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Patient and clinician perspectives of online-delivered exercise programmes for chronic musculoskeletal conditions: a mixed-methods systematic review

Avantika Bhardwaj[a,b], Caoimhe Barry Walsh[a], Allison Ezzat[c,d], Cliona O'Riordan[a,b], Norelee Kennedy[a,b] and Clodagh M. Toomey[a,b]

[a]School of Allied Health, Faculty of Education & Health Sciences, University of Limerick, Limerick, Limerick, Ireland; [b]Health Research Institute, University of Limerick, Limerick, Limerick, Ireland; [c]La Trobe Sport and Exercise Medicine Research Centre, La Trobe University, Melbourne, Victoria, Australia; [d]Department of Physical Therapy, University of British Columbia, Canada

ABSTRACT

Purpose: To synthesize common or differing perceptions of patients' and clinicians' that influence uptake of online-delivered exercise programmes (ODEPs) for chronic musculoskeletal (MSK) conditions.
Methods: Eight databases were searched from inception to April 2023 for studies including (1) patients with and/or clinicians delivering ODEPs for chronic MSK conditions, and (2) synchronous ODEPs, where information is exchanged simultaneously (mode A); asynchronous ODEPs, with at least one synchronous feature (mode B); or no ODEPs, documenting past experiences and/or likelihood of participating in an ODEP (mode C). Critical Appraisal Skills Programme checklists were used to assess study quality. Perceptions of patients' and clinicians' influencing uptake of ODEPs were extracted. Quantitative and qualitative data were synthesised and integrated.
Results: Twenty-one studies were included (twelve quantitative, seven qualitative, and two mixed-methods) investigating the perceptions of 1275 patients and 534 clinicians on ODEP mode A ($n=7$), mode B ($n=8$), and mode C ($n=6$). Sixteen of the 23 identified perceptions related to satisfaction, acceptability, usability, and effectiveness were common, with 70% of perceptions facilitating uptake and 30% hindering uptake.
Conclusions: Findings highlight the need to promote targeted education for patients and clinicians addressing interconnected perceptions, and to develop evidence-based perception-centred strategies encouraging integrated care and guideline-based management of chronic MSK conditions.

> IMPLICATIONS FOR REHABILITATION

- Almost 70% of perceptions related to satisfaction, acceptability, usability, and effectiveness that influence the uptake of online-delivered exercise programmes for chronic musculoskeletal conditions are shared by patients and clinicians.
- Patient perceptions that differ from clinicians and that hinder uptake include the risk of misdiagnosis, lack of social support, and advice from their clinic and/or clinician.
- Clinician perceptions that differ from patients and that hinder uptake include risk of last-minute appointment cancellations, the cost to set-up, and limitations of camera angles.
- Implementation of online-delivered exercise programmes may be supported by targeted education for patients and clinicians that addresses misinformed perceptions.

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Mixed-methods review; chronic MSK conditions; perceptions; online; exercise; self-management

Introduction

Chronic musculoskeletal (MSK) conditions are a leading cause of pain and disability, with a reported 19.6% increase in the global disability-adjusted life years between 2006 and 2016 [1]. The increasing prevalence has resulted in a substantial economic, social, and functional burden on healthcare resources worldwide [2]. In an effort to reduce this burden, clinical practice guidelines for the management of chronic MSK conditions have been developed, recommending non-pharmacological management (i.e., exercise) as the first intervention method [3]. However, uptake of clinical practice guidelines has been slow resulting in an evidence-to-practice gap [4]. For example, Zadro et al. [5] found that 43% of physiotherapists' treatments for the management of MSK conditions did not align with guidelines. This may be influenced by health systems and policies, professional training, lack of specificity of guidelines, and consumer participation and engagement [6].

Strategies to address the slow uptake of clinical practice guidelines have been explored. These include delivering self-management exercise programmes that have previously resulted in the provision of care that is more in line with guidelines [7]. Furthermore, the COVID-19 pandemic showed that healthcare services can adapt

CONTACT Avantika Bhardwaj avantika.bhardwaj@ul.ie School of Allied Health, Faculty of Education & Health Sciences, University of Limerick, Limerick, Limerick, V94 T9PX, Ireland

and offer self-management exercise programmes that can be delivered online [8]. These programmes can be synchronous (e.g., videoconference with a clinician), asynchronous (e.g.,exercise digital images and videos), or hybrid (e.g., a combination of synchronous and asynchronous) [9,10]. Such online-delivered exercise programmes (ODEPs) offer an opportunity to address long waiting lists and assist those who cannot access care due to their location, work/caring responsibilities, or symptoms [11]. Recent systematic reviews have found that delivering ODEPs for the management of chronic MSK conditions is effective and comparable to face-to-face care [12,13].

Despite these benefits and positive findings of effectiveness, an international survey of clinicians ($n = 827$) who used telehealth to deliver exercise to manage MSK conditions during COVID-19 found that only 42% agreed that telehealth was as effective as face-to-face care [14]. Similarly, Barton et al. [15] found that while 85% of people with MSK pain ($n = 172$) reported condition improvement as a result of telehealth, this intervention was perceived as inferior to in-person care. Previous research found that patient age and level of education, poor technological self-efficacy, resistance to changing clinical practice, and cost of resources contribute to the slow uptake of guideline-based telehealth services to manage chronic MSK conditions [8,10,15]. Additionally, previous studies report slow uptake due to the misinformed perceptions of patients and clinicians of the effectiveness, accessibility, and flexibility of ODEPs [11,16]. Furthermore, patients frequently seek medical advice and treatments from clinicians, whose acceptance of telehealth can in turn influence their own acceptance [16–18]. This suggests that the perceptions of patients and clinicians of ODEPs are interconnected, highlighting the need to determine the extent of shared perceptions to optimise uptake. Given the increasing prevalence of chronic MSK conditions, identifying patients' and clinicians' perceptions of ODEPs may inform efforts to address evidence-to-practice gaps, ensure optimal use of resources, and facilitate patient access to high-quality care.

Previously, qualitative studies using semi-structured interviews [17,19], quantitative studies using cross-sectional surveys [14,20], mixed-method studies using qualitative and quantitative methodologies [21,22], and systematic reviews using qualitative [10] or quantitative data [23] have been conducted to explore patient and clinician perceptions of ODEPs for the management of chronic MSK conditions. The current systematic review aims to address important gaps in the existing literature. First, significant heterogeneity in previous reviews due to their focus on one or other aspects of patient and clinician perceptions of ODEPs for the management of chronic MSK conditions. For example, Fernandes et al. [10] qualitatively summarised perceptions of patients with chronic MSK conditions of synchronous and asynchronous telehealth delivery of a pain management intervention. On the other hand, Amin et al. [23] quantitatively summarised the satisfaction of patients' and rehabilitation professionals' of telerehabilitation for musculoskeletal disorders. Second, no synthesis of both qualitative and quantitative findings related to patient and clinician perceptions of ODEPs for the management of chronic MSK conditions exists. Such syntheses are known as mixed-methods reviews and are particularly relevant in public health [24]. For example, health policy makers using systematic reviews to inform public health interventions may not only seek to answer, "What is effective and for whom?" but also, "Why is it effective and for whom?". While the former question may be answered by quantitative evidence, the latter requires qualitative evidence [25]. By integrating objective numerical data and subjective opinions data, a more in-depth understanding of a topic, compared to single method reviews, can be generated [26]. Health policy makers and practitioners may find such an in-depth understanding useful for informing evidence-based decision-making and implementing appropriate public health interventions [27].

Therefore, the current systematic review is timely as it builds on and streamlines the existing literature by including both qualitative and quantitative forms of evidence, addressing both patient and clinician data, and focusing on telehealth exercise services that are either entirely (e.g., videoconference-based) or partially (e.g.,web-based with telephone support calls) delivered via synchronous mediums. Our approach may maximise the ability of the findings to inform policy and practice due to the inclusion of diverse methodologies and perspectives [28]. Thus, our aim is to systematically review, synthesise and integrate the common or differing perceptions of patients and clinicians to inform our understanding of the complexity and interplay of factors related to facilitating or hindering the uptake of ODEPs for chronic MSK conditions.

