SYSTEMATIC REVIEW

Evaluating the Potential of WhatsApp-based Interventions for Chronic Knee Pain Management in Older Adults: A Systematic Review

Suliza Sulaiman[1], Aishairma Aris[2], Dudut Tanjung[3], Nur Ain Mahat[4], Mohd Khairul Zul Hasymi Firdaus[5], Nik Noor Kaussar Nik Mohd Hatta[5], Muhammad Kamil Che Hasan[5]

[1] Bahagian Pengurusan Latihan, Kementerian Kesihatan Malaysia, 62675 Putrajaya, Malaysia
[2] Department of Nursing, Universiti Kebangsaan Malaysia, 56000 Wilayah Persekutuan Kuala Lumpur, Malaysia
[3] Faculty of Nursing Universitas Sumatera Utara, 20155, Medan, Indonesia
[4] Department of Professional Nursing Studies, Kulliyyah of Nursing, International Islamic University Malaysia, 25200 Kuantan Pahang, Malaysia
[5] Department of Medical Surgical Nursing, Kulliyyah of Nursing, International Islamic University Malaysia, 25200 Kuantan Pahang, Malaysia

ABSTRACT

Intoduction: The prevalence of chronic knee pain in older adults is increasing, posing significant public health challenges, including economic, mental, and social burdens. While pharmacological treatments are common, non-pharmacological interventions like exercise and self-management are gaining attention. This study reviews the feasibility of using WhatsApp-based interventions for managing chronic knee pain in older adults. WhatsApp has shown promise in enhancing health education, disease awareness, and treatment adherence. **Method:** A comprehensive literature search was conducted using databases such as PubMed, SCOPUS, EBSCo, ProQuest, Cochrane Library, and Google Scholar, covering July to October 2023. **Results:** Four randomised controlled trials (RCTs) were analysed, though none utilised WhatsApp for delivering interventions. Reduction in pain scores or improvement in functional mobility observed in the reviewed interventions. **Conclusion:** Findings indicate that self-management and exercise interventions benefit older adults with chronic knee pain, but long-term effects remain uncertain. This review suggests exploring WhatsApp-based interventions as a potential strategy to promote patient-centred care and supporting self-management in this population. Further research is needed to determine their efficacy..

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Corresponding Author:
Muhammad Kamil Che Hasan, PhD
Email: mkamil@iium.edu.my
Tel : +609-5707325

INTRODUCTION

Chronic knee pain is a significant public health issue that affects many older persons. It is described as pain or discomfort that persists for more than three months and might be the sole or primary complaint, requiring specific treatment and attention (1). Increasing age is one of a risk factors for chronic knee pain (2). In Malaysia, chronic knee pain usually occurs in individuals aged 40 years and older (3). Meanwhile, there were 64.8% of joint pain complaints were regarding knee as reported by the Community Oriented Programme for the Control of Rheumatic Diseases (COPCORD) study conducted in Malaysia. Moreover, chronic pain mechanisms involve a complex combination of physiological, emotional, cognitive, social, and environmental components (4). It is also producing a significant impact on economic and social burdens (5).

Despite pharmacological interventions, one of the current strategies of non-pharmacological interventions for chronic knee pain is exercise and self-management (6) (7) (8). However, exercise engagement in patients with knee pain is generally low, with access to exercise

therapy being a major barrier (9). It is also reported that older adults with this type of problem have difficulties to getting treatment in healthcare facilities due to the accessibility of healthcare from homes (10). Thus, it will lead to ignorance or mismanaging the symptoms. Eventually, this will worsen the physical activity, mental well-being, and quality of life for older persons with these problems (11). In addition, there are no community or home-based programmes for those with knee pain in Malaysia (12).

Moreover, in recent years, digital interventions have emerged as promising tools for managing and controlling chronic health conditions, including knee pain (13). It also provides insights into the use of mobile devices and multicomponent interventions for pain self-management in older adults (14). Over than that, it is feasible to deliver exercise therapy and self-management to people with chronic knee pain via the Internet (15). Nevertheless, WhatsApp-based interventions have shown promising results in a variety of health-related fields (16). WhatsApp-based programmes also have their own popularity due to their accessibility, user-friendliness, and cost-effectiveness (17). Therefore, the purpose of this study is to comprehensively review the existing research on a WhatsApp-based intervention programme for older adults with chronic knee pain on self-management and exercise programme using mobile messaging application (WhatsApp-based) for older adults with chronic knee pain. This review distinguishes itself by focusing specifically on WhatsApp-based interventions for chronic knee pain in older adults, a novel approach compared to general digital interventions. While previous reviews broadly explored digital platforms (e.g., web-based, mobile apps, and telerehabilitation), this review uniquely highlights the potential of WhatsApp as a widely accessible, cost-effective, and user-friendly tool. Its emphasis on a single, commonly used platform aims to address practical and scalable solutions for community and home-based care, particularly in Malaysia.

