domestic" OR "Low Gross National" OR "Low Income Countries" OR "Low Income Country" OR "Low Income Economies" OR "Low Income Economy" OR "Low Income Nations" OR "Low Income Population" OR "Low Income Populations" OR "Lower GDP" OR "Lower Gross Domestic" OR "Lower Income Countries" OR "Lower Income Country" OR "Lower Income Nations" OR "Lower Income Population" OR "Lower Income Populations" OR "Middle Income Countries" OR "Middle Income Country" OR "Middle Income Economies" OR "Middle Income Nation" OR "Middle Income Nations" OR "Middle Income Population" OR "Middle Income Populations" OR "Poor Countries" OR "Poor Country" OR "Poor Economies" OR "Poor Economy" OR "Poor Nation" OR "Poor Nations" OR "Poor Population" OR "Poor Populations" OR "Poor World" OR "Poorer Countries" OR "Poorer Economies" OR "Poorer Economy" OR "Poorer Nations" OR "Poorer Population" OR "Poorer Populations" OR "Third World" OR "Transitional Countries" OR "Transitional Country" OR "Transitional Economies" OR "Transitional Economy" OR "Under Developed Countries" OR "Under Developed Country" OR "Under Developed Nations" OR "Under Developed World" OR "Under Served Population" OR "Under Served Populations" OR "Underdeveloped Countries" OR "Underdeveloped Country" OR "Underdeveloped Economies" OR "Underdeveloped Nations" OR "Underdeveloped Population" OR "Underdeveloped World" OR "Underserved Countries" OR "Underserved Nations" OR "Underserved Population" OR "Underserved Populations" **OR** Afghanistan OR Albania OR Algeria OR "American Samoa" OR Angola OR Armenia OR Azerbaijan OR Bangladesh OR Belarus OR Byelarus OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Botswana OR Brazil OR Bulgaria OR Burma OR "Burkina Faso" OR Burundi OR "Cabo Verde" OR "Cape Verde" OR Cambodia OR Cameroon OR "Central African Republic" OR Chad OR China OR Colombia OR Comoros OR Comores OR Comoro OR Congo OR "Costa Rica" OR "Côte d'Ivoire" OR Cuba OR "Democratic People's Republic of Korea" OR Djibouti OR Dominica OR "Dominican Republic" OR Ecuador OR Egypt OR "El Salvador" OR Eritrea OR Ethiopia OR "Equatorial Guinea" OR Fiji OR Gabon OR Gambia OR Gaza OR "Georgia Republic" OR Georgia OR Ghana OR Grenada OR Grenadines OR Guatemala OR Guinea OR "Guinea Bissau" OR Guyana OR Haiti OR Herzegovina OR Hercegovina OR Honduras OR India OR Indonesia OR Iran OR Iraq OR "Ivory Coast" OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyz OR Kirghizia OR Kirghiz OR Kyrgyzstan OR "Lao PDR" OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Macedonia OR Madagascar OR Malawi OR Malay OR Malaya OR Malaysia OR Maldives OR Mali OR "Marshall Islands" OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR "Papua New Guinea" OR Paraguay OR Peru OR Philippines OR Principe OR Romania OR Rwanda OR Ruanda OR Samoa OR "Sao Tome" OR Senegal OR Serbia OR "Sierra Leone" OR "Solomon Islands" OR Somalia OR "South Africa" OR "South Sudan" OR "Sri Lanka" OR "St Lucia" OR "St Vincent" OR Sudan OR Surinam OR Suriname OR Swaziland OR Syria OR "Syrian Arab Republic" OR Tajikistan OR Tadzhikistan OR Tajikistan OR Tadzhik OR Tanzania OR Thailand OR Timor OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmen OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uzbek OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR "West Bank" OR Yemen OR Zambia OR Zimbabwe	224

PUBMED

SEARCH TERMS	RECORDS