Methods

The protocol for this review has been previously registered on PROSPERO (registration number CRD42021273773) and published elsewhere [29]. The reporting of this review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist [30].

Eligibility criteria

As shown in Table 1, studies with (1) patients with diagnosed or self-reported chronic MSK conditions and/or clinicians, who deliver exercise treatments for chronic MSK conditions; (2) individual or group based ODEPs delivered via: delivery mode A: synchronously, participants exchange information simultaneously (e.g., videoconference call); delivery mode B: asynchronously, with at least one synchronous feature (e.g.,telephone support calls); or delivery mode C: no ODEP, where no exercise treatment was delivered but the authors investigated a participant's past experiences and/or likelihood of participating in an ODEP (e.g., hypothetical experiences or attitudes); and (3) patients and/or clinicians' perceptions influencing uptake of ODEPs for chronic MSK conditions (e.g., experiences, opinions, or beliefs) were included. Additionally, studies were considered for inclusion if they were reported in English and utilised either qualitative, quantitative, or mixed methodologies. No restrictions were applied to the intervention setting (i.e., could be a public or private setting) and publication date. Chronic MSK conditions were defined as conditions characterised with persistent pain ($\geq$ 3 months) in the muscles, bones, joints, or related soft tissues [31]. Synchronous features were defined as including some element of direct healthcare professional feedback.

Search strategy and selection process

Eight electronic databases were searched from inception to April 2023: CINAHL Complete, MEDLINE, SportDiscus, and The Allied and Complementary Medicine Database, APA PsycArticles, APA PsycInfo, Scopus, and Cochrane Library. Additionally, citation tracking and manual screening of the reference lists of included studies related to the research question were undertaken.

A Boolean search was conducted using an exhaustive list of combinations of key search terms relevant to the research aims in order to gather the current state of knowledge around the topic (Table 2). For example: 'Osteoarthritis OR "Knee osteoarthritis" OR

Table 1. Inclusion and Exclusion Criteria.

Criteria	Inclusion	Exclusion
Language	English	Other
Date Range	Unlimited	-
Sample	• Patients: Adults with chronic MSK conditions (≥18 years) • Clinicians: PTs, GPs, athletic trainers, community providers	• Pediatric population • Non-MSK conditions • Acute MSK injury
Setting	Public or private	Other
Study Design	Qualitative, Mixed methods, Quantitative	Protocols, Conferences, Reports, Abstracts, Case studies, Books, Chapters, Reviews
Type of programme	• Chronic MSK conditions management programmes delivered via: 1. Delivery mode A: Entirely synchronous ODEP. All participants engage with ODEP at the same time and can respond to each other immediately. Examples: (a) video-delivered (e.g., Skype, Zoom) exercise sessions or (b) telephone calls with exercise programme and advice. 2. Delivery mode B: Partially synchronous ODEP. All participants engage with ODEP at their convenience but have the option to respond to each other immediately. Examples: (a) web-based exercise sessions with regularly scheduled telephone support calls directed towards exercise goals and advice or (b) app-based exercise sessions with an option to chat (e.g., a chat box, messenger service) for feedback and questions 3. Delivery mode C: No ODEP. A participant's past experiences and/or likelihood of participating in a synchronous or partially synchronous ODEP. Example: no exercise sessions delivered but asked for opinions on hypothetical scenarios/treatment attributes. 4. Including an exercise or physical activity component. 5. Includes at least one synchronous feedback component with a healthcare professional. 6. Individual or group based.	• Chronic MSK conditions management programmes: 1. Delivered online asynchronously. 2. Not including an exercise or physical activity component. 3. Designed as (1) asynchronous only or (2) hybrid (e.g., asynchronous + in-person). 4. Provided synchronous artificial intelligence (AI) feedback.

Note: PTs: physiotherapists; GPs: general practitioners; MSK: musculoskeletal; ODEP: online-delivered exercise programme.

Table 2. PICO Framework for Eligibility and Search Terms Used.

Population	Intervention	Comparator	Outcome
• Osteoarthritis • "Knee osteoarthritis" • "Hip osteoarthritis" • Musculoskeletal • "Chronic pain" • "Chronic knee pain" • "Chronic hip pain" • "Lower limb pain" • "Lower extremity pain" • "Persistent pain" • "Back pain"	• Exercis* • Neuromuscular* • Aerobic* • Fitness* • Resistance* • Strength*	• Telerehabilitation • Telehealth • Telemedicine • Telemonitoring • Online* • Video* • Internet* • Web* • Digital* • Ehealth • "E-health"	• Adopt* • Uptake • Avoid* • Barrier* • Obstacle* • Enable* • Facilitat* • Motivat* • Challeng* • Perception* • Attitude* • Belief* • Experienc* • View* • Opinion* • Accept* • Satisfact* • Feasab*

Note: * Words match if they begin with the word preceding the Boolean Search Operator.

"Hip osteoarthritis" OR Musculoskeletal OR "Chronic pain" OR "Chronic knee pain" OR "Chronic hip pain" OR "Lower limb pain" OR "Lower extremity pain" OR "Persistent pain" OR "Back pain"' AND 'Exercis* OR Neuromuscular* OR Aerobic* OR Fitness* OR Resistance* OR Strength*' AND 'Telerehabilitation OR Telehealth OR Telemedicine OR Telemonitoring OR Online* OR Video* OR Internet* OR Web* OR Digital* OR Ehealth OR "E-health"' AND 'Adopt* OR Uptake OR Avoid* OR Barrier* OR Obstacle* OR Enable* OR Facilitat* OR Motivat* OR Challeng* OR Perception* OR Attitude* OR Belief* OR Experienc* OR View* OR Opinion* OR Accept* OR Satisfact* OR Feasib*'. Results were imported, organised, and stored using EndNote X9 (Version 9.3.3). Duplicates were removed and relevant titles and abstracts screened for eligibility by three independent reviewers (AB, CBW, CT). Full-text articles were screened for eligibility and methodological quality by six independent reviewers (AB, CBW, AE, COR, CT). Discrepancies were resolved by reviewer consensus (AB, CBW, AE, COR, CT).

Data collection process

Two reviewers (AB, CT) independently extracted the data from the included studies into standardised spreadsheets (Microsoft Excel version 16.59, Microsoft Corporation, 2010), which were then merged. Any discrepancies were resolved by reviewer consensus and cross-checked for consistency by a third reviewer (AB, CBW, AE, COR, CT). Data were extracted on (1) perceptions of patients and/or clinicians that facilitate or hinder uptake, and (2) commonalities or differences between data related to patients and clinicians. Descriptive information for each study was extracted: author, year, country, aims, study design, data collection methods, population (i.e., sample, number, gender, type of chronic MSK condition, setting), intervention (i.e., type, delivery mode, description, duration), and outcomes.

Study risk of bias assessment

Quality appraisal was performed using the Critical Appraisal Skills Programme (CASP) Checklists [32]. Studies were rated as high, medium, and low quality if they met ≥8, 5–7 and ≤4 criteria, respectively [33]. Any discrepancies were resolved by reviewer consensus and cross-checked for consistency by a third reviewer (AB, CBW, AE, COR, CT).

Synthesis methods

This mixed-methods review involved: (1) qualitizing of quantitative data [26]; (2) thematic analysis of qualitative data [34]; and (3) synthesis combining data from stages (1) and (2) [26]. This approach was adopted to facilitate a richer understanding of perceptions compared to examining qualitative or quantitative data independently. To optimise the applicability and richness of

the findings, those perceptions that appeared in at least three studies were included in this review [33]. To counteract any potential bias, reviewers' personal beliefs and experiences were reflexively assessed using field notes to document decisions.

