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Original Article

Effect of Positive Psychological Capital and Self-Management Model Interventions on Pain and Functional Difficulty in Persons With Osteoarthritis

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Abstract

Background: Osteoarthritis is a prevalent global health challenge, particularly among the elderly, and leads to significant physical disability, emotional distress, and socioeconomic burden. Effective interventions addressing these multifaceted effects are limited, especially in patients with severe knee osteoarthritis awaiting a surgical intervention. This study was guided by 2 theoretical frameworks: the positive psychological capital (PsyCap) theory, which focuses on enhancing psychological resilience, motivation, and coping strategies; and the self-management model, which emphasizes goal setting, symptom tracking, and adherence to self-care behaviors.

Objectives: To evaluate the effectiveness of a novel intervention integrating PsyCap theory and self-management model strategies to enhance self-care behavior, alleviate pain, and reduce mobility difficulties among patients with severe knee osteoarthritis (Kellgren-Lawrence grades 3-4).

Methods: A quasi-experimental pretest-posttest design was used between May and July 2023 at the outpatient surgery department of a university hospital. A total of 34 patients with primary knee osteoarthritis were randomly assigned into experimental (n = 17) and control (n = 17) groups. The experimental group received a self-care behavior enhancement program integrating PsyCap and self-management principles. Outcomes were assessed at 3 time points: baseline, postintervention (4 weeks), and follow-up (12 weeks). Statistical analyses included descriptive statistics and 2-way repeated measures analysis of variance (ANOVA) to examine within- and between-group effects over time.

Results: Compared to the control group, the experimental group demonstrated significant improvements in self-care behaviors ($F[1,32] = 24.982$; $P < .001$; $\eta^2 = 0.438$), with significant time-group interaction effects ($F[1.374,43.960] = 38.581$; $P < .001$; $\eta^2 = 0.547$). Additionally, pain and mobility difficulties significantly decreased in the experimental group ($F[1.640,52.473] = 42.261$; $P < .001$; $\eta^2 = 0.569$), whereas no significant changes were observed in the control group.

Conclusions: Integrating PsyCap theory and the self-management model significantly improved self-care behavior and reduced pain and mobility difficulty in patients with severe knee osteoarthritis awaiting surgery. These benefits were sustained over 12 weeks.

Keywords: Positive psychological capital, Self-management model, Osteoarthritis, Joint pain, Mobility limitations, Self-care behavior

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Introduction

Osteoarthritis, particularly knee osteoarthritis, is a major global health concern with growing implications for quality of life and health systems. According to the World Health Organization (WHO), musculoskeletal disorders (MSDs), including osteoarthritis, affect more than 1.71 billion people globally as of 2021, and continue to be a leading cause of disability-adjusted life years (DALYs) worldwide, especially among older adults.[1-2] The burden of osteoarthritis is expected to increase significantly owing to increased life expectancy and population aging. The WHO has reported that noncommunicable diseases (NCDs) account for nearly three-quarters of all deaths globally, and their absolute numbers are projected to increase dramatically, with musculoskeletal conditions playing a key role.[2] This trend underscores the urgent need for integrated interventions that address not only symptom management but also long-term functional health and quality of life for individuals living with osteoarthritis.[1]

The knee is the most frequently involved joint, contributing to substantial disability and making knee osteoarthritis a major public health concern. Its increasing prevalence is associated with aging populations, increasing obesity rates, and a higher incidence of joint injuries.[3-4] In Thailand, knee osteoarthritis predominantly affects the elderly, presenting a substantial burden on their physical, emotional, and social well-being. Patients often experience chronic pain, reduced mobility, and diminished quality of life.[5] Effective osteoarthritis management aims to slow disease progression, prevent complications, and maintain functional independence through a combination of pharmacological and nonpharmacological interventions.[6] Interdisciplinary approaches that integrate both treatment modalities have been emphasized to address the physical and psychological dimensions of the disease.[7] Without timely and appropriate interventions, osteoarthritis can lead to severe mobility impairments, exacerbating psychological challenges, such as anxiety, depression, and dependency.[8-9]

