



The telehealth program of occupational therapy among older people: an up-to-date scoping review

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Abstract

Background The average life expectancy of older people is increasing, and most seniors desire to age at home and are capable of living independently. Occupational therapy (OT) is client-centered and uses patients' meaningful activities, or occupations, as treatment methods, thus playing an important role in later adulthood. Telemedicine removes the constraints of time and space, and the combination of OT and telemedicine can greatly improve medical efficiency and clinical effectiveness.

Aims The purpose of this scoping review was to examine the scope and effectiveness of telehealth OT for older people.

Methods This scoping review was conducted following the methodological framework proposed by Arksey and O'Malley. We searched the literature in five databases following the PICOS (Population, Intervention, Comparison, Outcome, Study design) guideline, from inception to April 2022. Two trained reviewers independently retrieved, screened, and extracted data, and used a descriptive synthesizing approach to summarize the results.

Results The initial search yielded 1249 studies from databases and manual searches, of which 20 were eligible and were included in the final review. A thematic analysis revealed five main themes related to telehealth OT: occupational assessment, occupational intervention, rehabilitation counseling, caregiver support, and activity monitoring.

Conclusions Telehealth OT has been used widely for older people, focusing primarily on occupational assessment and intervention provided conveniently for occupational therapists and older clients. In addition, telehealth OT can monitor patients' activities and provide rehabilitation counseling and health education for the elderly and their caregivers, thus improving the security of their home life and the efficacy of OT. During the COVID-19 pandemic, telehealth will be an effective alternative to face-to-face modalities.

Keywords Occupational therapy · Telehealth · Older people · Telerehabilitation · Scoping review

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Introduction

Later adulthood is the period of life in people older than 65 years of age, according to the United Nations. Data show that the global population aged 65 and over was 727 million in 2020, and the proportion of older adults is expected to increase from 9.3 in 2020 to 16% in 2050 [1]. The satisfaction of people's material needs and advancements in medicine are increasing the average life expectancy year by year. Population health is improving globally, with the global average life expectancy at birth having increased from 66.8 years in 2000 to 73.4 years in 2019, and with healthy life expectancy at birth having improved from 58.3 years in 2000 to 63.7 years in 2019 [2]. However, the growth rate of healthy life expectancy is significantly lower than that of life expectancy, which means that gerontology is poised to face new opportunities and challenges. Sarcopenia, malnutrition

and osteoporosis are common factors leading to impairments in older adults, which in turn may result in functional limitations and disabilities [3, 4]. For example, sarcopenia in older people may lead to decreased oropharyngeal function, which can lead to malnutrition and further impair functional activity. These impairments which occur in later adulthood can reduce their quality of life and well-being, while at the same time increasing the burden on families.

Occupational therapy (OT) is an important component of rehabilitation that promotes functional independence through meaningful occupations and purposeful activities to enhance occupational performance. According to the fourth edition of the Occupational Therapy Practice Framework: Domain and Process (OTPF-4) [5], common types of OT interventions are occupation-based activities, interventions to support occupations, education and training, advocacy, group interventions, and virtual interventions. In general, OT interventions traditionally are conducted in hospitals [6], communities [7], and homes [8] through face-to-face meetings between therapists and clients. The practice of geriatrics relies on a multidisciplinary team to best serve patients, and OT plays an irreplaceable role in geriatric care [9–11]. Increasingly, older people are choosing to age in place, which means living independently or with minimal support in their homes [12, 13]. The focus of geriatric OT should be on helping older persons remain active and engaged in their meaningful activities and occupations while focusing on fall prevention and other safety issues in the home and community [5, 11]. However, the majority of older people with functional impairments have no access to timely occupational interventions because they have limited traditional rehabilitation resources [14]. Furthermore, older people have difficulty adhering to traditional rehabilitation because of its high cost, the time spent travelling between rehabilitation facilities and their home, and the safety issues that result from the journey [15, 16].

Fortunately, the use of mobile devices can somewhat alleviate the medical pressures of ageing [17–19]. Activity and participation are core concepts of the International Classification of Functioning, Disability and Health (ICF) and are the central focus of OT [20, 21]. The American Occupational Therapy Association (AOTA) defines telehealth as “the application of evaluative, consultative, preventative, and therapeutic services delivered through telecommunication and information technologies” [22]. The World Federation of Occupational Therapists (WFOT) has stated that telehealth can be used as an appropriate service delivery model for occupational therapists (OTs) and may be able to improve access to OT services [23]. Telehealth was highlighted as a rapidly developing service model for OT in 2014 [24].

One study has suggested that telehealth OT could positively impact the activities and lives of adults coping with long-term disabilities [25]. As the coronavirus disease 2019

(COVID-19) pandemic has intensified, some OTs have been forced to transition from traditional face-to-face services to telehealth [22]. OT is for people who have functional impairments, mostly affected by chronic illnesses that are not life-threatening [26]. The lockdown due to the COVID-19 pandemic substantially restricted OT practice. So it's time to think about existing OT practice and integrate it with telehealth models. During the COVID-19 pandemic, the quality of life and function of older people has declined [27, 28], and the implementation of geriatric care has been challenged [29–31]. A systematic review has presented experiences and reflections on telehealth in OT during the COVID-19 pandemic [32].

The OT focus on a client-centered approach, combined with the advantages of telehealth, could further develop the value of both modalities in older people. Consequently, this study had the following objectives: (a) to elucidate the areas of geriatric rehabilitation in which telehealth OT can be effectively applied; (b) to determine whether telehealth OT can fulfill the dual roles of OT and telemedicine; and (c) to analyze the current problems of telehealth OT and identify the vision for its future development.