Stage 1: Qualitizing of quantitative data

Qualitizing involves translating quantitative data into textual descriptions (i.e., a narrative interpretation of the results) [26]. This generates a descriptive summary of the quantitative data in a way that answers the review question independent of the qualitative data analysis and allows integration with qualitative data.

Stage 2: Thematic synthesis of qualitative data

Data from qualitative studies was copied verbatim and imported into QSR International's NVivo 10 qualitative data analysis software (QSR International, 2012). Firstly, free codes were developed through line-by-line coding of the data according to its meaning and content. Secondly, commonalities and differences in data were identified to develop new codes and organise the data into broader descriptive themes. Thirdly, higher order analytical themes were developed based on organisational groupings for facilitators and barriers to uptake. This was a highly repetitive process that involved re-examining and refining the themes continuously within the scope of the review. This cyclical process continued until final themes were agreed upon by reviewer consensus (AB, CT).

Stage 3: Combination of qualitized and qualitative data

To combine syntheses from stages (1) and (2), a table was constructed to juxtapose the qualitative and qualitized data to assess the extent to which the respective data confirmed, expanded, or refuted each other [26].

Results

Study selection

As shown in Figure 1, the database searches yielded 3056 records, of which 1940 records were identified as duplicates. After screening the title and abstract, 66 records underwent full-text review. Further 12 records were identified from citation tracking and manual screening of the reference lists, resulting in 21 included studies.

Study characteristics

Of the 21 included studies, twelve studies were quantitative [35–46], seven qualitative [47–53], and two mixed-methods [54,55]. Studies were published between 2005 and 2022 in Australia ($n=6$), Netherlands ($n=5$), United States of America (USA) ($n=3$), Turkey ($n=2$), Brazil ($n=1$), China ($n=1$), Sri Lanka ($n=1$), Sweden ($n=1$), and United Kingdom (UK) ($n=1$). Four studies were conducted with patients and clinicians [35,50,53, 54], fifteen studies with patients only [36,38–42,44–49,51,52,55], and two studies with clinicians only [37,43]. There were a total of 1275 patients with chronic MSK conditions (range 8–330 per article) and 534 clinicians who treat patients with a chronic MSK condition (range 7–268 per article). Chronic MSK conditions included: Achilles tendinopathy ($n=1$; [53]), chronic hip or knee pain/OA ($n=14$; [35–38,41–44, 46,48–51,55]), and chronic lower back pain (CLBP) ($n=6$; [39,40,45,47,52,54]). Eighteen studies (85.7%) reported on individual-based ODEPs [35–40,43–54] and three studies (14.3%) on group-based ODEPs [41,42,55]. These ODEPs were delivered either via delivery mode A ($n=7$; [39,42,46,50,51,53,55]), via delivery mode B ($n=8$; [35,40,41,44,45,49,52,54]), or via delivery mode C ($n=6$; [36–38,43,47,48]). Outcomes reported were measures of participant satisfaction ($n=6$), usability ($n=6$), acceptability ($n=5$), and experiences ($n=11$). Twelve studies were rated as high quality [35–38,43–45,47,49,51–55] and seven studies as medium quality [39–42,46,48,50,54]. Summary characteristics and the findings of the methodological quality assessment are presented in Table 3.

Results of syntheses

Stage 1: Qualitizing of quantitative data

A narrative synthesis of the quantitative data was undertaken (Table 3). Overall, patients and clinicians were highly satisfied with

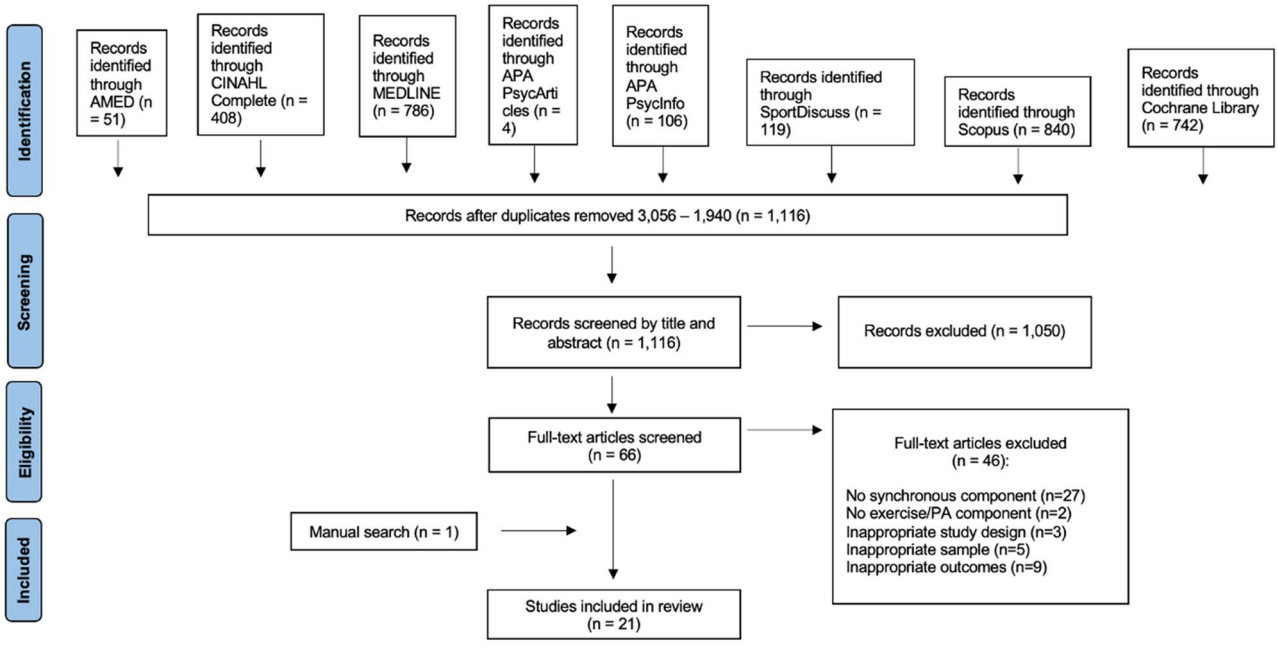

Figure 1. Flow diagram of study identification and selection, adapted from PRISMA flow chart [30].

Table 3. Characteristics and quality assessment of the included studies.

