

# Effectiveness of Exercises by Telerehabilitation for Neck and Shoulder Rehabilitation: A Scoping Review

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## Abstract

Telerehabilitation is a way of providing physiotherapy in remote mode with increased satisfaction and success rates. Physiotherapy plays a major role in rehabilitation of such conditions by proper assessment and early intervention leading to a better quality of life for the patient. Neck and shoulder pain are quite increasing in number because of many reasons like poor posture, trauma, poor lifestyle, post-surgery complications. 13 articles were included in the scoping review related to rehabilitation of neck and shoulder related conditions respectively. After reviewing various related articles, it was concluded that better results were found in terms of decrease in pain, disability and improvement in terms of range of motion (ROM), posture, endurance, quality of life and patient satisfaction. Patients described better sense of security and adherence in telerehabilitation as compared to the conventional treatment provided.

**Keywords:** telerehabilitation; rehabilitation; neck pain; shoulder pain; frozen shoulder; shoulder impingement; rotator cuff tear; fracture; chronic neck pain

## Introduction

Telerehabilitation is a platform where physical therapy services are provided at a distance in remote mode for communication like video conferences or telephone calls in a situation where patient can't afford face to face treatment. It has been proved feasible and effective in a low resource settings. Various ranges of services can be included in providing telerehabilitation such as assessment, prevention, monitoring, intervention, education, counseling, consultation and supervision. More patient centered approach could be established by focusing on removal of barriers such as transportation cost, waiting list, travelling time and improved flexibility of sessions, patient's choice and timely delivery of services [1]. With increasing number of older adults with multiple conditions, increased demand of physiotherapy will be there. It has been also observed that older adult spend much time in searching for health related aspects as compared to the peer groups [2]. Four domains are seen in respect to the clinical practice i-e tele-education, tele-monitoring, tele-consultation and tele-treatment. Tele-treatment is the new platform which helps the patient to get the treatment at their home without any visit to the healthcare professionals.

Neck and shoulder pain are quite increasing in number as the world is developing at its pace. With increasing technologies and increased demand in work sector individuals are more indulged into computer work and mobile work. Increased neck pain puts adverse effects on the society and its productivity. Shoulder pain can be due to various factors like posture, trauma or post-surgery. Shoulder impingement syndrome is the most common cause of shoulder pain in today's era. 44-60% of visits are SIS cases in the hospital settings as per review [3]. Osteoporosis has been proven to be serious condition in the older adults, in which proximal humerus fracture is most common. Surgeries are first line treatment in such patients to avoid any complications due to older age [4]. In home treatment has been proved to be a great promising way to dispense rehabilitation services for proximal shoulder fracture [3]. Conditions such as fibromyalgia, rotator cuff injury and treatments such as mastectomy post cancer, shoulder replacement surgeries post trauma or pathology needs a proper rehabilitation procedure. Physiotherapy plays a major role in rehabilitation of such conditions by proper assessment and early intervention leading to a better quality of life for the patient. Telerehabilitation has been given to patients with neck and shoulder conditions in various settings. To date, mostly studies on telerehabilitation have focused on post-operative conditions, stroke or cardiac rehabilitation. Reviews on the use of telerehabilitation in musculoskeletal conditions have mainly included studies investigating the post op conditions and to the best of our knowledge, no study has come across with the scoping review for telerehabilitation for neck and shoulder rehabilitation.

## Methods

Aim was to determine the effectiveness of telerehabilitation in neck and shoulder conditions. Study design was a scoping review. Scoping reviews have been described as a method or a way of planning the literature available at present or evidence.

A comprehensive search was done to find relevant electronic databases. There were several databases searched for review such as PUBMED, MEDLINE, GOOGLE SCHOLAR and COCHRANE. The scoping review included all types of study designs. The key words were telerehabilitation, rehabilitation, neck pain, shoulder pain, frozen shoulder, shoulder impingement, rotator cuff tear, fracture, chronic neck pain. Searches were tried to be as recent as possible ensuring English language only. In total 46 articles were searched for review but only 15 were included in scoping review (n=13) relating to neck and shoulder related rehabilitation via telerehabilitation respectively. Selection procedure of relevant research articles is shown in tabular chart below.