The research objectives are to firstly identify the existing WhatsApp-based self-management and exercise programme designed for older adults with chronic knee pain (participants); secondly to identify the most appropriate interventions through WhatsApp platform for older adults with chronic knee pain (intervention); thirdly to compare the WhatsApp-based/ digital platform based interventions that are effective in managing chronic knee pain (comparators); fourthly to synthesise and analyse the outcomes and findings of these interventions (outcomes); and lastly to identify the evidence base of possible chosen intervention from the randomised controlled trial findings (study design).

MATERIALS AND METHOD

The searching of the systematic review is carred out in accordance with Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA 2020) guidelines (18). Recommended specific characteristics that should be reported in this review includes PICOS tools (Participants, Interventions, Comparators, Outcomes and Study design) (19). The detailed of inclusion and exclusion criteria are in Table I.

Table I: : Eligibility criteria for the searching process

PICOS Tool	Inclusion Criteria	Exclusion Criteria
Participants	Adults with chronic knee pain.	Healthy volunteers
Interventions	Self-management and exercise therapy	Self-management and exercise therapy
Comparators	Control group	·Studies comparing different self-management programme and/or exercise based without an appropriate comparison group.
	Devices / platform digital/ on-line programme/ technology based.	· Face-to-face supervision (individual/group).
	Considered, if comparison group received the same co-intervention.	
Outcomes	· Pain; and either · Functional Mobility · Self-Efficacy ·Quality of Life ·Mental Well-Being · Health Belief · Self-reported function	· Laboratory test
Study Design	RCT, quasi-experimental control trials.	Systematic reviews, research protocol, non-experimental study, observational study or case study

Both published and unpublished intervention studies by International Islamic University Malaysia (IIUM) online database and the electronic databases that relevant are firstly PubMed, SCOPUS, EBSCo Discovery Service (EDS), Pro Quest, and Cochrane Library and Google Scholar as well as the 'grey literature' were searched between July 2023 to October 2023. The last search was performed on 13 October 2023. Secondly all searches retrieved documents published up until October 2023. Thirdly there will be no restrictions by type of setting. Next, no trial registers were searched and English language literature. The selected studies from the databases using the combination of following keywords: WhatsApp based, intervention programme, older adults and chronic knee pain. Any relevant text word, as well as any synonyms from the keywords found by MeSH search terms, were also used. The Boolean operator 'AND' was used to narrow the search results by combining each term. Meanwhile, the Boolean operator 'OR' was utilised to widen the search and retrieve more material that mentions each of the keywords. The literature search strategies by combination of keywords are as follows:

Consultations from the research team and librarian have been conducted to identify any articles that relate to the search. Any completed systematic reviews were searched by using Cochrane Library. Literature searches were extensively reviewed by identified through the reference list of the available studies to ensure the saturation of the literature. The author's personal files also have been searched to make sure the captivating of all related material. The funding sources were checked to make sure there were no conflicts of interest. The related papers or studies finding were uploaded to online Rayyan mobile apps (http://rayyan.qcri.org). This apps will speed the initial screening of abstracts and titles by allowing the importation of citations and PDF to be screened and added (20).

The process of selecting studies begins with screening the titles and abstracts based on eligibility criteria of the study. All related articles have been screened and any duplicate records were removed by the authors independently. Full reports of all titles appear to have been obtained and any articles with abstracts only were excluded. Any other potentially eligible studies were checked according to the reference lists. Meetings with the supervisor also have been held to screen the full text reports and decide whether it meets the inclusion criteria. The methodological qualities of all eligible articles were assessed based on a checklist by the Critical Appraisal Skills Programme (CASP). The tool is a quality assessment tools for controlled intervention study to assess methodological quality of RCT (21). The data of the individual trial articles were extracted based on (i) trial – country, design, setting, centres; (ii) targeting context of participant – average age, gender, mean durations of symptom, comorbidity and others; (iii) intervention – types of intervention, modes of application, intensity, the content, number of sessions, number of participants, duration, and others; (iv) comparators – criteria of the control groups, activities for the control, numbers of controls and others; (v) result – outcomes measurement, time point, type of analysis, function related outcome extracted; (vi) acceptance – rate of adherence and drop-out rate; and (vii) adverse events –any side effects or adverse events of the intervention.