Author, year, country	Aims	Study design	Population (sample, number, gender, type of chronic MSK condition)	Intervention (type, delivery mode, description, duration)	Outcomes	Data collection methods	CASP checklist	Methodological quality assessment	Qualitized findings
Bennell et al. [35] 2019, Australia	To evaluate whether a web-based exercise programming system improves adherence to a home exercise program for people with musculoskeletal conditions.	RCT	Sample: Patients ($n = 305$; 56-61% female) and PTs ($n = 16$; 7 females) Condition: 54-57% had chronic MSK (>3mon) condition (back, shoulder, knee and hip)	Type: Individual-based Delivery mode: B Description: Asynchronous web-based exercise programming system with synchronous chat Duration: 3 weeks	Satisfaction, usability	Satisfaction: 11-point NRS (0 = strongly disagree, 10 = strongly agree) Usability: 10-item System Usability Scale; 5-point NRS (1 = strongly disagree, 5 = strongly agree)	RCT	High	Patients and PTs were satisfied with the delivery of the exercise program, rating it as generally useable. Both perceived the frequency of monitoring and prompts to complete exercise sessions as positive whereas, potential cost was perceived as less positive.
Cranen et al. [38] 2017, Netherlands	To identify chronic pain patients' preferences for telerehabilitation services using a discrete choice experiment.	Cohort	Sample: Patients ($n = 104$; 63% females) Condition: Chronic pain	Type: Individual-based Delivery mode: C Description: No intervention delivered, asked for opinions on hypothetical synchronous video	Acceptability	Cross-sectional survey; with discrete choice experiment with 15 choice tasks, combining 6 telerehabilitation treatment characteristics	Cohort	High	Patients preferred "intermediate" treatments consisting of both online and in-person care most. Key drivers of preferences included clinician contact mode, the use of feedback and monitoring technology, and exercise location.
Jansen-Kosterink et al. [39] 2015, Netherlands	An evaluation study of a telemedicine service facilitating remote physical rehabilitation for CLBP, or PD patients implemented as a partial replacement into an out-patient RP.	RCT	Sample: Patients ($n = 118$) Condition: CLBP or PD	Type: Individual-based Delivery mode: A Description: Synchronous video Duration: 5-8 weeks	Satisfaction, usability	Satisfaction: 2 closed-ended questions Usability: 10-item System Usability Scale	RCT	Medium	Majority of patients perceived the exercise-based telerehabilitation service as usable and would recommend the service to another patient.
Lawford et al. [36] 2017, Australia	To investigate consumer perceptions about, and willingness to use, remotely delivered service models for physical therapist–prescribed exercise management of hip and/or knee OA.	Cohort	Sample: Patients ($n = 330$; 253 females) Condition: Chronic hip or knee OA	Type: Individual-based Delivery mode: C Description: No intervention delivered, asked for opinions on hypothetical synchronous video	Experiences	Cross-sectional survey	Cohort	High	Patients perceived telerehabilitation services as timesaving, convenient, easy, and practical. While video-delivered care was preferred over telephone-delivered care, patients expressed no privacy and confidentiality concerns over receiving care via telephone or video. However, patients expressed concerns over the lack of physical contact with the therapist, financial cost of service, effectiveness, and belief that a physical therapist would be able to adequately monitor their condition.

(*Continued*)

Table 3. Continued.

Author, year, country	Aims	Study design	Population (sample, number, gender, type of chronic MSK condition)	Intervention (type, delivery mode, description, duration)	Outcomes	Data collection methods	CASP checklist	Methodological quality assessment	Qualitized findings
Lawford et al. [37] 2018a, Australia	To investigate physical therapists' perceptions of, and willingness to use, telephone- and internet-mediated service models for exercise therapy for people with knee and/or hip osteoarthritis.	Cohort	Sample: PTs ($n=217$; 156 females) Condition: Chronic hip or knee OA	Type: Individual-based Delivery mode: C Description: No intervention delivered, asked for opinions on hypothetical synchronous video	Experiences	Cross-sectional survey	Cohort	High	PTs perceived telerehabilitation services as timesaving, affordable, safe, and convenient. While video-delivered care was preferred over telephone-delivered care, PTs expressed no privacy and confidentiality concerns over receiving care via telephone or video. However, PTs expressed concerns over the lack of physical contact and their ability to accurately monitor a patient's condition and exercise session.
Selter et al. [40] 2018, USA	The aim is to (1) describe patient engagement with the Limbr program, (2) describe patient-perceived utility of the Limbr program, and (3) assess the validity of the Your Activities of Daily Living module for quantifying functional status among patients with CLBP.	Cohort	Sample: Patients ($n=35$; 22 females) Condition: CLBP	Type: Individual-based Delivery mode: B Description: Asynchronous mobile application with synchronous chat Duration: 12 weeks	Usability	Cross-sectional survey	Cohort	Medium	Patients rated their overall experience as either good or excellent, with majority finding the system easy to use. The daily notifications and self-reports were perceived to be helpful in tracking pain-related ADL functionality, medication use, affect, and in reminding them to complete the Force Therapeutics exercises and daily surveys.
Smittenaar et al. [41] 2017, USA	The aims of this study were to (1) determine the change in pain and function between baseline and follow-up (week 12 and 6 months) in participants in the 12-week Hinge Health DCP and (2) assess changes in surgery interest and patient satisfaction between baseline and follow-up.	Cohort	Sample: Patients ($n=41$; 32 females) Condition: Chronic knee pain	Type: Group-based Delivery mode: B Description: Asynchronous mobile application with synchronous chat Duration: 12 weeks	Satisfaction	1 closed-ended question	Cohort	Medium	Patients expressed high satisfaction with the program, with average ratings ranging from 9.2/10 at week 12 and 9.3/10 at 6 months.

(*Continued*)

Table 3. Continued.

Author, year, country	Aims	Study design	Population (sample, number, gender, type of chronic MSK condition)	Intervention (type, delivery mode, description, duration)	Outcomes	Data collection methods	CASP checklist	Methodological quality assessment	Qualitized findings
Wong et al. [42] 2005, China	To explore the feasibility and efficacy of a community-based exercise programme for elderly patients with knee pain, conducted via videoconferencing.	Cohort	Sample: Patients ($n = 20$; 18 females) Condition: Chronic knee pain	Type: Group-based Delivery mode: A Description: Synchronous video Duration: 12 weeks	Acceptability	Cross-sectional survey	Cohort	Medium	Patients perceived the system as user-friendly and convenient.
Tore et al. [46] 2022, Turkey	To examine the effects of simultaneous telerehabilitation with a physiotherapist in patients with knee OA and to evaluate the quality of the physiotherapy and rehabilitation program received through telerehabilitation.	RCT	Sample: Patients ($n = 48$; 43 females) Condition: Chronic knee OA	Type: Individual-based Delivery mode: A Description: Synchronous video Duration: 8 weeks	Satisfaction	5-point Likert scale (lowest score indicates "not satisfied at all," and the highest score indicates "very satisfied")	RCT	Medium	Majority of patients reported that they were very satisfied or satisfied with the treatment.
Özden et al. [45] 2022, Turkey	To investigate the effect of the video-based telerehabilitation software on pain, function, quality-of-life, expectation, satisfaction, and motivation in individuals with CLBP.	RCT	Sample: Patients ($n = 50$; 30 females) Condition: CLBP	Type: Individual-based Delivery mode: B Description: Asynchronous web-based exercise programming system with synchronous chat Duration: 8 weeks	Satisfaction, usability	Satisfaction: 5-items; 5-point Likert type (0: strongly disagree to 4: strongly agree) Usability: 10-item System Usability Scale	RCT	High	Patients were highly satisfied with the intervention, rating usability as A+.
Fioratti et al. [44] 2022, Brazil	To evaluate the feasibility, usability, and implementation context of a self-management internet-based program based on exercises and pain education (ReabilitaDOR) in people with chronic musculoskeletal pain and to compare this program with a program using only a web-based self-management booklet.	RCT	Sample: Patients ($n = 64$; 43 females) Condition: Chronic pain	Type: Individual-based Delivery mode: B Description: Asynchronous web-based exercise programming system with synchronous telephone Duration: 8 weeks	Acceptability, usability	Acceptability: 4-item scale (1 = strongly disagree, 5= totally agree) Usability: 10-item System Usability Scale; 5-point NRS (1 = strongly disagree, 5 = strongly agree)	RCT	High	Patients reported high acceptability and usability of the intervention.

(*Continued*)

Table 3. Continued.

