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Complementary therapies for chronic knee pain: A placebo-controlled RCT of Reiki and mindfulness

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ABSTRACT

Context: Knee osteoarthritis (KOA) is a prevalent chronic pain condition that significantly impairs quality of life and is often treated with interventions that carry risks or provide limited relief. Reiki, a non-invasive complementary therapy, has shown early promise for pain management but lacks rigorous evaluation among American adults with KOA.

Objectives: This study evaluated the specific efficacy of Reiki and mindfulness for adults with chronic KOA pain compared to sham and waitlist control conditions.

Methods: In this placebo-controlled randomized trial, 164 adults with physician-confirmed KOA were assigned to one of four groups: Reiki, sham Reiki (i.e., Feiki), mindfulness meditation, or a waitlist control. Active treatments were delivered in four weekly 30-minute sessions.

Results: KOA symptom severity, assessed using the WOMAC at baseline, 1-month, and 2-month follow-ups, significantly improved in both the Reiki ($p = .02$) and mindfulness ($p < .001$) groups compared to waitlist controls. Mindfulness significantly outperformed Feiki ($p = .004$). Reiki demonstrated effects comparable to mindfulness ($p = .22$). Clinically meaningful reductions in symptoms (>30 %) were reported by 55 % of participants in the Reiki and mindfulness groups, compared to 20 % in the Feiki group and 13 % in the waitlist group. High retention (96 %) and successful blinding support the feasibility and internal validity of this approach.

Conclusions: These findings indicate that both Reiki and mindfulness may offer effective, well-tolerated, and time-efficient alternatives for managing KOA-related pain, with meaningful symptom improvement after just two hours of intervention. Larger trials are warranted to confirm efficacy and explore long-term outcomes and underlying mechanisms.

1. Introduction

Knee osteoarthritis (KOA) is a degenerative joint disease marked by the progressive breakdown of articular cartilage that affects an estimated 14 million adults in the United States.[17,19] Common symptoms include knee pain, stiffness, swelling, and functional impairments that interfere with daily activities.[19,51] KOA not only undermines quality of life but also contributes to increased mortality and is commonly linked with comorbid conditions such as obesity, cardiovascular disease, and depression.[9,11,36,45,46,53,57] Given its widespread impact and the burden

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of related health complications, timely access to effective and safe treatments is essential for individuals living with KOA.

Treatment options for KOA range from conservative approaches to surgical interventions. First-line treatments typically include weight management, physical therapy, and nonsteroidal anti-inflammatory drugs (NSAIDs).[8,16,38,51] As pain worsens, opioids are commonly prescribed, despite their limited effectiveness and their well-documented risks, including addiction.[14,15] Total knee replacement is often recommended for advanced cases; however, approximately 20 % of patients continue to experience chronic post-surgical pain,[50,59] and up to 41 % are still using opioids three months after surgery.[44] Given these limitations, there is increasing demand for non-invasive, non-pharmacological alternatives to manage KOA pain.[51]

Complementary therapies, such as mindfulness and Reiki, have been investigated as non-pharmacological approaches to pain management. A substantial body of high-quality evidence demonstrates mindfulness-based interventions (MBIs) can decrease chronic pain.[32,47] Yet, while MBIs are efficacious,[32,47] they require sustained practice and cognitive engagement, commitments that may be difficult for individuals with demanding schedules or multiple responsibilities. Given the demands of mindfulness practice, therapies like Reiki, which do not require ongoing self-practice, may be more accessible, though their clinical efficacy remains uncertain.