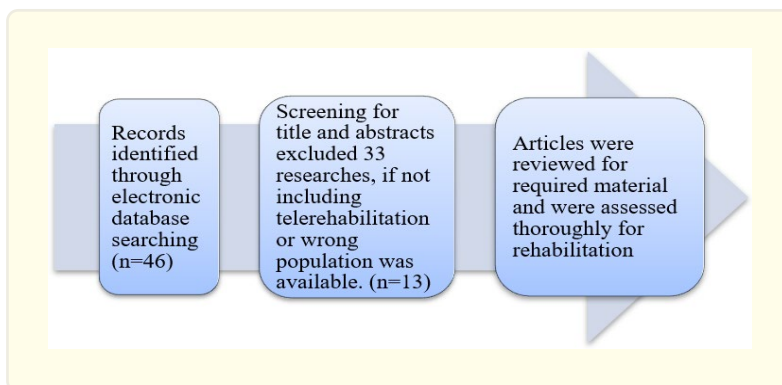


Table below is showing the review of studies relating to neck and shoulder rehabilitation via telerehabilitation in various health conditions related to neck and shoulder.

<b><i>Aim and Objectives</i></b>	<b><i>Methodology</i></b>	<b><i>Comments</i></b>
To evaluate the changes in musculoskeletal problems and psychosocial status of teachers during the COVID-19 pandemic due to online education and to investigate the effects of preventive telerehabilitation applications for musculoskeletal problems [5].	<ul style="list-style-type: none"> <li>• 40 teachers participated in the study and filled the questionnaires online.</li> <li>• The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ), ProFit-Map-Neck questionnaire, Oswestry Disability Index (ODI), and Upper Extremity Functional Index (UEFI), the Beck Anxiety Inventory (BAI) and the Beck Depression Inventory (BDI), Work-Life Balance Scale (WLBS). Telerehabilitation involved brochures and presentations via zoom meeting.</li> </ul>	It has been determined that the duration of using VDTs increased due to the transition of teachers to online education, and this situation is accompanied by an increase in the intensity and duration of pain and related limitations. All these changes have caused the work-life balance to deteriorate. After the posture and ergonomics training given via tele-assistance, there were significant improvements in the musculoskeletal system problems. However, the increased anxiety and depression experienced during the pandemic did not improve as much as the musculoskeletal system did
Aim was to examine the effectiveness of remote spinal stabilization exercises in a patient with chronic neck pain [6].	<ul style="list-style-type: none"> <li>• Pain, disability, kinesophobia, grip strength, and quality of life of a 26-year-old female patient who was an operating room nurse were evaluated. 3 days a week, 5 weeks of distance exercise training was given where the first session was done face to face and cervical stabilization exercises were taught to the patient.</li> <li>• The exercises were progressed through live video calls with the patient 3 times a week.</li> </ul>	As a result of the remote education program that lasted for 5 weeks, pain, disability, and kinesophobia levels decreased, while the level of grip strength and quality of life increased. Our patient stated that her symptoms decreased especially after the third week of the training program and that the pain that occurred during the operations started later.
To explore effects and experiences among patients participating in home-physiotherapy based on interactive video-communication after shoulder joint replacement [7].	<ul style="list-style-type: none"> <li>• 22 patients actually participated in the study. All patients underwent the same shoulder joint replacement with hemiarthroplasty.</li> <li>• In control group the physiotherapy aimed at daily home exercises supplemented by 2-3 individually supervised training sessions a week gradually reduced to once every week or every second week.</li> <li>• In the telerehabilitation group participated in 8 weeks of individually supervised physiotherapy at home including exercising on their own. The patient was connected by a video-conference system which permitted the physiotherapist to continuously supervise the exercise programme with the patient and they saw and could speak to each other.</li> </ul>	There was a greater recovery two months after surgery regarding pain and shoulder function as well as pain and vitality dimension of health-related quality of life. The interviews revealed that all patients participating in the telerehabilitation were highly satisfied with the remote-technology provided physiotherapy services at home. The participants in the actual study experienced that they did not miss hands-on treatment as they expressed the remote-physiotherapy so intensively.