Pain management remains a cornerstone of osteoarthritis treatment, utilizing both pharmacological options, including nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroids, and emerging innovations such as nanotechnology-based drug delivery and gene therapy. Nonpharmacological interventions, such as structured exercise programs and weight management, are equally crucial, with evidence supporting their effectiveness in reducing pain and improving joint function. Personalized nursing care and therapeutic strategies further enhance patient outcomes by optimizing symptom control and promoting self-management behaviors.[6, 10, 11]

Despite substantial evidence supporting psychological and self-management model, their integration into single-structured programs remains limited. Previous interventions have often addressed psychological strategies or self-management approaches in isolation, failing to account for their combined impact on long-term behavioral adherence and clinical outcomes.[12, 13] Additionally, existing studies frequently suffer from methodological constraints, such as the lack of comprehensive behavioral frameworks, thereby limiting their applicability.

This study was guided by 2 theoretical frameworks: PsyCap theory and the self-management model. PsyCap comprises psychological assets hope, resilience, optimism, and self-efficacy that enhance patients' ability to manage chronic conditions through motivation and persistence.[14] In contrast, the self-management model emphasizes patient-driven behaviors such as goal setting, symptom tracking, and treatment adherence, empowering individuals to take an active role in their care and sustain long-term health behaviors.[15] Integrating these frameworks provides a holistic approach

by addressing both psychological resilience and behavioral engagement, which is particularly relevant for patients with knee osteoarthritis awaiting surgery who experience prolonged pain and functional decline.[16]

Building on prior research demonstrating that interventions grounded in the self-management model alleviate osteoarthritis symptoms and PsyCap strengthens adherence to self-care behaviors, this study sought to bridge these strategies into a unified intervention. Systematic reviews have emphasized the necessity of such an integrated approach; however, few studies have implemented this within a structured program for patients with knee osteoarthritis. A rigorous validation process was conducted by orthopedic specialists, behavioral psychologists, and rehabilitation experts reviewing the program's content to ensure scientific rigor and clinical applicability.[17]

This study aimed to evaluate the effectiveness of integrating PsyCap theory and a self-management model to improve self-care behaviors in patients with knee osteoarthritis. Specifically, it examines whether the intervention enhances self-care behaviors, reduces pain and mobility difficulties, and sustains its effects over time. It is hypothesized that the intervention group will demonstrate significantly improved self-care behaviors and reductions in pain and mobility difficulties compared to the control group, with sustained benefits observed at follow-up. By addressing these considerations, this study contributes to the advancement of knee osteoarthritis management through an integrative approach that bridges the psychological and self-management models, ultimately improving patients' quality of life, particularly for those awaiting surgical treatment.

Methods

Study Design

This quasi-experimental study employed a 2-group design, comprising an experimental group and a control group. Data were collected at 3 time points: baseline (prior to the intervention), postintervention (4 weeks), and follow-up (12 weeks). To minimize contamination, data collection for the control group was completed before enrolling the experimental group.

Data Collection

Data collection occurred between May and July 2023 in 3 phases: baseline assessment, intervention implementation, and evaluation. In the baseline phase, demographic and physical data, including body mass index (BMI), weight, height, and osteoarthritis severity, were recorded. The intervention phase involved delivering a structured PsyCap and self-management program to the experimental group, while the control group received standard care. This phase included three structured sessions conducted in weeks 1, 2, and 4, delivered both in-person and online. During the self-management model period, participants documented their daily activities, weight, and self-reported pain, stiffness, and joint function based on their set goals. In the evaluation phase, osteoarthritis severity was reassessed at the end of the intervention (week 4) and at follow-up (week 12). To minimize contamination, the control group completed all assessments before the experimental group began the intervention. Research assistants blinded to group allocation conducted all assessments using standardized procedures to ensure consistency and reliability.