Reiki is a complementary therapy that originated in Japan and is increasingly being offered in mainstream healthcare settings.[10,23,31,52] It involves a trained practitioner placing their hands lightly on or just above the recipient's body with the intention of activating the patient's "biofield energy" to restore "energetic balance" and support the body's natural healing processes.[33,43] Unlike mindfulness, which has a well-established evidence base, Reiki research remains preliminary. A small number of studies suggest that Reiki and similar Biofield (e.g., consciousness-based) Therapies may reduce symptoms associated with chronic pain conditions, including KOA,[40,55,61] but many Reiki studies are limited by methodological weaknesses,[5,39,40,48,55,58,61] and null findings have also been reported.[3,27,48] Moreover, no validated biological mechanisms for Reiki have been identified,[4,12,20,33,42,54] and concepts such as "biofield energy" remain controversial within the scientific community. In the absence of validated mechanisms, Reiki's effects may also be understood through psychosocial processes such as expectancy, relaxation, therapeutic ritual, and the patient-provider relationship.[13,34,37,49]

To advance the complementary therapy evidence base, we conducted a four-arm, placebo-controlled RCT to evaluate Reiki's effects on KOA symptom severity among American adults. Adults with physician-confirmed KOA were randomly assigned to one of four groups: Reiki, sham Reiki (Feiki; placebo control), mindfulness meditation (active control), or a waitlist control group, with outcomes assessed through a 2-month follow-up. Deception was used to ensure participants remained unaware of the Feiki condition – an essential methodological strategy to minimize expectancy effects and isolate Reiki's therapeutic impact from placebo responses. Mindfulness was chosen as the active comparator because, like Reiki, it is a non-invasive modality requiring no movement or physical manipulation, but unlike Reiki, it is supported by a robust evidence base for reducing chronic pain.[e.g., 32,47] At the same time, while both Reiki and mindfulness are considered complementary approaches, they are theoretically distinct: Reiki is a practitioner-delivered "biofield" therapy, whereas mindfulness is a self-regulation practice mediated by cognitive processes such as attention and awareness.[56] The comparison with mindfulness was therefore intended not to imply mechanistic equivalence, but to evaluate whether Reiki could produce clinical effects of similar magnitude to an established complementary therapy. Based on prior findings,[20,40,61] we hypothesized that Reiki would significantly reduce KOA symptoms compared to both Feiki and waitlist controls and would yield outcomes comparable to those of mindfulness.

2. Methods

2.1. Design, setting, and participants

This was a single-site, four-arm, placebo-controlled randomized clinical trial with blinded assessment (trial registry: NCT05541718). No modifications to trial design, eligibility criteria, or outcomes were made after the trial began. The local Institutional Review Board approved all procedures. Between 01/2023 and 06/2024, all participants were recruited from primary care and pain clinics in Salt Lake City, Utah, through medical provider referral, electronic health record review, opt-out letters, flyers, and social media advertisements. All participants provided written informed consent. During the consenting process, all study procedures were described except the placebo-control condition (i.e., Feiki). Participants were informed of only three conditions: Reiki, mindfulness, and waitlist. Deception was used to guard against significant threats to internal validity. The use of deception was carefully considered and implemented in accordance with ethical guidelines, ensuring that participants were fully debriefed about the true nature of the study after they completed all study procedures.

Eligible participants were English speaking adults (i.e., $\geq$18 years old) with physician-confirmed osteoarthritis in at least one knee and an average WOMAC pain score $\geq$ 2 at baseline. Exclusion criteria included: (1) previous experience with Reiki or formal mindfulness training (2) use of oral, systemic injectable or intra-articular steroids in the 3 months leading up to study screening; (2) use of intra-articular hyaluronate in the 3 months leading up to study screening; (3) knee arthroplasty in the previous year; (4) reported other causes of pain in lower limbs; (5) have cognitive impairment, as determined by clinical interview.

2.2. Blinding and randomization

A study coordinator uninvolved in outcome assessments or analysis randomized participants to one of four conditions (allocation ratio 1:1:1:1) via computerized random number generator: Reiki (experimental condition), Feiki (placebo control), mindfulness (active control), and a waitlist control condition. To ensure that participants remained blinded, we used strategies employed in previous Reiki studies involving a placebo control condition.[3,52] For example, appointments were scheduled at staggered times to reduce the likelihood of overlap in the waiting area or interactions between participants. Providers adhered to a standardized script to limit dialogue with participants and relied on pre-prepared responses for frequently asked questions.[3] Protocol adherence was evaluated through video recording of each treatment session.