<p>To determine the concurrent reliability and validity of TR based evaluation among adults for cervical spine with non-specific neck pain [8].</p> <p><a href="http://doi.org/10.1177/1357633X19861802">http://doi.org/10.1177/1357633X19861802</a></p>	<ul style="list-style-type: none"> <li>• 11 participants were recruited for study with non-specific neck pain.</li> <li>• Assessment was done in both face to face and TR based method with 1 hour gap in between to check for ROM, posture, pain intensity, endurance of deep neck flexors and disability.</li> </ul>	<p>There was high degree of reliability and validity found for pain, ROM, posture, endurance and disability for TR based assessment of cervical spine among adults with non-specific neck pain.</p>
<p>To assess the effects of using smartphones for TR on neck dysfunction and head position in workers with VDT syndrome [9].</p> <p><a href="http://doi.org/10.21598/JKPNFA.2017.15.2.149">http://doi.org/10.21598/JKPNFA.2017.15.2.149</a></p>	<ul style="list-style-type: none"> <li>• 16 participants were included in the study. 3 groups were formed for visit group, video group and TR group.</li> <li>• Exercises were performed 3times a week for 4 weeks for all groups.</li> </ul>	<p>It was founded that there was decrease in NDI score compared to the baseline. Telerehabilitation by using smartphones is an alternative method to conventional treatment for workers with neck dysfunctions.</p>
<p>To investigate the experience of patients who received video-based rehabilitation at home after shoulder joint replacement [10].</p> <p><a href="http://doi.org/10.1258/jtt.2010.100317">http://doi.org/10.1258/jtt.2010.100317</a></p>	<ul style="list-style-type: none"> <li>• 10 patients were investigated for their experience with video-based physiotherapy at home via patient's home broadband connection at bandwidth of 256-768 kbit/s.</li> <li>• Qualitative interviews were carried, transcribed and analyzed.</li> </ul>	<p>Experience of safety and strengthening were described by the patient during home exercises. Frequent interplay with patient led to positive findings because of individual judgment with physiotherapist.</p>
<p>To develop and test for the wearable technology platform to allow remote rehabilitation for shoulder musculoskeletal [11].</p>	<ul style="list-style-type: none"> <li>• Minimal set of inertial sensors were worn by patients, under remote supervision of therapist</li> </ul>	<p>The system developed was able to discriminate between compensatory and correct movement strategies.</p>
<p>To investigate if telerehabilitation is feasible for treatment of frozen shoulder [12].</p>	<ul style="list-style-type: none"> <li>• A case presentation was done for a 43 year female with frozen shoulder at thawing stage. A system of home rehab was used consisting of various features and components.</li> <li>• There were 4 sessions oh physiotherapy. Session 2 and 3 was telerehabilitation and session 1 and 4 was in person. Sessions included ROM, strengthening and stretching exercises.</li> </ul>	<p>It showed good results after a period of 9 weeks. Decrease in pain and increase in ROM was there with patient satisfaction. It is feasible and convenient to use telerehabilitation in frozen shoulder patients of middle age.</p>
<p>To investigate if in home telerehabilitation is feasible for treatment of proximal humerus fracture [4].</p>	<ul style="list-style-type: none"> <li>• A pilot study was done, 17 patients were included in study with proximal humerus fracture.</li> <li>• After discharge from hospital, all undergone telerehabilitation through videoconferencing for 8 weeks. In sessions 1,3,5 telerehabilitation was given twice/week, whereas for week 2,4,6,7 and 8 it was given once/week.</li> <li>• Exercises included stretching, pain control, ROM and muscle building exercises for 35-40 minutes.</li> </ul>	<p>Significant results were present at the end of program in pain and quality of life of patients, suggesting that telerehabilitation is a promising platform. ROM, disability and patient satisfaction were also positive.</p>