The primary outcomes for the trial articles review are online based intervention programmes for participants with chronic knee pain, which is defined as age 40 years and older and diagnosed with knee pain (more than 6 months duration). The included trial studies were assessed for potential risk of bias using the Revised Cochrane risk-of-bias methodology for randomized trials (RoB2) (22). The researcher and supervisory team discussed all the decision for the included studies and risk of bias level was assigned according to the risk level which was low, high or some concerns. Outcomes were justified using validated tools like NRS, WOMAC, KOOS, 30-s CST, and PASE. Improvements were significant if they met clinical thresholds (e.g., ≥2-point NRS reduction, ≥10% WOMAC improvement, or ≥2 CST repetitions). Quality of life improvements were measured by KOOS QoL scores, with ≥5-point increases deemed meaningful. Comparisons to control groups demonstrated better short-term effects, though long-term benefits were inconsistent, highlighting the need for sustained interventions to maintain improvements.

RESULTS

Figure 1 depicts the results of the research selection and screening procedures based on the PRISMA 2020 flow diagram (18). Eventually, four studies were appraised in this systematic review which were outlined and compared in Table II (21) (23) (24) (25). All of these four studies were experimental RCT, but the randomisation process varied. However, in terms of the method of delivering the intervention, none of the studies were using WhatsApp as a medium for delivering the method. Two studies were used web-based (24) (25), one study was used mobile-apps (23) and another one was using telerehabilitation (21). Among all of these four studies, only (25) that done a study on a web-based intervention for patients with knee OA in a long-term research (until 12 months follow-up). The sample sizes ranged in these four studies are varied from 48 to 206. Subjects were recruited from the community and clinics, and their average age ranged from 55 to 63 years.

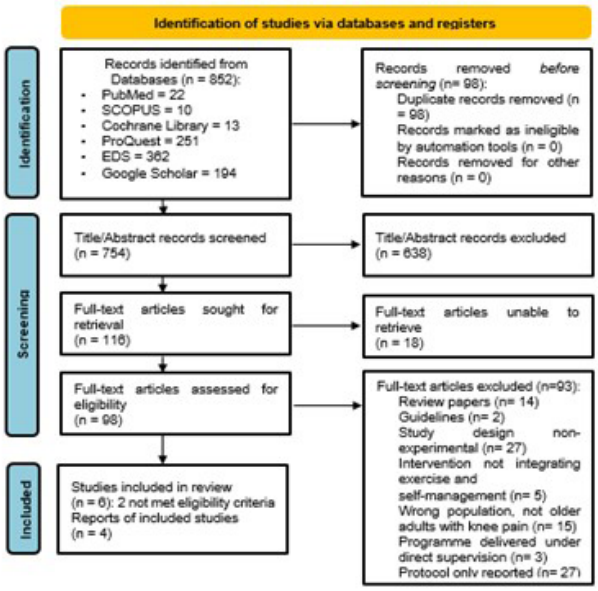

Figure 1: Flow diagram based on PRISMA 2020

The methodological quality of these four studies was reviewed using the CASP Randomised Controlled Trial Checklist. Among two of the four trials, participants, investigators and people assessing/analysing the outcome were not blind to the intervention (21) (25). Although, in these two trials the intervention that not identical between groups where both groups not been treated equally. Meanwhile trial done by (23) did not