Methods

For this study, we applied the methodological framework proposed by Arksey and O'Malley [33] for a scoping review and strictly followed the five basic stages: (a) identifying the research question; (b) identifying relevant studies; (c) selecting studies; (d) charting the data; and (e) collating, summarizing, and reporting results. The sixth stage, consulting with stakeholders, was omitted from this scoping review.

A scoping review, as opposed to a systematic review, was appropriate because the areas of telehealth OT in older people are unclear, the interventions are complex and diverse, and the literature is limited. For reporting this review, we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) [34]. The scoping review protocol was established prior to the start and was rigorously implemented at all stages.

Eligibility criteria

The search strategy was formulated using the PICOS (Population, Intervention, Comparison, Outcome, Study design) framework. This scoping review encompassed studies that met all of the following defined inclusion criteria.

Population: participants ≥ 65 years old, or include a wider age but with a mean or median age of 65 years old and older;

Intervention: focus on OT or OT-related interventions and which were conducted through telehealth;

Comparison: could be any (such as conventional face-to-face OT) or none;

Outcome: included (but were not limited to) the scope and effectiveness of telehealth OT;

Study design: all studies besides review articles which were published in English language papers in peer-reviewed journals.

Furthermore, studies were excluded if they were:

- (i) Full-text articles that could not be found/accessed;
- (ii) Study designs and protocols;
- (iii) Articles on telehealth device development and platform construction and lacked a clinical evaluation.

In contrast to systematic reviews, studies that met the inclusion criteria were included in this scoping review without considering the literature quality and the journal impact factor.

Information sources

This study searched five databases for literature from the time of database inception to April 2022, in PubMed, Web of Science, Embase, Scopus, and the Cochrane Library. This scoping review used a complete search strategy that employed keywords, US National Library of Medicine medical subject headings (MeSH) or terms related to key concepts, and the Boolean terms “AND” and “OR.” The search strategy was drafted by the first author and finalized after discussion and revision by our research team. Furthermore, relevant reviews and references of included studies were manually screened for additional suitable studies. If necessary, the original authors were contacted for further information.

Search

The key search terms included three categories related to older people, telehealth, and occupational therapy. As an

example, the detailed search strategy of PubMed is presented in Table 1.

Selection of sources of evidence

Search results were imported into a citation management software package (Endnote 20), and duplicates were removed by a combination of the removal function on Endnote and a manual check by the first author. Subsequently, two trained reviewers with medical research experience of more than 5 years independently screened the titles and abstracts and then the full-text. Before the formal study, we tested the suitability of the inclusion and exclusion criteria in a pilot project of 50 studies. According to the Joanna Briggs Institute (JBI) [35], an agreement of 75% demonstrates the satisfactory performance of the inclusion and exclusion criteria. The agreement between the two reviewers for the pilot was 88% and therefore our inclusion/exclusion criteria met the feasibility criteria. Any disputes were discussed and consensus were reached among the reviewers. Other inextricable conflicts were resolved by a medical professor reviewer.

Data charting process

The first author initially drew a data extraction chart, and each author independently tested its feasibility through a pilot of five studies. Next, the standardized data extraction chart was finalized through communication and discussion by our research team. In the data extraction phase, two reviewers extracted data independently using the standardized data extraction chart, via Microsoft Excel. Any conflicts were resolved through discussion or consultation with the professor reviewer.

Data items

The data were extracted in two parts: part one: basic characteristics of the included studies, and part two: characteristics related to telehealth OT. The first part involved authors,

Table 1 List of search strings in PubMed

Step	Search strategy
#1	“Telemedicine”[MeSH] OR telerehabilitation OR telehealth OR telemedicine OR ehealth OR mhealth
#2	“Occupational Therapy”[MeSH] OR “occupational therapy” OR OT OR occupation OR “occupational therapist”
#3	“Aged”[MeSH] OR aged OR gerontology OR elderly OR senior OR older people OR geriatric
#4	#1 AND #2 AND #3

year of publication, country of origin, study design, population group(s), age, number of study participants, intervention period, intervention frequency, and study aim(s). The second part contained the project name, telerehabilitation platform(s), and telehealth OT content(s).

Synthesis of results

The data extracted from the articles were entered into Microsoft Excel for classification and synthesis. The inevitably heterogeneous nature of data reporting in a scoping review rendered a quantitative analysis unsuitable, so we used a descriptive synthesizing approach to summarize the results in this study.