Author, year, country	Aims	Study design	Population (sample, number, gender, type of chronic MSK condition)	Intervention (type, delivery mode, description, duration)	Outcomes	Data collection methods	CASP checklist	Methodological quality assessment	Qualitized findings
Dissanayaka et al. [43] 2022, Sri Lanka	To assess physiotherapists' perceptions and barriers to using telerehabilitation via video and telephone for exercise management for people with knee osteoarthritis in Sri Lanka.	Cohort	Sample: PTs ($n = 268$; 157 females) Condition: Chronic knee OA	Type: Individual-based Delivery mode: C Description: No intervention delivered, asked for opinions on hypothetical synchronous video and telephone	Experiences	Cross-sectional survey	Cohort	High	While video-based care was preferred over telephone-based care, PTs perceived telerehabilitation as convenient, acceptable, and safe. Further, it would save patients' time and money, and would not violate the patient's privacy. However, PTs expressed concerns over technical issues, lack of skills and high costs.
Arensman et al. [47] 2022, Netherlands	To investigate patient perspectives on the acceptability, satisfaction, and performance of an app to support HBE following recommendations from a physical therapist.	Semi-structured interviews	Sample: Patients ($n = 9$; 5 females) Condition: CLBP	Type: Individual-based Delivery mode: C Description: Asynchronous mobile application with synchronous chat Duration: No intervention delivered, asked for past experiences on partially synchronous ODEP	Experiences	Inductive thematic analysis	Qualitative	High	n/a
Cranen et al. [48] 2012, Netherlands	To explore patients' perceptions regarding prospective telerehabilitation services and the factors that facilitate or impede patients' intentions to use these services.	Semi-structured interviews	Sample: Patients ($n = 25$; 52% females) Condition: Chronic pain	Type: Individual-based Delivery mode: C Description: No intervention delivered, asked for opinions on hypothetical synchronous video	Acceptability	Thematic analysis based on the Unified Theory of Acceptance and Use of Technology (UTAUT)	Qualitative	Medium	n/a
Cronström et al. [49] 2019, Sweden	To investigate the experiences of a digital management programme for hip and knee osteoarthritis, including education and exercises as well as an option to chat with an assigned physical therapist for feedback, questions and support.	Semi-structured interviews	Sample: Patients ($n = 19$; 10 females) Condition: Chronic hip or knee OA	Type: Individual-based Delivery mode: B Description: Asynchronous web-based exercise programming system with synchronous chat Duration: 6 weeks	Experiences	Systematic text condensation	Qualitative	High	n/a
Geraghty et al.. [52] 2020, UK	To explore patients' experiences of using the SupportBack Internet intervention, both with and without physiotherapist telephone support.	Semi-structured interviews	Sample: Patients ($n = 15$; 10 females) Condition: CLBP	Type: Individual-based Delivery mode: B Description: Asynchronous internet with synchronous telephone Duration: 6 weeks	Experiences	Thematic analysis	Qualitative	High	n/a

(*Continued*)

Table 3. Continued.

Author, year, country	Aims	Study design	Population (sample, number, gender, type of chronic MSK condition)	Intervention (type, delivery mode, description, duration)	Outcomes	Data collection methods	CASP checklist	Methodological quality assessment	Qualitized findings
Hasani et al. [53] 2021, Australia	To explore the experience of participants and physiotherapists with gym-based exercise interventions for Achilles tendinopathy with weekly telehealth monitoring (via videoconference).	Semi-structured interviews (patients) and focus groups (PTs)	Sample: Patients ($n=8$) and PTs ($n=7$; 2 females) Condition: Achilles tendinopathy	Type: Individual-based Delivery mode: A Description: Synchronous video Duration: 12 weeks	Experiences	Inductive thematic analysis	Qualitative	High	n/a
Hinman et al. [50] 2017, Australia	To explore the experience of patients and physical therapists with Skype for exercise management of knee osteoarthritis.	Semi-structured interviews	Sample: Patients ($n=12$; 6 females) and PTs ($n=8$; 4 females) Condition: Chronic knee pain	Type: Individual-based Delivery mode: A Description: Synchronous video Duration: 12 weeks	Experiences	Thematic and constant comparative analytical analysis	Qualitative	Medium	n/a
Lawford et al. [51] 2018b, Australia	To explore peoples' perceptions of exercise therapy delivered by physiotherapists via telephone for their knee OA.	Semi-structured interviews	Sample: Patients ($n=20$; 13 females) Condition: Chronic knee OA	Type: Individual-based Delivery mode: A Description: Synchronous phone Duration: 6 months	Experiences	Thematic analysis	Qualitative	High	n/a
van Tilburg et al. [54] 2022, Netherlands	To investigate the feasibility of the e-Exercise LBP prototype for patients and physiotherapists to improve the intervention.	Mixed	Sample: Patients ($n=37$; 23 females) and PTs ($n=18$; 11 females) Condition: CLBP	Type: Individual-based Delivery mode: B Description: Asynchronous web-based exercise programming system with synchronous chat Duration: 12 weeks	Satisfaction, usability, experiences	Satisfaction: 5-point Likert scale Usability: 10-item System Usability Scale Experiences: closed-ended questions and statements; semi-structured interviews	Cohort; Qualitative	Medium; High	Participants were satisfied with the e-Exercise LBP program, with both patients and PTs rating the web-based application as usable. The program was perceived as tailored to their needs and as adding value.
Patel et al. [55] 2022, USA	To evaluate the feasibility and acceptability of remotely delivered EnhanceFitness (tele-EF) among rural older adults with knee OA.	Mixed	Sample: Patients ($n=15$; 14 females) Condition: Chronic knee OA	Type: Group-based Delivery mode: A Description: Synchronous video Duration: 12 weeks	Acceptability, experiences	Acceptability: 1 closed-ended question; Technology acceptance model (TAM) scale (7-point Likert scale) Experiences: semi-structured interviews	Cohort; Qualitative	High; High	Patients were very satisfied with the intervention, reporting positive perceptions of the ease of use and usefulness of videoconferencing for engaging in exercise. However, lack of or insufficient internet connection was considered a challenge.

Note: USA: United States of America; UK: United Kingdom; CLBP: chronic lower back pain; PD: pulmonary disease; RP: rehabilitation program; OA: osteoarthritis; DCP: digital care program; LBP: low back pain; MSK: musculoskeletal; PTs: physiotherapists; HBE: home-based exercise; NRS: numeric rating scale; CASP: Critical Appraisal Skills Programme; SD: standard deviation; CI: confidence interval; SUS: system usability scale; OR: odds ratio; ADL: activities of daily living; LBP: low back pain; n/a: not applicable.

telehealth and would recommend it to peers. ODEPs were found to be timesaving, accessible, useful, and flexible. Video-delivered care was preferred over telephone-delivered care, with participants expressing no concerns of privacy and confidentiality. Clinician contact mode (i.e., face-to-face/web-camera/combination), the presence of feedback and monitoring technology, and exercise location were found to be the most important telehealth intervention characteristics that influence uptake. ODEPs were found to be safe, easy to use, and convenient. Daily reminders and access to supporting materials reinforcing the importance of routine exercise were found to be effective in improving patient outcomes. Uptake was hindered by clinicians' perceptions of the financial cost of setting up telehealth and patients' perceptions of whether the condition could be adequately monitored via telehealth.

Stage 2: Thematic synthesis of qualitative data

Four themes emerged as the perceptions of patients and clinicians that influence the uptake of ODEPs for chronic MSK conditions: satisfaction, acceptability, usability, and effectiveness. Each theme could be both a facilitator and a barrier, depending on context, and was supported by data from patients, clinicians, or both. A summary of the groupings of facilitators and barriers to uptake that contributed to the development of third-order themes and illustrative quotes from primary studies supporting the themes can be seen in Table 4.

Satisfaction with ODEPs. Patients and clinicians were highly satisfied with the delivery of ODEPs and would recommend it to peers. Perceived benefits included being time-efficient, reduced travel times, the flexibility of appointment/exercise times and locations, easily accessible equipment, and an alternative to waiting for traditional care. Synchronous delivery allowed for satisfactory engagement and support from their clinicians, which encouraged goal maintenance and accountability. However, patients expressed concerns over the quality of feedback and monitoring technology, risk of misdiagnoses, lack of contact with fellow patients, and the possibility of alienation/social isolation. Some clinicians noted that flexibility could come at a cost, with appointments being rescheduled at the last minute.