Table II: Characteristics of the studies

Author, Year & Location	Design	Aim	Sample Size	Population	Age (SD) IG; CG2	Intervention & period	Strength & Limitation
Tore, Oskay, and Hazne-daroglu 2023 Ankara, Turkey	RCT	To compare the effects of telerehabilitation and home-based exercise programs for knee osteoarthritis (KOA).	n=48 IG=24 CG=24	Volunteers with mild to moderate KOA (clinic)	n= 55.83±6.93 IG= 55.87±7.24 CG= 55.79±6.76	Randomization program. **Intervention:** Telerehabilitation – Zoom Meetings, simultaneous video conference, attended by a physiotherapist - 24 times in total for telerehabilitation. Following the evaluation via Zoom – Patient educarion. **Control:** Brochure demonstrating and explaining how to perform each exercise. Zoom meetings are only used during the baseline evaluation and after 8 weeks. The treatment for both groups is same - exercise. **Duration:** - The duration and number of repetitions were gradually increased each week. - Telerehabilitation - three days a week, 45-60 minutes every day, for eight weeks, with a physiotherapist. - Control group performed exercise on their own.	**Strength** 1) First study to examine the efficacy of physiotherapy and rehabilitation simultaneously with videoconferencing. 2) First study to examine the change in the level of kinesiophobia following the telerehabilitation. 3) First study evaluate the quality of the physiotherapy through telerehabilitation **Limitation** Study design - lack of double blind
Arfaei Chitkar et al. 2021 Bojnurd, Iran	Parallel RCT	To assess the effectiveness of mobile app-based education in enhancing the physical performance of female patients with knee osteoarthritis.	n=60 IG=31 CG=29	Knee OA female patients aged 40–70 year-old in Bojnurd city in 2018	n= 58.17 (7.55) IG= 57.84 (8.63) CG= 58.52 (6.33)	Blocked randomization method **Intervention:** Mobile app – deliver all the educational content. To get familiar using the app – subjects met once at the beginning of the study. **Control:** Face to face – two sessions; at initial session and a month later for questions and further clarifications. Routine medical – intervention and control groups. Both groups received educational content related to: - What is OA and the causes of OA - risk factors of OA - Nutrients and healthy diet - Treatment modalities and management for OA - OA exercises	

CONTINUE

Table II: Characteristics of the studies (CONT.)

Author, Year & Location	Design	Aim	Sample Size	Population	Age (SD) IG; CG2	Intervention & period	Strength & Limitation
Nelligan et al. 2021 Victoria, Australia	Parallel, 2-arm, superiority RCT	To assess the benefits of a self-directed web-based strengthening exercise and physical activity program supported by automated behavior-change text messages on knee pain and function in adults with knee OA.	n=206 IG=103 CG=103	Individual that met clinical criteria for knee OA with follow-up taking place at 24 weeks across communities in Australia from July 2018 to August 2019,	n= 60 (8.4) IG= 60.3 (8.2) CG= 59 (8.5)	- Participant, assessor and biostatisticians - blinded - Screening - using REDCap software and eligibility of the participants were confirmed by telephone. - Computer generated randomization - 1:1 ratio - permuted blocks of sizes 6 to 12. - Concealment - randomization schedule was accessed through a password-protected computer program by a researcher who was not involved in participant screening, recruiting scheduling, or evaluation. - Participants were not provided detailed information about the intervention or control groups, nor the hypothesis under examination. **Intervention:** Access to a custom-built website with information on osteoarthritis and the benefits of exercise and physical activity. A prescription for a 24-week self-directed strengthening regimen is also included, as well as instruction on increasing physical activity, which is supported by automatic behavior-change text messages that encourage exercise adherence. **Control:** Given access to the same information	**Strength** 1) A strong randomized clinical trial design with reliable and valid outcomes. 2) Participant, assessor and biostatisticians -blinding 3) Participant retention –excellence - improves internal validity. 4) Generalizability - broad inclusion criteria and nationwide recruitment of participants. 5) There are no restrictions on co-intervention and pharmaceutical use. 6) The intervention design was rigorous, evidence-based, incorporated behavior change theory, and included feedback from doctors and persons with knee OA. **Limitation** 1) Potential for bias, as participants self-selected to volunteer for a study exploring diverse digital resources. 2) The study findings may not apply to those with lesser levels of education or self-efficacy. 3) The intervention may not be appropriate for persons who prefer pharmacological therapies. 4) No long-term follow-up was included. 5) The comparison between web-based education and clinician-delivered interventions (one-on-one or group) is unclear.

CONTINUE

Table II: Characteristics of the studies (CONT.)