Sample Selection and Randomization

Participants were selected based on inclusion and exclusion criteria. Eligible particpants were at least 50 years, provided informed consent, had no history of total knee replacement surgery, and had not received corticosteroid knee injections or experienced severe knee pain in the last 3 months. They were required to have an activities of daily living (ADLs) score of 12 or higher. For participants aged 60 years and older, cognitive function was assessed using the mini-cognitive assessment instrument (Mini-Cog), with a score of at least 3 required for inclusion. All participants were also required to obtain medical clearance from a physician prior to enrollment.

Exclusion criteria included severe, uncontrolled medical conditions such as acute heart failure or stroke, an inability to participate throughout the study, severe comorbidities like knee infections or neurological disorders impairing daily function, use of medications affecting balance, or corticosteroid knee injections during data collection.

Participants were randomly assigned to either the experimental group (n = 17) or the control group (n = 17) using simple random sampling. A power analysis using G*Power software version 3.0.1 determined the required sample size based on an estimated effect size (Cohen *f* = 0.25) from Bunsanong et al.[18] The statistical test applied was analysis of variance (ANOVA): repeated measures, within-between interaction, with a power of 0.80, an α level of 0.05, and a confidence level of 95%. The analysis recommended a total of 28 participants. Allowing for a 16% attrition rate,[19] the final sample size was 34 participants, with 17 per group.

Measures

The instruments used in this study consist of 3 components. The first component included screening tools: the Kellgren-Lawrence (KL) grading system for classifying knee osteoarthritis severity, the Barthel ADL Index for assessing daily activity performance, and the Mini-Cog for cognitive function evaluation (administered to participants aged 60 years and older).

The second component comprised instruments for data collection, including a general information questionnaire covering demographic and health-related data, such as age, weight, height, marital status, occupation, education level, comorbidities, frequency of exercise, medication and supplement use, and engagement in alternative treatments. A self-care behavior questionnaire was developed based on relevant literature to assess self-care behaviors in 3 domains: exercise (5 items), weight management (6 items), and joint care practices (8 items), with responses recorded on a Likert scale. Higher scores indicate better adherence to self-care practices. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was used to assess symptom severity. The instrument consists of 24 items divided into 3 subscales: pain (5 items), joint stiffness (2 items), and physical function (17 items). In this study, pain was assessed using the WOMAC pain subscale and mobility difficulty was assessed using the WOMAC physical function subscale. Each item was scored on a 5-point Likert scale (0 = none to 4 = extreme), with higher scores indicating greater severity. The subscale scores were summed to represent each outcome. The Thai version of the WOMAC used in this study has been validated previously, with a Cronbach α exceeding 0.80, indicating high internal consistency.

The third component included the PsyCap and self-management program, which underwent expert validation to ensure alignment with the theoretical constructs and practical relevance. Five experts an orthopedic specialist, a physical activity expert, a nurse

specializing in osteoarthritis management, a health behavior modification expert, and a musculoskeletal nursing educator assessed its content. The item-level content validity index (I-CVI) and scale-level validity index (S-CVI) were both 1.00.[20-21] Pilot testing confirmed clarity and feasibility, and reliability was supported with a Cohen coefficient of 1.00.[22]

Intervention

The intervention was based on a self-management model and PsyCap theory. Self-management model-guided strategies such as goal setting, osteoarthritis education, decision-making exercises, and behavioral adjustment, and PsyCap theory were embedded to promote a positive mindset toward self-care and symptom control.

The program consisted of 3 structured in-person sessions over 4 weeks in a hospital setting. Session 1 focused on osteoarthritis self-care, goal setting, and joint mobility strategies. Session 2 addressed cognitive restructuring, low-impact exercises, and self-care planning. Session 3 emphasized problem solving, adherence strategies, and peer support.

Online follow-ups were conducted to reinforce adherence and self-monitoring. Participants received weekly virtual check-ins via video or phone calls along with motivational messages through a mobile platform. They also maintained a self-care journal that was reviewed by the research team for feedback and engagement tracking.

In contrast, the control group received standard care, comprising routine nursing consultations, osteoarthritis educational brochures, and verbal guidance on pain and mobility management. They were encouraged to continue regular physical activity and joint mobility exercises according to the general osteoarthritis guidelines.