Acceptability of ODEPs. Patients and clinicians found ODEPs to be acceptable. ODEPs suited conditions where the hands-on assessment was not essential and allowed them to focus on the most important and effective treatments/techniques. Furthermore, patients and clinicians felt the exercise location (i.e., home environment) encouraged a focus on the performance/technique of the exercises and integration into daily life. The opportunity to provide and receive regular feedback and monitoring was perceived as beneficial for therapeutic satisfaction and motivation. However, patients relied on their clinic and/or clinician, whose endorsement of ODEPs influenced patient acceptability.

Usability of ODEPs. Patients and clinicians found ODEPs to be easy to execute, structured, and designed to be user-friendly. Positive perceptions included it being an accessible resource for exercise or educational material to monitor self-progress and review correct techniques. However, few expressed concerns over the quality of feedback, difficulty understanding specific words/exercises, poor internet or audio connection, disruptions due to background noise, cost and time needed to set up an ODEP, and limited examination capacity (i.e., only having one camera angle).

Effectiveness of ODEPs. Patients and clinicians perceived ODEPs to be effective in promoting patient self-management, confidence, and routine treatment. Positive perceptions included reduction in pain, increased self-efficacy, ability to observe progress, and improvements in physical function.

Stage 3: Combination of qualitized and qualitative data

Data from qualitized findings confirmed and expanded 19/23 subthemes identified in the four themes. Integration was not possible for 4 subthemes as no qualitized data relating to these were identified. No qualitized data refuted qualitative data. Table 5 presents this interpretive synthesis and the extent to which the respective data confirmed, expanded, or refuted each other.

To demonstrate patient and clinician common or differing perceptions influencing the uptake of ODEPs, the integrated data were juxtaposed (Figure 2). Findings indicated that 4/7 of perceptions related to satisfaction, 3/4 related to acceptability, 5/8 related to usability, and 4/4 related to the effectiveness of ODEPs were common between patients and clinicians.

Patients and clinicians were highly satisfied with ODEPs and would recommend the service to peers. Both found that ODEPs were time-efficient, accessible, and flexible, with these perceptions facilitating uptake. However, uptake was hindered by perceptions concerning the risk of misdiagnosis (patients only), lack of social support (patients only), and risk of last-minute appointment cancellations (clinicians only). ODEPs were also found to be highly acceptable, with patient and clinician perceptions that facilitated uptake including the quality of feedback and monitoring, the exercise location/home environment, and the frequency of communication between participants. For patients, advice from their clinic and/or clinician hindered uptake. Additionally, patients and clinicians found ODEPs to be usable, with perceptions that facilitated uptake including ease of execution, convenience, structure, access to supporting materials/resources, and user-friendly (patients only). Perceptions that hindered uptake included concerns over internet and audio connection/quality (both), limitations of camera angles (clinicians only) and the cost of setting up an ODEP (clinicians only). Furthermore, patients and clinicians found ODEPs to be effective, with perceptions on pain reduction, improvements in physical function, increased self-efficacy/confidence, and reinforcement of the importance of routine treatments/self-management strategies facilitating uptake.

Discussion

This mixed-methods systematic review synthesised evidence to identify the perceptions of patients and clinicians influencing the uptake of ODEPs for chronic MSK conditions. The findings suggest that patients' and clinicians' uptake of ODEPs is influenced by perceptions related to the following themes: satisfaction, acceptability, usability, and effectiveness. Specifically, 16/23 perceptions were found to facilitate uptake and 7/23 were found to hinder uptake. Furthermore, almost 70% of perceptions were common across patients and clinicians. The varied perceptions (30%) may be due to an individual's role in telehealth services (i.e., patients receive vs. clinicians deliver).

Comparison with previous literature

In relation to satisfaction, the findings are similar to those reported previously. Kloek et al. [56] and Winkelmann et al. [57] found that

Table 4. Development of third-order themes, based on groupings for facilitators and barriers to uptake, with illustrative quotes from primary studies.

Theme/Subthemes	Reported by	Groupings summary	Example quotation from included studies	Studies
Facilitators to uptake				
Theme 1: Satisfaction with ODEPs				
Time-efficient	Both	ODEPs offer benefits such as reduced travel times, ability to execute exercise at any time or location, and timesaving, and more options to schedule appointment time.	"Participants praised how time-efficient and flexible consulting via telephone was, allowing them to talk to the physiotherapist at a time and place convenient to them" [51]	[48–51,53,55]
Accessible	Both	ODEPs are accessible, offer additional resources, and enable more regular contact.	"I think the access is easy, yes, so it was I could go to it at any time and pick whatever topics I needed…" [52]	[47,50,52–54]
Flexible	Both	ODEPs allow for flexibility in scheduling appointments, exercise times, exercise locations, and offer an alternative to traditional management.	"Some participants described that there were long waiting-lists for traditional OA management in primary care and that the digital programme was, thus, a flexible alternative that they could start at once." [49]	[48–53,55]
Recommend to peers	Both	ODEPs are highly recommendable.	"All patients expressed a desire to use Skype for future consultations and would highly recommend it to peers." [50]	[48–51]
Theme 2: Acceptability of ODEPs				
Quality of feedback and monitoring	Both	ODEPs are suitable for assessment, motivational, and provide access to immediate feedback.	"Some described how it would have been easier to give up and disengage without the physiotherapist contact." [52]	[47–55]
Frequency of communication	Both	ODEPs allow for frequent interaction, professional satisfaction, and immediate feedback between participants.	"Using Skype provided them with instantaneous feedback and the ability to observe facial expressions and body language." [50]	[47–50,52–54]
Exercise location/home environment	Both	ODEPs encourage integration of exercises into daily life and allow for focus on correct techniques.	"The ability to execute the exercises at home or at any place at any time without any use of equipment was highly appreciated." [49]	[47–51,55]
Theme 3: Usability of ODEPs				
User-friendly	Patients	ODEPs are designed to be easy to use.	"The majority of participants reported finding the intervention easy to use and clear, valuing the simplicity of the design and navigation system" [52]	[47, 48, 50,52–54]
Ease of execution	Both	ODEPs are easy to execute and encourage routine self-management.	"They were positive about how easy it was to install and use the application." [53]	[47–50,52,53]
Convenience	Both	ODEPs can be easily integrated into daily life.	"For them, all telerehabilitation scenarios would make it easier to integrate exercise as a routine into their daily life." [48]	[47–51,53]
Access to supporting materials	Both	ODEPs include easily accessible equipment, and exercise or education material to observe progress and correct techniques.	"Other elements that facilitated participation were instructional videos…" [49]	[47–49,51,52,54]
Structure	Both	ODEPs offer a structured approach allowing participants to focus on most important and effective treatments.	"The structure of Skype consultations allowed them to fit treatments in between their daily activities" [50]	[49–53]
Theme 4: Effectiveness of ODEPs				
Pain reduction	Both	ODEPs are effective in managing and reducing pain symptoms.	"The majority of the participants reported improved functioning and reduced pain." [49]	[49–51,53–55]
Increased self-efficacy	Both	ODEPs are effective in improving confidence and self-efficacy.	"Importantly, patients described improved confidence and a greater sense of self-efficacy in managing their knee OA." [50]	[47–54]
Improvements in physical function	Both	ODEPs are effective in improving physical function and offer the ability to observe progress.	"All participants [8/8] described that the care provided was effective in terms of improvement in symptoms and function." [53]	[47,49–51,53–55]
Reinforcing the importance of routine treatments	Both	ODEPs offer frequent interaction and support that encourage accountability and goal maintenance.	"The daily contact with their physical therapist encouraged them to perform their exercise+s every day…" [49]	[47,49–55]

(*Continued*)

Table 4. Continued.