Author, Year & Location	Design	Aim	Sample Size	Population	Age (SD) IG; CG2	Intervention & period	Strength & Limitation
Bossen et al. 2013 Netherlands	2-arm RCT - not blinded	To compare the completely automated Web-based physical activity (PA) intervention in patients with knee and/or hip OA between a waiting list control group. Result in improved levels of PA, physical function, and self-perceived effect.	n=199 IG=100 CG=99	Volunteers Recruited from articles in newspapers and health-related websites. Eligibility criteria: 1) 50-75 years old 2) Knee and/or hip OA - self-reported 3) Inactivity (30 minutes of moderate PA, 5 times or less per week) - self-reported 4) In the last 6 months - no face-to-face consultation with any health care provider other than general practitioners, for OA 5) Can access the Internet weekly 6) no contra-indications to exercise without supervision	n= 62 (5.7) IG= 61 (5.9) CG= 63 (5.4)	- Patients met inclusion criteria received an invitation letter and provided informed consent. - Complete an online baseline questionnaire. - Randomly assigned. - Concealment - a researcher not participating in data collection delivered sequentially numbered opaque sealed envelopes containing allocation information. -Informed via email. - Intervention - received a username and password. - Neither the study staff or the subjects were blinded. - Online questionnaires - at 3 and 12 months. - Accelerometer - random subgroup from both groups (n=83) received and returned by post. - Failure to complete the online questionnaire within two weeks prompted an email and phone reminder. - No face-to-face - participants	Strength 1) RCT design and long-duration study. 2) Measures to assess PA - objective and subjective Limitation 1) Self-reported OA - diagnosis was not confirmed by clinical tests or x-rays 2)results might be biased - participant's dropout of at 3 months and at 12 months. 3) Possibility of Type I errors – two separate measures (questionnaires and accelerometers) were used twice (3 months and 12 months apart). 4) The self-selected sample limited representativeness - a widely acknowledged phenomenon known as "the inverse information law".

blind the investigators, nor estimate the intervention effect and did not mention the benefits outweigh the risks and expenses. In this review, all of the outcomes were assessed using an online platform. However, only a physical performance test (30-s chair stand test) (21) study was assessed using the Zoom Meetings application by a physiotherapist. Meanwhile, other outcomes were measured using online questionnaires. The outcomes are shown in Table III.

Table III: : The Outcome Measures

Outcomes	Tore, Oskay, and Haznedaroglu, 2023	Arfaei Chitkar et al. 2021	Nelligan et al. 2021	Bossen et al. 2013
1. Times of measurement	Baseline and after 8 weeks.	Baseline and after two months.	Baseline and 24 weeks.	Baseline, 3-month, and 12-month
Pain				
2. Pain	NRS ↓ KOOS (pain) ↑	WOMAC ↓ SF-36 ↓	NRS ↓ WOMAC ↓ KOOS (pain) ↑ ASES (pain) ↑	NRS ↓ (3 months) NRS = (12 months) ASES for pain = (3&12 months) PCI = (3&12 months)
Physical				
3. Physical Performance	30 CST – ↑ (physical performance via Zoom Meetings)	NA	NA	NA
4. Physical activity	IPAQ-SF ↑ MET-min/ week ↑	NA	PASE ↑	PASE = (3 months) PASE ↑ (12 months) accelerometer min/day = (3&12 months)
5. Functional status	KOOS ↑ (symptoms, functional status: ADL & sports & leisure, total)	WOMAC ↑ SF-36 ↑	KOOS ↑ (sports/ recreation) ASES ↑ (function)	KOOS physical function & recreation: ↑ (3 months); = (12 months) KOOS symptoms ↓ (3&12 months)
6. Fatigue	FSS ↓	SF-36 ↓	NA	NRS ↓ (3 months) NRS = (12 months)
7. Self-Efficacy for Exercise	NA	NA	SEE ↓	NA
Psychological				
8. Anxiety & Depression	HADS ↓	SF-36 =	NA	HADS ↓
9. Kinesphobia/ Fear of movement/ re-injury	TSK ↓	NA	NA	NA
10. Self-perceived	NA	NA	NA	Improved (3 months) No effect (12 months)

CONTINUE

Table III: : The Outcome Measures (CONT.)