Statistical Analysis

All statistical analyses were performed using SPSS version 29.0 (IBM SPSS Statistics for Windows, Version 29.0. Armonk, NY: IBM Corp; 2021). Descriptive statistics, including mean (SD), were used to summarize participant characteristics and baseline measurements. Independent *t* tests and chi-square tests were conducted to compare baseline characteristics between the experimental and control groups.

To assess within-group and between-group differences over time for the primary outcomes (self-care behavior, pain, and mobility difficulties), 2-way repeated measures ANOVA was used. Post hoc analyses with Bonferroni correction were conducted to further explore significant interaction effects. All statistical tests were performed at a 95% CI and a P value < .05 was considered statistically significant.

Results

General Characteristics of Participants and Baseline Statistics

The study included 17 participants in the experimental group and 17 in the control group, all of whom were patients with primary knee osteoarthritis receiving treatment at Vajira Hospital. All participants had radiographically confirmed knee osteoarthritis classified as KL grade 3 or 4 and had been on the surgical waiting list for at least 1 year. The majority of participants in both groups were female (94.12%), aged 61-70 years, and had attained a primary level of education. Most were homemakers (76.47%) and had a disease severity classified as KL grade 4.

The chi-square test showed no statistically significant differences in demographics and clinical characteristics between groups, confirming comparability at baseline. The mean (SD)

age in the experimental and control groups was 66.06 (4.56) and 66.53 (6.81) years, respectively. The mean (SD) BMI was 26.23 (5.35) kg/m^2 in the experimental group and 24.58 (5.44) kg/m^2 in the control group. Both groups had an identical mean knee osteoarthritis severity score (mean [SD], 3.71 [0.47]).

Effect of the Intervention on Self-Care Behavior

The repeated measures ANOVA results for self-care behavior were determined (Table 1 and Figure 1).

The interaction effect (time x group), a significant interaction effect was observed (F = 38.581; P < .001; η^2 = 0.547), indicating that changes in self-care behavior over time varied by group. The experimental group demonstrated a consistent increase in self-care behavior scores post-intervention and at follow-up, while the control group exhibited a decline in scores.

The between-groups effect, the experimental group consistently had significantly higher self-care behavior scores compared to the control group (F = 24.982; P < .001; η^2 = 0.438).

The within-groups effect (time), the effect of time alone was not statistically significant (F = 0.269; P = .681; η^2 = 0.008), suggesting that observed changes were not solely due to time but rather the impact of the intervention.

These findings indicate that the intervention effectively improved self-care behavior among patients in the experimental group, with significant gains sustained at follow-up.

Effect of the Intervention on Pain and Mobility Difficulty

The repeated measures ANOVA results for pain and mobility difficulty were determined (Table 2 and Figure 2).

Interaction effect (time x group), a significant interaction effect was found (F = 42.261; P < .001; η^2 = .569), showing that changes in pain and mobility difficulty varied by group. The experimental group had a substantial decrease in pain and mobility difficulty post-intervention and at follow-up, while the control group remained relatively unchanged.

Between-groups effect while the between-groups difference was not statistically significant at the conventional threshold (F = 4.060; P = .052; η^2 = 0.113), the effect size suggests a small to moderate impact of the intervention.

Within-groups effect (time), a significant time effect was observed (F = 24.866; P < .001; η^2 = 0.437), indicating that time contributed to changes in pain and mobility difficulty, particularly within the experimental group.

These findings suggest that the intervention effectively reduced pain and mobility difficulty, with sustained improvements in the experimental group at follow-up.

Summary of Findings

The intervention significantly improved self-care behavior, as evidenced by a substantial increase in scores in the experimental group over time. The intervention led to a meaningful reduction in pain and mobility difficulty, with sustained improvements at follow-up. The interaction effects (time x group) were highly significant, underscoring the intervention's impact. Between-group differences in pain and mobility difficulty approached significance, with an effect size suggesting clinical relevance table changes, reinforcing the effectiveness of the intervention.