Theme/Subthemes	Reported by	Groupings summary	Example quotation from included studies	Studies
Barriers to uptake				
Theme 1: Satisfaction with ODEPs				
Risk of misdiagnosis	Patients	ODEPs suit conditions where hands-on assessments are not essential as they could lead to inaccurate diagnoses.	"Some concerns were revealed regarding the risk of missing serious diseases if the diagnosis was given by phone or internet." [49]	[48–51,53]
Lack of social support	Patients	ODEPs could lead to social isolation due to lack of contact with fellow patients.	"However, a majority of the patients also expressed worries concerning the quality of feedback, the possibility of fellow sufferer contact and the feeling of alienation." [48]	[48–50,52,55]
Risk of last-minute appointment cancellations	Clinicians	ODEPs come at a cost to scheduling and clinician workload.	"However, patient flexibility could come at a cost to the therapist sometimes, with one noting it allowed patients to reschedule at the last minute." [50]	[50,53,54]
Theme 2: Acceptability of ODEPs				
Influenced by advice from their clinic and/or clinician	Patients	ODEPs are preferred less however, engagement depends on clinical advice.	"In addition, some participants associated the clinic with professionalism. As a result, they would rely on the advice of the rehabilitation clinic and their therapist" [48]	[48,49,53,54]
Theme 3: Usability of ODEPs				
Cost to set-up	Clinicians	ODEPs cost time and money to set up.	"Additionally, physiotherapists commented on the time needed to set up and tailor the web-based application that: 'Time investment of caregivers will have to be compensated, otherwise it simply will not work [physiotherapist 14]'." [54]	[48,50,54]
Limitations of camera angles	Clinicians	ODEPs offer limited or poor monitoring capacity.	"This mostly stemmed from concerns about the fact that the physiotherapist could not see their knee and/or observe their exercise technique, and was instead forced to rely on the participant's "description of what's wrong". [51]	[48,50,51,53]
Internet/audio connection or quality	Both	ODEPs are at risk of disruptions due to background noise, poor quality or loss of internet or audio connection.	"…occasionally there were technical difficulties (such as poor internet connection causing video pixelation or audio problems) that could disrupt the flow of the consultation." [50]	[48,50,53,55]

Note: ODEP: online-delivered exercise programme.

telehealth services were perceived as timesaving. A recent systematic review and meta-analysis reported that telehealth visits for orthopaedic care were shorter than in-person visits (19 ± 8 min vs. 79 ± 85 min) [58]. Similarly, Tenforde et al. [59] found that patients saved more than 30 min of travel time on average due to telehealth visits. The accessibility and flexibility of telehealth allow for the inclusion of a diverse population (e.g., patients in rural areas) and previously, geographical location has been associated with access to care [11]. Furthermore, Åkesson et al. [60] found that healthcare professionals providing care for patients with OA reported challenges such as limited time to offer programme and high workload. Pearson et al. [61] report on the importance of social support, the lack of which is perceived as negative by patients. While other studies report clinicians' concerns of accurately diagnosing and treating patients via telehealth services [14,62], we found that patients were concerned about the risk of misdiagnosis. A possible explanation for this contrast could be that only six of the twenty-one (29%) included studies investigated the perceptions of clinicians.

In relation to acceptability, previous investigations also found that regular contact between patients and clinicians allowed for enhanced access to timely feedback and reassurance, and the opportunity to build rapport/trust [63]. Additionally, the finding that exercise location, and the home environment, resulted in patients feeling more comfortable addressing their concerns and/or participating in exercise is similar to Kairy et al. [64] reporting that patients felt less stressed and appreciated the sense of privacy. Furthermore, previous research reports "guidance by the physical therapist" and "preference of practioners for surgery" as important factors to participation [16].

In relation to usability, the finding that access to supporting materials/resources would be useful and ensure an accurate understanding of the exercise technique is similar to previous studies reporting that instructional videos and reminders are elements that facilitate participation in telehealth services [61]. Furthermore, treatment attributes that are important for uptake include ease of use, convenience, and structure [57]. Additionally, previous research supports our finding that the cost of implementing telehealth services hinders uptake [62].

In relation to effectiveness, the findings are similar to those reported previously on the importance of learning to self-manage and improving self-efficacy in patients with chronic MSK conditions [60], and perceptions of symptom reduction and/or effective management [62]. No perceptions that differed, and that hindered uptake were identified. A possible explanation for this could be that to optimise the applicability and richness of the findings, only perceptions that appeared in at least three of the twenty-one studies were included in this review [33].

Implications

Misinformed perceptions (e.g., lack of content flexibility, de-personalization of care) may create barriers to the uptake of

Table 5. The extent to which qualitized data confirms, expands, or refutes the themes/sub-themes identified from the qualitative data.

Theme/Sub-theme	Quantitative studies													
	Wong et al. [42]	Jansen-Kosterink et al. [39]	Cranen et al. [38]	Lawford et al. [36]	Smittenaar et al. [41]	Seltr et al.. [40]	Lawford et al. [37]	Bennell et al. [35]	van Tilburg et al. [54]	Dissanayaka et al. [43]	Fioratti et al. [44]	Özden et al. [45]	Tore et al. [46]	Patel et al. [55]
Summary score (out of 23)	3	3	3	9	1	5	12	4	7	4	2	1	0	3
Facilitators to uptake														
Theme 1: Satisfaction with ODEPs														
Time-efficient	–	–	–	✓	–	–	✓	–	–	✓	–	–	–	–
Accessible	–	–	–	–	–	–	✓	–	–	–	–	–	–	–
Flexible	✓	–	–	✓	–	–	✓	–	✓	–	–	–	–	–
Recommend to peers	–	✓	–	–	✓	–	–	–	–	–	–	–	–	–
Theme 2: Acceptability of ODEPs														
Quality of feedback and monitoring	–	–	✓+	✓ +	–	–	✓ +	✓	✓	–	–	–	–	–
Frequency of communication	–	–	✓	+	–	–	+	–	–	–	–	–	–	–
Exercise location/ home environment	–	–	✓	–	–	–	–	–	✓	–	–	–	–	–
Theme 3: Usability of ODEPs														
User-friendly	✓	✓	–	✓	–	✓	✓	✓	✓	–	✓	✓	–	✓
Ease of execution	–	✓	–	✓	–	✓	✓	–	✓	–	✓	–	–	✓
Convenience	✓	–	–	✓	–	–	✓	–	✓	✓	–	–	–	–
Access to supporting materials	–	–	–	–	–	✓	–	–	✓	–	–	–	–	–
Structure	–	–	–	–	–	+	–	–	–	–	–	–	–	–
Theme 4: Effectiveness of ODEPs														
Pain reduction	–	–	–	–	–	–	+	–	–	–	–	–	–	–
Increased self-efficacy	–	–	–	–	–	–	+	–	–	–	–	–	–	–
Improvements in physical function	–	–	–	–	–	–	+	–	–	–	–	–	–	–
Reinforcing the importance of routine treatments	–	–	–	–	–	✓	–	✓	–	–	–	–	–	–
Barriers to uptake														
Theme 1: Satisfaction with ODEPs														
Risk of misdiagnosis	–	–	–	✓	–	–	–	–	–	–	–	–	–	–
Lack of social support	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Risk of last-minute appointment cancellations	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Theme 2: Acceptability of ODEPs														
Influenced by advice from their clinic and/ or clinician	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Theme 3: Usability of ODEPs														
Cost to set-up	–	–	–	✓	–	–	✓	✓	–	✓	–	–	–	–
Limitations of camera angles	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Internet/audio connection or quality	–	–	–	–	–	–	–	–	–	✓	–	–	–	✓

Note: ✓: qualitized data confirms qualitative data; +: qualitized data expands qualitative data; ✓ +: qualitized data confirms and expands qualitative data; -: not identified in qualitized data.

and referral to ODEPs [10,65]. Our findings indicate that despite differences in patients' and clinicians' roles in telehealth services (i.e., patients receive vs. clinicians deliver), most perceptions influencing uptake are shared, highlighting the significant role interconnected perceptions play in telehealth engagement. Future development and testing of telehealth services must consider addressing interconnected perceptions with targeted education for patients and clinicians. Acceptance of telehealth has been reported as a barrier to uptake [14,18] and such targeted education strategies may encourage patient and clinician acceptance.