Outcomes	Tore, Oskay, and Haznedaroglu, 2023	Arfaei Chitkar et al. 2021	Nelligan et al. 2021	Bossen et al. 2013
Quality of Life				
11. Quality of Life	KOOS ↑ (Knee related QoL)	NA	KOOS ↑ (Knee related QoL) AQoL ↑	KOOS QoL ↑ (3 months) KOOS QoL = (12 months)
After Treatment				
12. Exercise Adherence	EARS ↑	NA	NA	NA
13. Satisfaction with the treatment	Very satisfied		Satisfied	
14. Quality of the physiotherapy received.	QUIPA↑		NA	

Key: 30 CST (30-s chair stand test); NRS (Numerical Rating Scale); KOOS (Knee Injury and Osteoarthritis Outcomes Score); QoL (quality of life); HADS (Hospital Anxiety and Depression Scale); FSS (Fatigue Severity Scale); IPAQ-SF (International Physical Activity Questionnaire Short Form); TSK (Tampa Scale of Kinesphobia); MET(metabolic equivalent, min minute); WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index); AQoL, (Assessment of Quality of Life); PASE (Physical Activity Scale for the Elderly); ASES (Arthritis Self-Efficacy); SEE (Self-Efficacy for Exercise); PCI (Pain-Coping Inventory); NA (not applicable).

In terms of pain outcome, pain measurement was using various tools such as the Numerical Rating Scale (NRS), Pain-Coping Inventory (PCI), Knee Injury and Osteoarthritis Outcome Score subscale of pain (KOOS-pain), Arthritis Self-Efficacy (ASES), Western Ontario and McMaster Universities Arthritis Index (WOMAC) and SF-36. All four studies found evidence of short-term pain relief within three months of management. However, the effectiveness in pain was maintained in long-term follow-up at one year (25). The most use tools for pain measurement were NRS where three out of four trials were used this tools. The assessment for risk of bias within these four included studies by utilising RoB2 for assessing the risk of bias in randomised trials (22). The results determined that all of the studies have low risk of bias. The results showed that interventions effectively reduced pain (e.g., NRS, WOMAC), improved physical function (e.g., 30-s CST, PASE), and enhanced quality of life (e.g., KOOS QoL). Variability among studies included differences in methodologies (e.g., telerehabilitation, web-based, mobile apps), sample sizes (48 to 206 participants), and intervention durations (8 weeks to 12 months). These variations highlight diverse approaches and outcomes, providing valuable context but limiting direct comparisons and generalisation across studies.

DISCUSSION

The intervention programmes discovered through the comprehensive literature search primarily included a combination of self-management and exercise for participants. Although a comprehensive search technique was used in this systematic review, only four intervention programmes were chosen for consideration. The majority of the programmes were assessed in

different countries and yielded varying effectiveness results. This may impede the transferability of the conclusions to the Malaysian setting. In general, all self-management and exercise therapies appeared to benefit older adults with chronic knee pain, but the long-term impact was unclear. Several outcome measures were highlighted to assess the profile of participants in terms of pain (e.g., WOMAC, KOOS, NRS, SF-36, ASES, PCI), physical function (e.g., WOMAC, KOOS, SF-36, PASE, NRS, FSS, SEE, IPAQ-SF, 30 CST), psychological (e.g., HADS, TSK, SF-36), and quality of life (e.g. KOOS). Furthermore, these instruments could be used as a baseline in the feasibility study to compare differences across groups or time periods. Thus, the WhatsApp-based self-management and exercise programme among older adults living with chronic knee pain will involve the components of positive evidence from the literature. WhatsApp-based interventions may enhance outcomes through improved adherence, real-time support, and accessible communication compared to traditional methods. These features enable consistent patient engagement and self-management. Compared to in-person or web-based interventions, WhatsApp's user-friendliness and cost-effectiveness make it a practical tool for older adults. However, limitations like a lack of long-term data and variability in intervention designs may influence the sustainability of observed benefits, highlighting the need for further research to confirm efficacy.

CONCLUSION

Although research is progressing beyond usability and acceptance, there have been few experimental trials in older persons focusing on improving pain outcomes. The study designs, sample size and diversity, measured outcomes, and interventional strategy have all varied. It is too early to conclude that these interventions will produce a significant effect on chronic knee pain for older adults. However, as technology continues to be integrated into health care, additional study is needed to determine the efficacy of WhatsApp-based self-management and exercise programme on chronic knee pain outcomes in older adults. The small number of studies and limited participant diversity, restricting the ability to generalise findings. However, byy integrating WhatsApp-based interventions into healthcare strategies for older adults with chronic knee pain may have the potential effects on self-management support and contribute to more comprehensive and patient-centred care.

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