These results highlight the effectiveness of the intervention in enhancing self-care behavior and reducing pain and mobility difficulty among patients with knee osteoarthritis. The improvements in the experimental group were not solely attributed to the passage of time but rather to the impact of the structured intervention program.

Table 1. Repeated Measures Analysis of Variance for Self-Care Behavior in Patients With Knee Osteoarthritis

Source of Variance	SS	*df*	MS	*F* Test	*P* Value	η^2
Between groups						
Group	3866.510	1.000	3866.510	24.982	< .001	0.438
Error	4952.745	32.000	154.773	NA	NA	NA
Within groups						
Time	8.647	1.374	6.294	0.269	.681	0.008
Time x group	1241.196	1.374	903.505	38.581	< .001	0.547
Error	1029.490	43.960	23.419	NA	NA	NA

Abbreviations: *df*, degrees of freedom; MS, mean square; NA, not applicable; η^2, effect size; SS, sum of squares.

Figures 1. Changes in Self-Care Behavior Scores Over Time

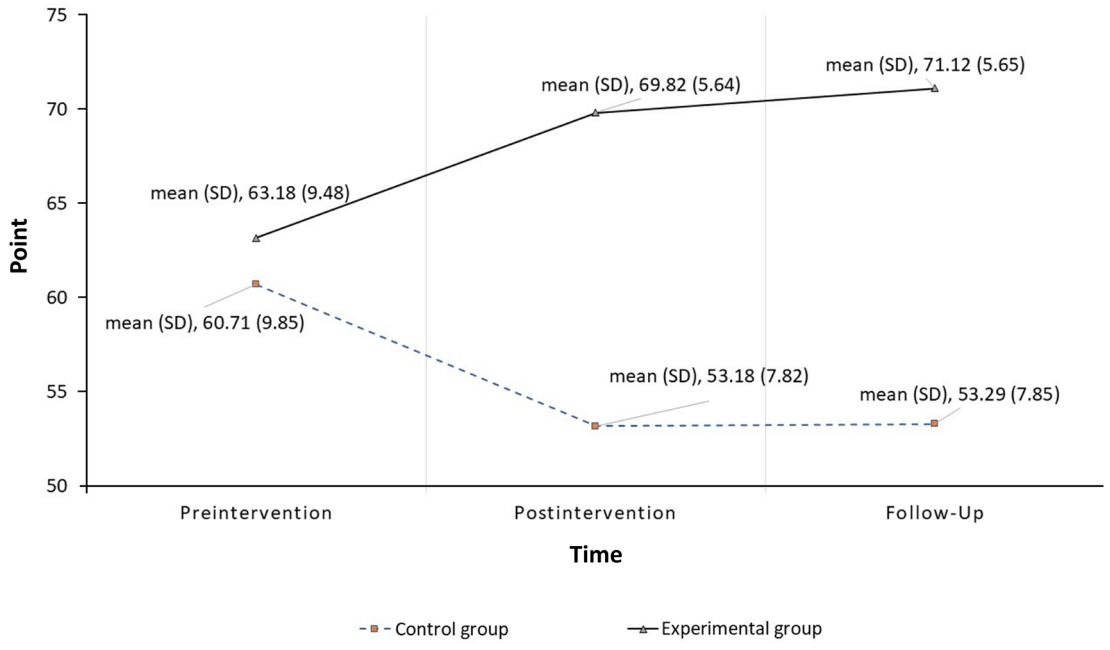
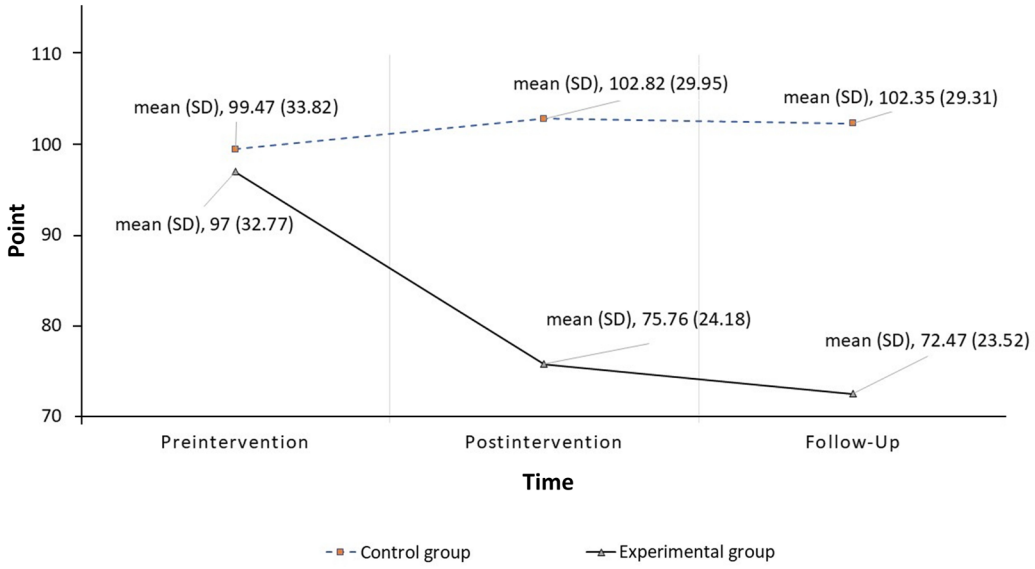