Results

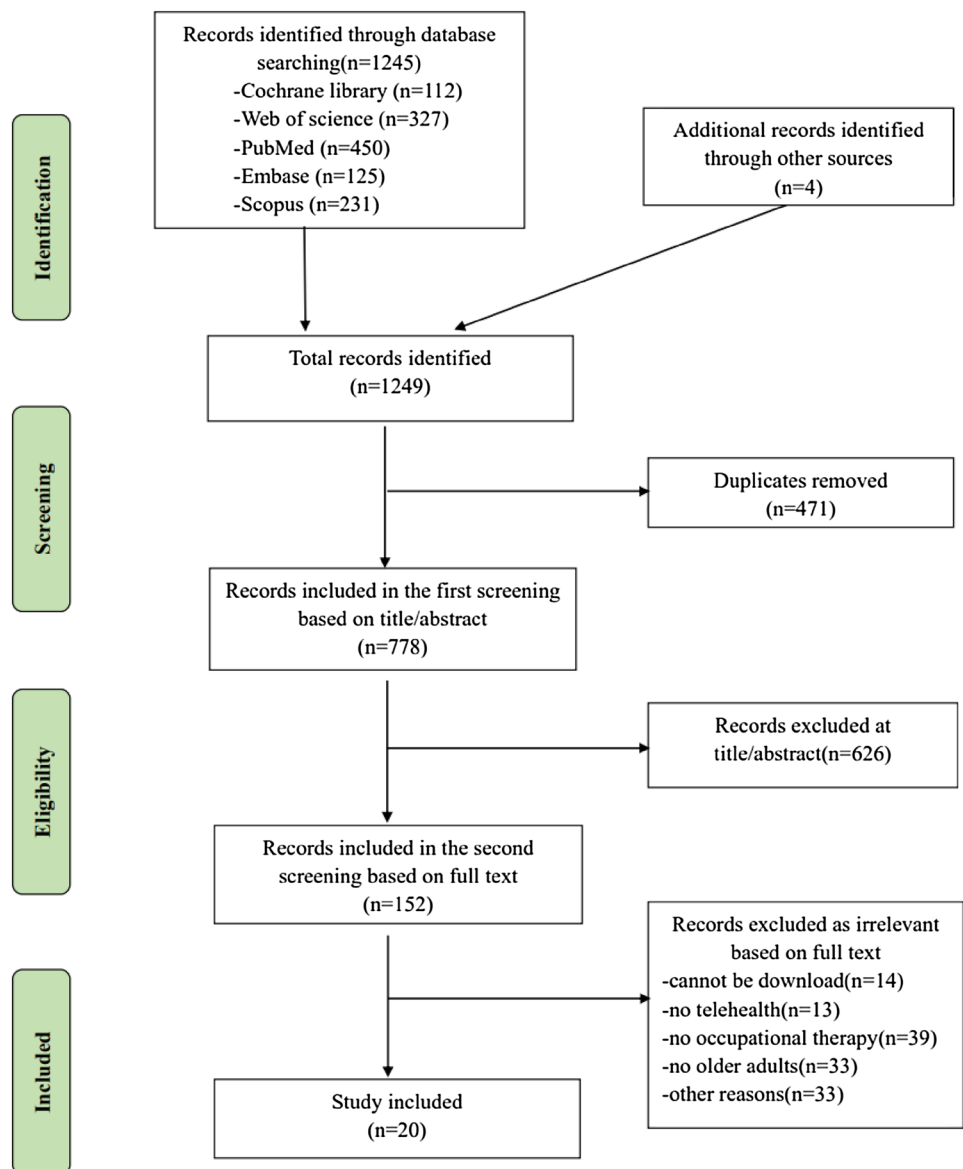
Selection of sources of evidence

From the five databases and manual searches, 1249 studies were identified, and 778 references remained after duplicates were removed. Ultimately, 20 eligible studies were included in the review, following title/abstract and full-text screening. Figure 1 shows the PRISMA flow diagram used to identify eligible studies [36].

Characteristics of sources of evidence

The 20 references ultimately included in the study were published between 2008 and 2021, and only one had been

Fig. 1 PRISMA diagram of the study selection process



published more than 10 years previously [37]. Eight of the 20 (40%) [38–45] were published after the onset of the COVID-19 pandemic. A large proportion of the studies were conducted in the U.S.A. ($n=5$, 25%) [39, 40, 42, 44, 46], Canada ($n=4$, 20%) [47–50], and Austria ($n=4$, 20%) [37, 51–53], with the remaining study locations being China ($n=2$, 10%) [41, 43], Spain ($n=2$, 10%) [45, 54], England ($n=1$, 5%) [55], Israel ($n=1$, 5%) [56] and Sweden ($n=1$, 5%) [38]. Five studies included older persons with stroke (25%) [38, 39, 42, 46, 50], four studies included older people without special diseases (20%) [44, 51, 52, 55], two studies included older persons with Parkinson's disease (10%) [37, 53], two studies included older people with cognitive impairment (10%) [41, 48], and two studies included older individuals with hip fracture (10%) [43, 45]. In addition, four studies included older persons from other populations of individuals who: were manual wheelchair users [49], had the chronic obstructive pulmonary disease (COPD) [54], had acquired brain injury [56], or had cancer [40]. Sample sizes of the studies ranged from two participants to 205 participants, and the study periods ranged from 3 weeks to 3 months. Table 2 presents the detailed characteristics of the studies we investigated.

Telerehabilitation platform(s)

Most of the studies took practicality and convenience into consideration when selecting telehealth platforms. Five studies conducted telemedicine via smartphones [39, 41–43, 46], seven conducted telemedicine via tablet computers [39, 43, 44, 47, 49–51], and seven provided intervention via video conferencing [40, 41, 48, 51–53, 56]. In addition, two of the studies mentioned having used other electronics, such as a computer [54] or an interactive whiteboard [51].

The development of new platforms/applications

Specific applications (APPs) or platforms were applied in 12 of the studies to study the value and efficacy of a newly developed software package or platform [38, 39, 42–47, 49, 50, 54, 55].

Characteristics related to telehealth OT

A thematic analysis revealed five main themes that were related to telehealth OT: occupational assessment, occupational intervention, rehabilitation counseling, caregiver support, and activity monitoring. Detailed characteristics related to telehealth OT are presented in Table 3, and the correlations between the themes included in the literature are illustrated in Fig. 2.