<p>To investigate if telerehabilitation is feasible and effective for treatment in patients after subacromial decompression surgery as compared to usual care [3].</p>	<ul style="list-style-type: none"> <li>• 18-65 years of age of patients were included in the study.</li> <li>• Patients included in TR were provided with exercises videos, images and protocol through web platform via emails. 3 sessions of videoconferencing with physiotherapist were added to ensure proper guidelines being addressed to patient. Exercises were done 5times/ week for 12 weeks.</li> <li>• Baseline group received general advice regarding physical therapy and issues regarding intake of analgesics.</li> </ul>	<p>Telemedicine improves quality of life of patients, cost effective and easily accessible. It's a trial and ongoing with recruitment process expecting and promising that it will be accessible to all patients since it will be available on all platforms and not a high technology based platform.</p>
<p>To provide treatment for acute upper limb lymphedema by congestive decompression therapy via telerehabilitation after mastectomy in a case during covid 19 [13].</p>	<ul style="list-style-type: none"> <li>• 69 year old woman after mastectomy due to covid 19 wasn't able to go to rehabilitation centers.</li> <li>• Telerehabilitation was provided to patient via skype platform for self-congestive decompression therapy for upper limb. 10 sessions were provided lasting for 60 minutes each for around 15 days.</li> <li>• Sessions included self-massage, CT, application of some gentle exercises and skin care. Bandaging was applied after each session for 24 hr duration and was removed before next session only 15-20 minutes prior if patient wanted to take a bath.</li> </ul>	<p>There was significant reduction found in the circumference of the upper arm (30 cm to 25 cm), lower arm (40.5cm to 24.5 cm), wrist circumference (33.5 cm to 16.5 cm) and palm circumference (25.5 cm to 17 cm) after 10 days. Patient satisfaction was positive after sessions. Established mentalities and perceptions needs to be kept aside to help telerehabilitation to be grounded in clinical practice.</p>
<p>To investigate feasibility of internet delivered rehabilitation for rotator cuff related shoulder pain in comparison to advice, recommended care, recommended care with group based telerehabilitation [14].</p>	<ul style="list-style-type: none"> <li>• 12 weeks internet based intervention was provided to 36 participants after 20 minutes of telehealth assessment in patients having pain because of rotator cuff in shoulder for 3 months or more.</li> <li>• 3 groups were made, where first received advice only, second received recommended care and third received recommended care and telerehabilitation.</li> </ul>	<p>Acceptable adherence was found in third group as compared to second group.</p>
<p>To evaluate the experiences of patients with post shoulder joint replacement surgery and video communication based telerehabilitation at home for physiotherapy [15].</p>	<ul style="list-style-type: none"> <li>• 22 participants were included in the study. 10 were included in TR group where 3 part video meeting was arranged for the patient via images and sound system. Group c was referred for conventional physiotherapy treatment.</li> </ul>	<p>Patient who received TR had decrease in the shoulder pain with increase in range of external rotation, improvement in quality of life, and shoulder function and activity limitation as compared to control group. Interactive video based physiotherapy showed better results as compared to the conventional one.</p>

## Discussion

The scoping review done was to provide the overview regarding available databases for neck and shoulder rehabilitation via telerehabilitation. The review included rehabilitation of various conditions like shoulder surgeries, frozen shoulder, mastectomy, fibromyalgia, chronic neck pain, rotator cuff pathology etc. After reviewing various related articles, it was found out that better results were present in terms of decrease in pain, disability and improvement in terms of range of motion (ROM), posture, endurance, quality of life and patient satisfaction. Patients described better sense of security and adherence in telerehabilitation as compared to the conventional treatment provided. Decrease in the number of hurdles such as travelling to hospital or clinic showed better compliance in patients. In the present study various range of literature has been found showing effectiveness of telerehabilitation and providing information regarding better outcomes and results from the same. The review informs the researchers and the end users such as clinicians, physiotherapist and other healthcare providers regarding the effectiveness of telerehabilitation and that it will be the new normal in near future in health care practice. It showed that telerehabilitation is a feasible yet effective in conditions relating to neck and shoulder. Future studies can be done focusing on telerehabilitation for neck and shoulder as a method of rehabilitation in patients with neck and shoulder pain.

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