Table 2. Repeated Measures Analysis of Variance for Pain and Mobility Difficulty in Patients with Knee Osteoarthritis

Source of Variance	SS	*df*	MS	*F* Test	*P* Value	η^2
Between groups						
Group	10000.980	1.000	10000.980	4.060	.052	0.113
Error	78829.650	32.000	2463.426	NA	NA	NA
Within groups						
Time	2273.882	1.640	1386.702	24.866	< .001	0.437
Time x group	3864.549	1.64	2356.753	42.261	< .001	0.569
Error	2926.235	52.473	55.767	NA	NA	NA

Abbreviations: *df*, degrees of freedom; MS, mean square; NA, not applicable; η^2, effect size; SS, sum of squares.

Figures 2. Pain and Mobility Difficulty Trends Across Assessment Periods



Discussion

This study evaluated the effects of an integrated intervention combining PsyCap theory and the self-management model on self-care behaviors, pain, and mobility in patients with knee osteoarthritis. The findings indicate that this dual-framework approach significantly enhanced self-care adherence and reduced both pain and mobility difficulties over time. In contrast, participants who received standard care did not show significant improvements, underscoring the added value of structured psychological and behavioral strategies in osteoarthritis management.

The improvements observed in the experimental group likely stemmed from the synergistic effects of the 2 theoretical components. PsyCap — comprising self-efficacy, resilience, optimism, and hope — has been shown to strengthen motivation and commitment to health-related behaviors.[14] Among these, self-efficacy is particularly influential in

sustaining activity despite pain, while optimism and hope help patients cognitively reframe limitations and maintain focus on achievable health goals.[23] These findings are consistent with literature linking psychological resilience to greater pain tolerance and better functional outcomes in osteoarthritis populations.[24]

Complementing the psychological component, the self-management model provided participants with concrete tools for behavioral regulation. Strategies such as goal setting, symptom monitoring, and behavior adjustment empowered patients to take an active role in their care. These principles align with Creer's self-management framework, which emphasizes action planning and self-monitoring as essential for sustaining long-term behavior change.[15] Previous studies support these findings, showing that structured self-management interventions can lead to reduced pain severity and improved mobility in patients with osteoarthritis.[25] In particular, elements like joint protection and weight management directly mitigate biomechanical stressors that contribute to osteoarthritis symptoms.[26]

The lack of significant change in the control group highlights the limitations of passive care strategies. While standard consultations and educational brochures provide essential knowledge, they often lack the interactive and reinforcing components necessary to initiate and sustain behavioral change. Without structured guidance and motivational support, patients may find it difficult to adhere to recommended self-care routines.

This integrated intervention offers a comprehensive approach by addressing both psychological resilience and behavioral engagement. PsyCap strengthens the internal capacity for self-regulation, while self-management strategies offer a practical pathway for translating psychological strengths into action. When combined, these frameworks appear to generate more substantial and sustainable health benefits than when used independently.