Occupational assessment

OT begins with assessment and ends with assessment, making an accurate and efficient assessment crucial to the process of OT. Nine of the studies (45%) dealt specifically with the occupational assessment [37, 44, 46, 49, 50, 52–55]. Chumbler and colleagues used the STeleR (short for “stroke telerehab”) intervention through home visits conducted by trained occupational assistants via telehealth to assess physical performance, to provide suitable interventions for the clients. Middle and final assessments were conducted by telephone in their study [46]. Guideomeasure-3D is a web-enabled 3D mobile APP designed by Hamm et al. that enables the elderly to carry out self-assessment tasks [55]. Home modifications are effective interventions for improving older adults' safety and independence. Nguyen et al. developed a mobile APP that provides home assessments and modifications for OTs and community-dwelling older adults [44]. Two studies focused on patients with Parkinson's disease and confirmed the feasibility of telehealth assessment: Hoffmann assessed activities of daily living (ADL) and hand function via an Internet-based telerehabilitation system [37], and Stillerova screened cognition using the Montreal Cognitive Assessment via videoconferencing [53]. Khan et al. assessed and diagnosed Alzheimer's disease via videoconferencing [52]. In addition, three studies exploring the efficacy of telehealth OT [49, 50, 54] conducted assessments by telehealth.

Occupational intervention

The use of occupational-based activity is the most extensive intervention method of telehealth OT, and 15 (75%) of the included studies applied OT to telemedicine [38–43, 45–51, 54, 56]. OT is a client-centered discipline that reflects the establishment of occupational goals and a selection of interventions. In the studies we reviewed, goals were set using the Canadian Occupational Performance Measure (COPM), and in four studies meaningful occupational interventions were selected through telehealth methods [38, 39, 48, 54]. EPIC WheelS is a training program APP for at-home instruction in wheelchair use, and it includes video instruction, self-paced training activities, and training games. It was developed to improve patients' wheelchair skills, and in so doing to enhance their participation in the community [47, 49]. The STeleR intervention focuses specifically on improving functional mobility via in-home messaging devices and telephones [46]. The Caspar Health e-system was designed for older adults who have recently had hip fracture surgery, to engage them in occupation-based activities anywhere through digital communication [43]. The mRehab system delivers 12 mRehab activities that are designed to improve upper limb mobility in patients with chronic stroke [42].

Table 2 Characteristics of the included studies

References	Country of origin	Study design	Population group(s)	Mean/median age	Number of study participants	Intervention period	Intervention frequency	Study aim(s)
Chumbler et al. [46]	USA	RCT* ¹	veterans with stroke	IG* ² 67.1(mean) CG* ³ 67.7(mean)	IG* ² 25 CG* ³ 23	3 months	IG* ² : 3 1-h home visits + 5 intervention calls + monitored weekly + routine care CG* ³ : routine care	To determine the effect of a multifaceted stroke telerehabilitation (STeleR) intervention on physical function, and secondarily on disability, in veterans poststroke
Giesbrecht et al. [47]	Canada	RCT* ¹	manual wheelchair users	66.1 (mean)	IG* ² 9 CG* ³ 8	4 weeks	IG* ² : 150 min/week, 1–2 sessions/day, 15–30 min in length, at least five days per week CG* ³ : routine exercise	To evaluate the feasibility of implementing the studied mHealth manual wheelchair skills training program among middle-aged and older adults
Burton et al. [48]	Canada	RCT* ¹	SCT* ⁴ , MCI* ⁵ , AD* ⁶	IG* ² (66,68,80) CG* ³ (68,72,77)	IG* ² 3 CG* ³ 3	8 weeks	IG* ² : a week for a 1-h session CG* ³ : the same as IG* ²	To compare goal-oriented cognitive rehabilitation delivered in-person with videoconferencing to determine whether telehealth cognitive rehabilitation appears feasible
Li et al. [43]	China	RCT* ¹	hip fracture patients	IG* ² 76.5(mean) CG* ³ 82.1(mean)	IG* ² 15 CG* ³ 16	3 weeks	Not mentioned	To investigate the effects of a home-based occupational therapy telerehabilitation via smartphone in enhancing functional and motor performance and fall efficacy for outpatients receiving day hospital rehabilitation after hip fracture surgery in Hong Kong

Table 2 (continued)

References	Country of origin	Study design	Population group(s)	Mean/median age	Number of study participants	Intervention period	Intervention frequency	Study aim(s)
Crotty et al. [51]	Australia	quasi-experimental study	community patients, nursing home residents	73.4(mean)	61	8 weeks	Not mentioned	To investigate the feasibility of providing telerehabilitation in the home as an alternative to conventional ambulatory rehabilitation
Giesbrecht et al. [49]	Canada	quasi-experimental study	manual wheelchair users	66.5(mean)	2	4 weeks	4 to 5 days per week in 15–30 min sessions for a total of at least 75 min each week	To determine the acceptability and feasibility of administering an mHealth wheelchair skills training program safely and effectively with two participants of different skill levels
Rosenbek et al. [54]	Spain	quasi-experimental study	COPD*7	69.2(mean)	37	3 weeks	3 times/week, lasting 30–45 min	To assess the post-hospitalization feasibility of an individualized home-based training and counseling program via video conference for patients with severe COPD*7
Beit Yosef et al. [56]	Israel	quasi-experimental study	ABI*8	67(median)	5	3 months	1–2 times a week, 45 min per session, 15 sessions in total	To explore the feasibility, acceptability, and preliminary efficacy of a metacognitive occupation-based intervention in a telerehabilitation format with adults and older adults in the chronic phase after ABI*8