Telerehabilitation [Mesh Terms] or Remote rehabilitation or Virtual Rehabilitation or Telerehabilitation **AND** Physiotherapy or Physical therapy or Physiotherapist or Physical therapist **AND** Deprived Countries OR Deprived Population OR Deprived Populations OR Developing Countries OR Developing Country OR Developing Economies OR Developing Economy OR Developing Nation OR Developing Nations OR Developing Population OR Developing Populations OR Developing World OR LAMI Countries OR LAMI Country OR Less Developed Countries OR Less Developed Country OR Less Developed Economies OR Less Developed Nation OR Less Developed Nations OR Less Developed World OR Lesser Developed Countries OR Lesser Developed Nations OR LMIC OR LMICS OR Low GDP OR Low GNP OR Low Gross Domestic OR Low Gross National OR Low Income Countries OR Low Income Country OR Low Income Economies OR Low Income Economy OR Low Income Nations OR Low Income Population OR Low Income Populations OR Lower GDP OR lower gross domestic OR Lower Income Countries OR Lower Income Country OR Lower Income Nations OR Lower Income Population OR Lower Income Populations OR Middle Income Countries OR Middle Income Country OR Middle Income Economies OR Middle Income Nation OR Middle Income Nations OR Middle Income Population OR Middle Income Populations OR Poor Countries OR Poor Country OR Poor Economies OR Poor Economy OR Poor Nation OR Poor Nations OR Poor Population OR Poor Populations OR poor world OR Poorer Countries OR Poorer Economies OR Poorer Economy OR Poorer Nations OR Poorer Population OR Poorer Populations OR Third World OR Transitional Countries OR Transitional Country OR Transitional Economies OR Transitional Economy OR Under Developed Countries OR Under Developed Country OR under developed nations OR Under Developed World OR Under Served Population OR Under Served Populations OR Underdeveloped Countries OR Underdeveloped Country OR underdeveloped economies OR underdeveloped nations OR underdeveloped population OR Underdeveloped World OR Underserved Countries OR Underserved Nations OR Underserved Population OR Underserved Populations **OR** Afghanistan OR Albania OR Algeria OR American Samoa OR Angola OR Armenia OR Azerbaijan OR Bangladesh OR Belarus OR Byelarus OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Botswana OR Brazil OR Bulgaria OR Burma OR Burkina Faso OR Burundi OR Cabo Verde OR Cape Verde OR Cambodia OR Cameroon OR Central African Republic OR Chad OR China OR Colombia OR Comoros OR Comores OR Comoro OR Congo OR Costa Rica OR Côte d'Ivoire OR Cuba OR Djibouti OR Dominica OR Dominican Republic OR Ecuador OR Egypt OR El Salvador OR Equatorial Guinea OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Gaza OR Georgia OR Georgia Republic OR Ghana OR Grenada OR Grenadines OR Guatemala OR Guinea OR Guinea- Bissau OR Guyana OR Haiti OR Herzegovina OR Hercegovina OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Ivory Coast OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Democratic People's Republic of Korea OR Kosovo OR Kyrgyz OR Kirghizia OR Kirghiz OR Kyrgyzstan OR Lao PDR OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Macedonia OR Madagascar OR Malawi OR Malay OR Malaya OR Malaysia OR Maldives OR Mali OR Marshall Islands OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Papua New Guinea OR Paraguay OR Peru OR Philippines OR Principe OR Romania OR Ruanda OR Rwanda OR Samoa OR Sao Tome OR Senegal OR Serbia OR Sierra Leone OR Solomon Islands OR Somalia OR South Africa OR South Sudan OR Sri Lanka OR St Lucia OR St Vincent OR Sudan OR Surinam OR Suriname OR Swaziland OR Syria OR Syrian Arab Republic OR Tajikistan OR Tadzhikistan OR Tajikistan OR Tadzhik OR Tanzania OR Thailand OR Timor OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmen OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uzbek OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR West Bank OR Yemen OR Zambia OR Zimbabwe	59