Physiologically, the intervention likely contributed to symptom improvement through several mechanisms. Encouraging regular physical activity may have enhanced joint stability, muscle strength, and proprioception — all of which are critical in reducing osteoarthritis-related pain.[27, 28] Furthermore, research suggests that psychological resilience can lower inflammatory markers and reduce pain perception, reinforcing the mind–body link in chronic disease management.[17]

Despite these positive outcomes, certain limitations must be acknowledged. The relatively small sample size may limit the generalizability of findings, and conducting the study within a single clinical setting may reduce its applicability to other healthcare contexts. Future studies should include larger and more diverse populations to validate these results and explore subgroup-specific responses.

Additionally, the 12-week follow-up period may not be sufficient to determine the long-term sustainability of the intervention. Further research should investigate the durability of outcomes over longer periods and examine whether digital tools, ongoing peer support, or booster sessions enhance adherence. Exploring the individual contribution of each PsyCap component — such as optimism or self-efficacy — in facilitating specific self-care behaviors could also inform the refinement of future interventions.

From an implementation perspective, adapting this integrated intervention for broader clinical and community use holds promise. It may be incorporated into preoperative care for patients awaiting knee replacement surgery or delivered through digital platforms that combine interactive self-care modules with remote psychological coaching. Blending face-to-face delivery with telehealth approaches may improve both accessibility and scalability. These strategies align with health system goals to support multimodal, patient-centered care and empower individuals to actively manage chronic conditions.

Conclusions

This study underscores the efficacy of integrating positive PsyCap and self-management model strategies in the comprehensive management of knee osteoarthritis. By addressing both the psychological and behavioral dimensions of patient care, the intervention resulted in significant improvements in pain reduction, mobility enhancement, and sustained self-care behaviors. These findings highlight the synergistic interaction between psychological resilience (encompassing self-efficacy, hope, optimism, and resilience) and structured self-management model techniques including goal setting, behavioral monitoring, and patient education. The intervention was developed to empower patients with the necessary psychological and behavioral tools to engage in sustained self-management model practices. The incorporation of positive PsyCap principles fostered motivation, persistence, and adaptive coping mechanisms, whereas the self-management model framework provided structured guidance for symptom regulation and functional maintenance. This dual-faceted approach facilitates both behavioral adherence and psychological adaptation, contributing to long-term self-efficacy and improved disease management outcomes. The adoption of a holistic model of care reflects the recognition that osteoarthritis management extends beyond pharmacological and surgical intervention. By integrating psychosocial and behavioral interventions, this study demonstrates the necessity of a patient-centered, multidimensional strategy that supports physical, psychological, and emotional well-being. The success of this intervention highlights the importance of multimodal approaches to chronic disease management, emphasizing the role of psychological resilience and structured self-care practices in promoting patient autonomy, functional independence, and overall quality of life.

Additional Information

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Ethics Approval: This study received ethical approval from 2 institutional review boards: the Ethics Committee of the Kuakarun Faculty of Nursing (No. KFN8/2023 on 17 August 2023), and the Vajira Hospital Institutional Review Board (No. 160/2023 on 13 September 2023). Prior to participation, all individuals provided written informed consent after receiving comprehensive information about the study objectives, procedures, potential risks, and anticipated benefits. The consent process emphasized the participants' rights to confidentiality and anonymity, and the research team ensured the protection of personal data throughout all phases of the study. Participants were also informed of their right to withdraw from the study at any time, without penalty. To uphold ethical standards, participants in the control group were notified that they would be offered the opportunity to receive the structured intervention program after the conclusion of the study, contingent upon the intervention's demonstrated effectiveness. This approach was intended to ensure fairness and equal access to the potential benefits of the program.

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Methodology: All authors
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Validation: All authors
Visualization: Jeerawan Pangsan
Writing – Original Draft: Jeerawan Pangsan
Writing – Review & Editing: Araya Chiangkhong

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