Table 2 (continued)

References	Country of origin	Study design	Population group(s)	Mean/median age	Number of study participants	Intervention period	Intervention frequency	Study aim(s)
Guidetti et al. [38]	Sweden	quasi-experimental study	stroke	65(mean)	10	8 weeks	Not mentioned	To evaluate the i) feasibility of F@ee, within in-patient and primary care rehabilitation after stroke, ii) study design and outcome measures used, and iii) fidelity, adherence, and acceptability of the intervention
Langan et al. [42]	USA	quasi-experimental study	stroke	66.5(median)	16	6 weeks	10 repetitions of each activity daily, 5 days/week	To examine whether individuals with chronic stroke can use mRehab at home to improve upper limb mobility To examine whether changes in limb mobility can be transferred to standardized clinical assessments
Kringler et al. [39]	USA	descriptive case study	stroke	67(median)	5	5 weeks	Not mentioned	To adapt the delivery of strategy training for remote delivery using mobile health technology
Lafaro et al. [40]	USA	quasi-experimental study	lung or GI ^{*9} cancers and their caregivers	GI ^{*9} 68.0 (median) Lung 74.0 (median)	GI ^{*9} 16 Lung 18	4 weeks	five sessions in total	To determine the feasibility and acceptability of a personalized telehealth perioperative physical activity intervention for older lung and GI ^{*9} cancer surgery patients and their caregivers

Table 2 (continued)

References	Country of origin	Study design	Population group(s)	Mean/median age	Number of study participants	Intervention period	Intervention frequency	Study aim(s)
Lai et al. [41]	China	quasi-experimental study	older adults with NCD ^{*10} and their caregivers	IG ^{*2} : 72.87(mean) CG ^{*3} : 72.73(mean)	IG ^{*2} : 30 CG ^{*3} : 30	4 weeks	IG ^{*2} : weekly health services delivered through video communication apps + weekly 30 min calls CG ^{*3} : weekly 30 min calls	To evaluate whether supplementary telehealth via videoconferencing platforms could bring additional benefits to care recipients with NCD ^{*10} and their spousal caregivers at home
Ortiz-Pina et al. [45]	Spain	quasi-experimental study	hip fracture patients	IG ^{*2} : 75.86(mean) CG ^{*3} : 80.38(mean)	IG ^{*2} : 28 CG ^{*3} : 34	12 weeks	IG ^{*2} : five online-based sessions per week, each lasting 50–60 min CG ^{*3} : 5–15 sessions of physiotherapy and OT	To examine the effects of a multidisciplinary telerehabilitation program on functional recovery of older adults with hip fractures, compared with home-based in-person rehabilitation
Hamm et al. [55]	England	mixed-methods study	older adults	68.3(mean)	34	Not mentioned	Not available	To present guideline measure-3D, a web-enabled 3D mobile application that enables older-adult patients to carry out self-assessment measurement tasks, and to conduct a mixed-methods evaluation of its performance and obtain associated user perceptions of the application, compared with a 2D paper-based equivalent
Nguyen et al. [44]	USA	mixed-methods study	community-dwelling older adults	72.8(mean)	6	Not mentioned	Not available	To develop and test the usability of a mobile app directory of OTs who provide home modifications in the United States

Table 2 (continued)

References	Country of origin	Study design	Population group(s)	Mean/median age	Number of study participants	Intervention period	Intervention frequency	Study aim(s)
Hoffmann et al. [37]	Australia	observational study	Parkinson's disease	66.1 (mean)	IG ^{*2} 6 CG ^{*3} 6	Not mentioned	Not available	To determine the validity and the intra-rater and inter-rater reliability of the telerhabilitation system in measuring ADL ^{*11} and hand function in 12 people with Parkinson's disease
Martin-Khan et al. [52]	Australia	observational study	older adults	76 (mean)	IG ^{*2} 100 CG ^{*3} 105	Not mentioned	Not available	To determine the validity of the diagnosis of dementia via video conferencing
Stillerova et al. [53]	Australia	observational study	Parkinson's disease	69 (median)	11	Not mentioned	Not available	To evaluate the in-home feasibility of screening cognition in people with Parkinson's disease by using available technology
Pugliese et al. [50]	Canada	prospective cohort study	stroke	75 (median)	30	3 months	the recommended daily therapy time totaled 1 h	To demonstrate the feasibility of Recover Now, a tablet-based stroke recovery platform aimed at delivering speech and cognitive therapy

*¹RCT means randomized controlled trial*²IG means intervention group*³CG means control group*⁴SCI means subjective cognitive impairment*⁵MCI means mild cognitive impairment*⁶AD means Alzheimer's disease*⁷COPD means chronic obstructive pulmonary disease*⁸ABI means acquired brain injury*⁹GI means gastrointestinal*¹⁰NCD means neurocognitive disorder*¹¹ADL means activities of daily living