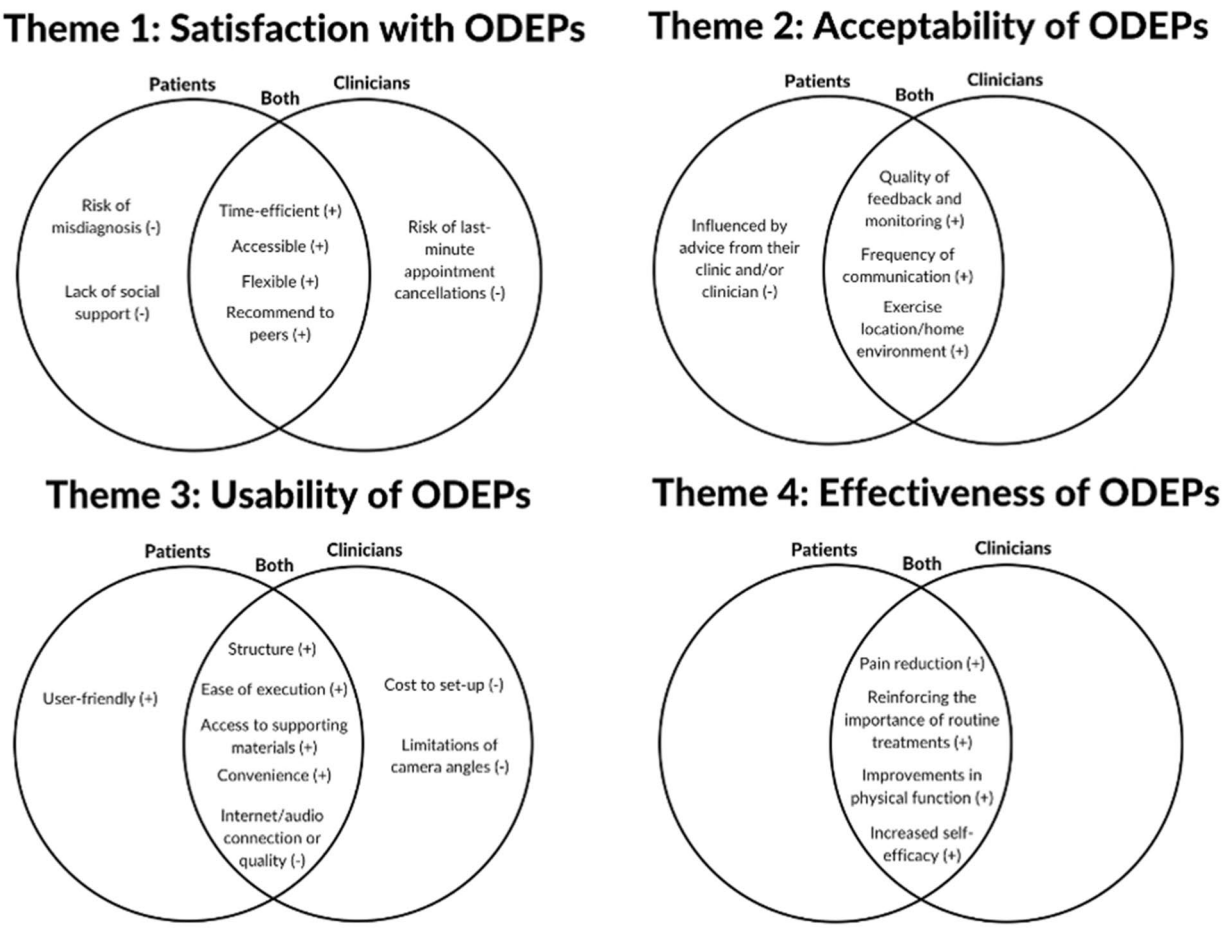

Figure 2. Thematic schema illustrating the common or differing patient and clinician perceptions of ODEPs for chronic MSK conditions. Note: ODEP: online-delivered exercise programme; MSK: musculoskeletal condition; +: facilitates uptake; -: hinders uptake.

In addition, targeted education strategies may help facilitate guideline-based management of chronic MSK conditions by addressing computer or e-health literacy, previously reported as one of the main barriers to adoption of telehealth globally [66].

Almost 70% (16/23) of the identified perceptions facilitated uptake, suggesting that patients and clinicians may acknowledge the advantages of telehealth services (e.g., improved accessibility). This suggests that the slow uptake of telehealth services may be significantly influenced by the 30% (7/23) of perceptions that hindered uptake. This is an important finding that researchers, community providers, and health policy makers may find useful when designing telehealth services and developing implementation strategies. Such telehealth services and implementation strategies may adopt a perception-centred approach that addresses key facilitators and challenges to uptake. Strategies addressing facilitators to uptake may include further supporting evidence on the benefits of telehealth (e.g., timesaving, flexible) or a greater number of supporting materials (e.g., exercise videos, educational websites). Strategies addressing challenges to uptake may include highlighting research on the diagnostic accuracy of telehealth, offering clear pathways to engage in online social support (e.g., additional online networking sessions for participants), or advocating for reimbursement of telehealth services (e.g., financial cost of necessary technological equipment is funded by professional bodies). The findings of this review highlight important areas for future studies including, how a perception-centred approach to implementation influences engagement with telehealth services, and how it may be helpful in selecting the most appropriate patients for ODEPs and improving patient outcomes for chronic MSK conditions.

Strengths and limitations

To our knowledge, this review is the first to examine the common or differing perceptions of patients and clinicians related to facilitating or hindering uptake of ODEPs for chronic MSK conditions. Uniquely, it synthesized the literature from patients' and clinicians' perspectives, whereas others have focused on one or other of these. Both quantitative and qualitative studies were included to maximise applicability of the findings. The studies included were of high to medium quality. Additionally, personal beliefs and experiences of the reviewers were reflexively assessed throughout to counteract any potential bias. Limitations include the exclusion of wider literature from other languages possibly resulting in publication bias, paediatric populations, and other types of telehealth services and health conditions. These findings may not be generalisable to (1) other self-management strategies as the studies focused on exercise, (2) other geographical locations, cultures, and healthcare settings, and (3) other healthcare professionals involved in delivery of care for MSK pain. The heterogeneity of included trials (e.g., context, methods, outcomes) prevented meta-analysis of quantitative results. Lastly, six of the twenty-one included studies were conducted in Australia raising questions of applicability to other countries,

and three of the twenty-one included studies were undertaken by the same group of researchers raising issues of potential bias.

Conclusion

Globally, uptake of ODEPs for chronic MSK conditions has been slow, partly due to perceptions of patients and clinicians. This mixed methods review synthesised the common and differing perceptions of patients and clinicians that facilitate or hinder the uptake of ODEPs. Our findings suggest that patients' and clinicians' share almost 70% of perceptions related to satisfaction, acceptability, usability, and effectiveness that influence the uptake of ODEPs. The majority of perceptions facilitated uptake, highlighting that the development of telehealth services must strongly focus on and address perceptions that hinder uptake as these may be contributing significantly to patient and clinician uptake. Implementation strategies may be strengthened by targeted education encouraging acceptance of telehealth and e-health literacy for patients and clinicians and by adopting a perception-centred approach addressing key facilitators and challenges to uptake. This may positively influence uptake and ultimately, facilitate long-term sustainability guideline-based management of chronic MSK conditions.

Reporting guidelines

Open Science Framework: PRISMA-P Checklist for "Patient and clinician perspectives of online-delivered exercise programmes for chronic musculoskeletal conditions: protocol for a systematic review," https://doi.org/10.17605/OSF.IO/75GVY (Bhardwaj, 2022). Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Universal).

Systematic review registration number

PROSPERO CRD42021273773.

Disclosure statement

The authors report there are no competing interests to declare.

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Data availability statement

No data are associated with this article.

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