Table 3 Characteristics related to telehealth occupational therapy

References	Project name	Telerehabilitation platform(s)	Telehealth occupational therapy content(s)				
			Occupational assessment	Occupational intervention	Rehabilitation counseling	Car-giver support	Activity monitoring
Chumblor et al. [46]	SteleR	in-home messaging device, telephone	✓	✓			✓
Giesbrecht et al. [47]	EPIC WheelS home program	tablet computer		✓	✓		✓
Burton et al. [48]	None	video conferencing		✓			
Li et al. [43]	Caspar Health e-system	smartphone or tablet computer (APP)		✓	✓		
Crotty et al. [51]	None	tablet computer (iPad, Apple Inc.), document camera (Ziggi HD, Ipevo), interactive whiteboard (Baiboard), video software (ManyCam), desktop video recorder (BandiCam)		✓		✓	✓
Giesbrecht et al. [49]	EPIC WheelS	tablet computer (APP)	✓	✓		✓	✓
Rosenbek et al. [54]	Patient Briefcase	a computer containing a screen, a microphone, an on/off switch and a volume control	✓	✓	✓		✓
Beit Yosef et al. [56]	None	video conferencing(Skype™ software)		✓			
Guidetti et al. [38]	F@ce	website, stroke rehabilitation platform, database		✓			✓
Langan et al. [42]	mRehab	smartphone(APP)		✓			
Kringle et al. [39]	iADAPTS	tablet computer or smartphone (APP), portal		✓			✓
Lafaro et al. [40]	None	video conferencing (Zoom)		✓		✓	✓
Lai et al. [41]	None	video conferencing (Zoom, WhatsApp, or FaceTime), telephone		✓		✓	
Ortiz-Pina et al. [45]	@ctivehip	No mentioned		✓		✓	
Hamm et al. [55]	guidetomeasure-3D	multi-platform deployment including Android, IOS, desktop and the Web	✓				
Nguyen et al. [44]	Home Maddirs	tablet computer (APP on Apple iPad 4)	✓				
Hoffmann et al. [37]	None	APP	✓				
Martin-Khan et al. [52]	None	video conferencing	✓				
Stillerova et al. [53]	None	video conference (Skype)	✓				
Pugliese et al. [50]	Recover Now	tablet computer (therapy platform)	✓	✓			✓

In one study, OTs provided safety education on fall prevention and personalized home modifications through @ctivehip [45]. The Cognitive Orientation to Daily Occupational Performance (CO-OP) approach is a metacognitive approach. Pugliese et al. [50] and Beit Yosef et al. [56] used

the CO-OP intervention via video conferencing in their studies. Conventional occupational interventions were used to examine the feasibility of telehealth via tablets or telephones in three studies [40, 41, 51].

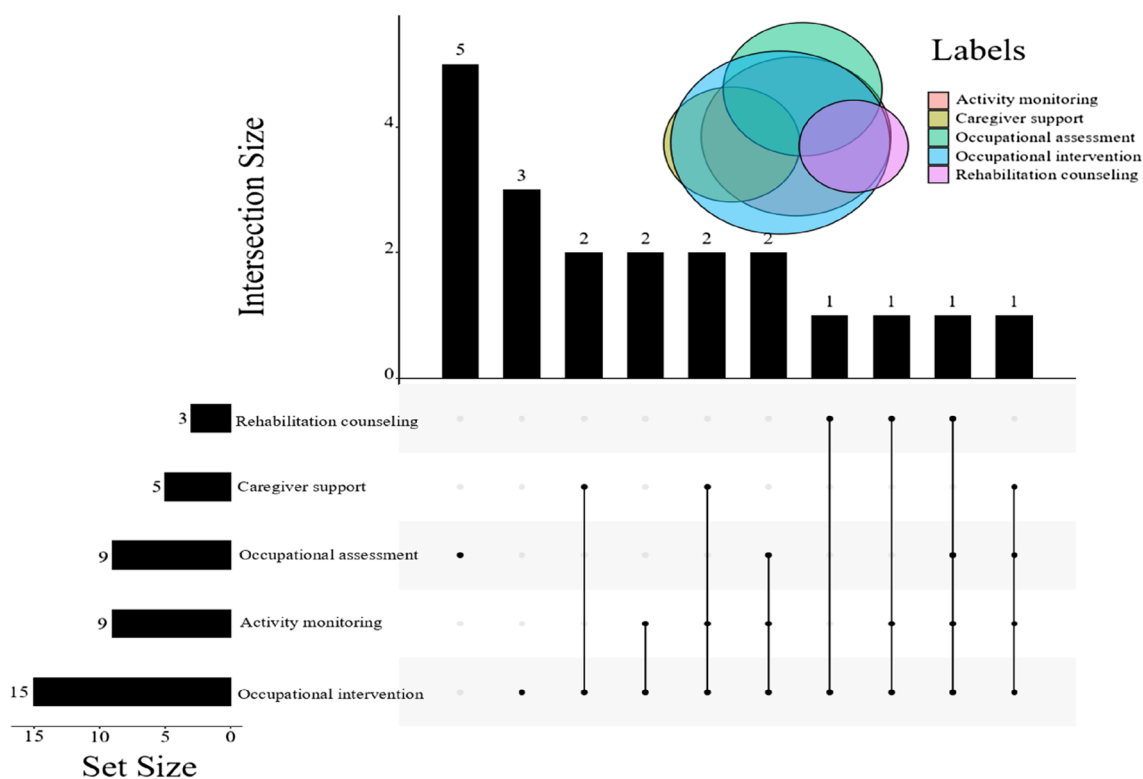


Fig. 2 Upset plot of the study's telehealth occupational therapy themes

Rehabilitation counseling

OT focuses on the meaningful activity/occupational performance of clients, so providing rehabilitation consultations to clients is a significant part of telehealth OT. However, only three papers in this review (15%) included rehabilitation consultations [43, 47, 54]. A study of the EPIC WheelS APP [47] mentioned consultations about using wheelchairs for the elderly, and the Caspar Health e-system[43] provides in-home rehabilitation consultations for patients with hip fractures. Patient Briefcase [54] is telemedicine videoconferencing equipment that provides training and counseling on energy conservation techniques that OTs use for COPD clients. Telehealth increases the continuity of early consultation and intervention, putting OT into patients' daily lives.

Caregiver support

The clients of OT are patients who have limitations in everyday activities, and their caregivers. The use of telehealth makes caregiver support more convenient and efficient, and five of the studies we reviewed specifically involved caregiver support (25%) [40, 41, 45, 49, 51]. Crotty's study enrolled patients and their caregivers and fully considered the application of caregiver support in telehealth [51]. A pilot study of EPIC WheelS took safety factors into account

and invited caregivers to participate in the process of providing safety education [49]. Both older persons with cancer and their caregivers endure significant burdens, and some research on older adults with cancer and their caregivers has aimed to determine the feasibility and acceptability of occupation-based activities [40]. In addition, although the COVID-19 pandemic has seriously further affected patients' access to rehabilitation, telehealth is an attractive alternative to in-person rehabilitation. Specifically, during the COVID-19 pandemic, research has shown that telehealth can provide interventions and support to patients with Alzheimer's disease and their caregivers, and it has also addressed telehealth's distance limitations and ability to improve patient and caregiver well-being [41]. In one study, caregivers were invited to participate in the telerehabilitation group (@ctivehip) for client management and home satisfaction [45].

Activity monitoring

Electronic devices make activity monitoring more convenient, and nine of the studies (45%) monitored occupational interventions through telehealth platforms that improved security and facilitated OTs' ability to review and summarize their interventions [38–40, 46, 47, 49–51, 54]. OTs monitor participants' activities weekly by in-home messaging devices, which provide feedback in a positive form

to enhance the clients' exercise adherence [46]. The EPIC WheelS APP enables therapists to monitor each client's training activity and adjust the next session of intervention on the basis of the feedback results [47, 49]. In the research of Crotty et al., the APP named Fitbit was used to monitor activities, and BandiCam was used to record the content of videoconferences to acquire immediate feedback [51]. Patient Briefcase, the home-based supervised training system, includes a camera installed in the participant's home to follow movements around the home and uses a pulse oximeter to monitor saturation and training sessions [54]. The F@ce platform has three interfaces: the administrator's view, the team's review, and the participant's view. In the work by Guidetti et al., researchers logged into the administrator's view to monitor the intervention process, and therapists entered the team view to monitor their patients' occupational performances [38]. Some self-monitoring approaches also can be provided, such as the physical activity diary and wristband pedometer to enhance functional recovery discussed in Lafaro et al.'s study [40]. In addition, two of the studies monitored patients' ADLs with the use of a messaging system embedded in the telehealth system that they studied. If the participant failed to complete the activities as required, after an extended period the therapist would receive a system reminder and then would contact the participant by telephone or other means to assure his/her safety and identify the reasons why the participant was not accomplishing the required activities [39, 50].

Discussion

Summary of evidence

This scoping review sought to identify which fields of telehealth OT can be applied to older adults and to explore the feasibility and directions of development for telehealth OT. To our knowledge, our review is the first study to combine telehealth and OT in geriatric rehabilitation. In this study we examined five areas of telehealth OT among older people: occupational assessment [37, 44, 46, 49, 50, 52–55], occupational intervention [38–43, 45–51, 54, 56], rehabilitation counseling [43, 47, 54], caregiver support [40, 41, 45, 49, 51], and activity monitoring [38–40, 46, 47, 49–51, 54]. The records that were included in this review provide insights into the characteristics of telehealth OT in older people and offer new ideas and novel perspectives for further research on telehealth OT.

Nineteen of the studies we reviewed were published in the past decade (95%), and only one was published more than 10 years ago [37]. In light of the COVID-19 crisis, OTs somewhere are thinking about switching from working face-to-face to using a telehealth modality. Eight of the records

(40%) [38–45] were published after the onset of the COVID-19 pandemic, which greatly accelerated the development of telehealth OT in a sense. Unfortunately, only one study [41] examined the protective impact of telehealth OT on older persons with dementia during the COVID-19 pandemic. The reasons for this limited consideration may be the time-consuming nature of clinical studies and the long publication cycle of papers. A number of preventive measures have been applied to prevent the spread of the COVID-19 infection, such as lockdown, quarantine and social distancing, but they have also brought a significant impact on the conventional medical practice and health practitioners. Since the early part of the COVID-19 pandemic, an increasing number of health workers, including OTs, have been recognizing the advantages of telemedicine, and it is believed that in the near future telehealth OT will be widely adopted for older persons.

A study published in 1962 proposed the idea of mobile health services for migrant families [57], and a pilot study of the Tele-Home health project began in 1996 as a multi-disciplinary team intervention that included OTs [58]. The concept of telerehabilitation actually dates back to at least 1998, when it was first used to evaluate in-home seating and home accessibility [59]. Therefore, the concept of telehealth OT is not a completely new research direction and has been studied for many years [60]. Previous reviews on telehealth focused primarily on rehabilitation for common geriatric diseases and proved the feasibility and efficacy of telerehabilitation for certain diseases in older patients, such as stroke [61–63], polytraumas [64], cancer [65–67], osteoarthritis [68], fractures [69], Parkinson's disease [70], psychological disorders [71], and fall prevention [72, 73]. Several other studies have demonstrated the value of telerehabilitation in improving functional impairment by promoting ADLs [74] and improving lower extremity dysfunction [75]. In addition, previous research hotspots have included home health monitoring [76–78], telehealth assessments [79], and caregiver support [66].

In general, all of the studies that were included in this scoping review confirmed the effectiveness and clinical value of telehealth OT, with five studies [41, 43, 45–47] showing that interventions by telehealth were more effective than the traditional approach. The reasons for those results are probably related to three factors: the intervention environment, activity monitoring, and caregiver support. Environment is a significant factor affecting clients' occupational performance, according to the Person-Environment-Occupation (PEO) model [80]. Most of the traditional OT assessments and interventions are carried out in specialized areas. Older adults are less adaptable to their environment and are prone to stress responses in unfamiliar environments, and those reactions affect their occupational performance [81–83]. In contrast, telehealth occupational interventions are conducted

in the patients' homes or communities, thus minimizing the impact of having to adapt to the environment. In addition, the long-term efficacy and safety of the treatment are also considerations for older people when choosing a treatment option. No serious adverse events were reported in any of the studies we included, so the safety of telehealth OT can be initially confirmed. Follow-up was less discussed in the included studies. Two studies [46, 56] conducted follow-up assessments at 3 months after intervention and showed that most of the improvement was maintained during the subsequent 3 months. The results of the follow-up in another study [43] showed that 3 weeks after the intervention ended the functioning of the telehealth group decreased and that of the control group remained. We are looking forward to further high-quality studies in the future.

Another advantage of telehealth OT is the ability to monitor activities comprehensively with mobile devices. As one advantage, such monitoring can improve the safety of clients' activities. In addition, therapists can receive timely feedback and conduct their intervention processes even when their older adult patients have not participated in an occupation for a long time or the quality of the occupation has deteriorated [39, 50]. Furthermore, the impact of caregivers on older people falls within the scope of the human environment, according to the PEO model [80]. Certainly caregivers, as the people most familiar with and connected to the patients, play an especially important role in the daily lives of older people [84–87]. Because telehealth is family centered or community-centered, its advantages may be exploited to the fullest [88–90].

It is noteworthy, however, that in the study by Burton and O'Connell [48], telehealth OT was found to be effective but was not as effective as face-to-face occupational interventions were. We propose three likely reasons for such findings. First, the human environment is an important factor affecting occupational performance. In addition to their caregivers, the other participants surrounding older people are also of great significance, so group therapy is an efficient modality [91–94] that can increase the communication between clients and others and further restore their social abilities to participate through group activities. However, Burton and O'Connell's study did not involve communication with anyone other than the caregivers, and that might have affected patient performance to some extent. Second, face-to-face intervention enables the clients to better obtain various forms of sensory feedback from therapists and the surrounding environment, such as through their auditory sense, tactile sense, and proprioceptive sense, but those senses are not available in telehealth, meaning that telehealth could not provide the patients with timely sensory feedback. In addition, the intervention with clients was through

video recordings, which made it impossible for the clients to receive timely feedback in the intervention process, in contrast to studies in which the therapists regularly monitored activities [42, 45, 47, 49, 50]. Finally, some older adults have used mobile devices only very infrequently in the past, making it difficult for them to accept and master the use of telehealth platforms quickly. Although some studies mentioned offering training in the use of mobile devices before the interventions [39, 42, 46, 47, 49, 51, 55], it can be difficult for short-term teaching to change one's inherent habits, especially for older people with memory degradation [95] and a reduced acceptance of novelty. In summary, these factors may have an impact on the effectiveness of telehealth OT, and thus it is necessary to further optimize the modality.

The focus of OT services is to improve a person's independence and a client's quality of life. OT practitioners supported by the philosophy of profession can work with clients of all ages, abilities and in many different settings[5]. We may frequently see OTs in hospitals, schools, nursing homes, communities and other unexpected locations. OT is an essential part of a rehabilitation group and plays an integral role in many different areas, such as neurological rehabilitation, pulmonary rehabilitation, musculoskeletal rehabilitation, and others. Furthermore, OTs are well suited to succeed as driving rehabilitation specialists[96], and are specialized in pain management[97] and sleep management[98].

Future research should focus on the following needs. First, it is essential that large-scale randomized controlled trials of telehealth OT among older adults be conducted, and also that the scope and forms of telehealth OT, such as group interventions and psychological interventions, be further explored. Finally, the application of telehealth OT should be fully explored in different lifespan, different areas and different locations of clients.

Limitations

Certain limitations merit attention because they may have influenced the results this review obtained. Initially, although we followed the PRISMA-ScR to ensure the scientific nature of the research, publication bias and selection bias are limitations for a majority of scoping reviews. Additionally, only studies published in English and with full text available were enrolled in our review. Therefore, many studies that might have been otherwise suited to our inclusion criteria were not included because they had been published in other languages. Finally, the inclusion criteria required that the studies' participants be an average or median age of 65 years or older, thus resulting in bias caused by age inconsistency among some of the participants studied.

Conclusions

In the present study, we used a scoping review to clarify the scope and effectiveness of telehealth OT among older adults. The results reveal that telehealth OT has been used successfully for occupational assessment, occupational intervention, rehabilitation counseling, caregiver support, and activity monitoring through multiple mobile platforms. To the best of our knowledge, this is the first review that combines telehealth and OT in geriatric rehabilitation. Telehealth has extensive potential for use and further development, both during the COVID-19 pandemic and beyond. Further research is needed that will employ large-scale randomized controlled trials to explore new scope and applications for telehealth OT.

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Declarations

Conflict of interest None.

Ethical approval This review does not contain any experiments involving human participants or animals performed by any of the authors.

Consent to participate This is a review article, and informed consent was not applicable.

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