Baseline assessments were conducted by research team members who were blinded to the randomization process, which remained concealed throughout the study. To preserve blinding, the randomization sequence was not accessible to either assessment staff or the principal investigator until the study's completion. Outcome assessor blinding was further ensured through the use of online, asynchronous self-report surveys, preventing any direct interaction between study personnel and participants.

2.3. Interventions

Participants in the three active study arms (i.e., Reiki, Feiki, mindfulness) each received individualized treatment sessions at a frequency of once per week, for a duration of 30 min, over four consecutive weeks at a university research center. Research staff were absent from the room during treatment.

2.3.1. Reiki (experimental condition)

The first Reiki session began with a brief, standardized introduction to Reiki, followed by 20 min of Reiki therapy. The session concluded with a 5-minute discussion between the Reiki provider and participant

about the participant's experience receiving Reiki. Sessions two through four followed a similar structure, including a brief welcoming conversation, 20–25 min of Reiki therapy, and 5–10 min of post-Reiki discussion. Only non-contact Reiki was used in this study, with practitioners held their hands approximately 6–12 in. above the participant's body.[24] Practitioners primarily stood during sessions but occasionally sat on a stool. Participants were seated in an adjustable ergonomic chair designed to maximize comfort and relaxation. A seated posture was necessary to ensure clean acquisition of psychophysiological data, including electroencephalography (EEG) and functional near-infrared spectroscopy (fNIRS). EEG and fNIRS findings will be reported in a separate publication.

During Reiki therapy, practitioners consciously maintained the intention to alleviate KOA symptoms by promoting energetic balance. Reiki practitioners moved their hands over specific areas of the participant's body (e.g., head, shoulders, abdomen, knees, and feet) holding each position for several minutes before proceeding to the next. The sequence and placement of hand positions were standardized across sessions but allowed for slight variation based on the participant's reported needs or areas where the practitioner perceived energy blockages. To ensure consistency across sessions, all practitioners were required to view a video of an exemplar Reiki session prior to delivering treatment and were encouraged to follow a standardized script for participant dialogue, with flexibility to accommodate individual participant needs when appropriate.

Reiki therapy was delivered by one of five trained practitioners. Eligibility criteria for practitioners included: at least five years of public Reiki practice; an active caseload averaging five or more sessions per week; comfort working in a laboratory environment; experience with and confidence performing non-contact Reiki; submission of valid training certificates; provision of three verifiable client testimonials; and prior experience working with individuals with KOA and/or chronic pain. In alignment with best practices from prior Biofield Therapy studies, Reiki practitioners met regularly throughout the study to review techniques, maintain treatment fidelity, and collaboratively address any protocol-related questions or challenges.[35]

2.3.2. Feiki (placebo control condition)

The structure of the Feiki sessions mirrored the structure of the Reiki sessions in terms of format and form. The Feiki sessions were scripted and Feiki providers were trained to mimic the gentle, intentional hand movements of the Reiki providers by watching the exemplar video used to encourage standardization among the real Reiki practitioners. Feiki providers were members of the research team with no knowledge of, or training in, Reiki. Consistent with validated protocols investigating similar Biofield Therapies,[3] Feiki practitioners did not set healing intentions and mentally distracted themselves to suppress any focus on biofield energy. To ensure that they were not inadvertently activating biofield energy, Feiki providers were trained to occupy their mind by counting backwards from 1000 by 7 s in their head while administering treatment.[1] In the event participant questions arose, Feiki practitioners gave basic responses informed by a standardized script that was developed in collaboration with the study's Reiki providers.

2.3.3. Mindfulness meditation (active control condition)

Participants randomized to the active control condition engaged in guided mindfulness practices, which are adapted from standardized mindfulness practice scripts used in the Mindfulness-Oriented Recovery Enhancement (MORE) treatment program.[26] During mindfulness meditation training, participants learned to focus attention on breath and body sensations while monitoring and accepting discursive thoughts, negative emotions, and pain. Each session included an introduction from the provider, a guided mindfulness activity, activity processing, and maintenance instructions. Mindfulness meditation treatment was provided by six Master's level interventionists who had been trained by the PI in the specific study protocol.

2.3.4. Waitlist control group

Participants randomized to the waitlist control condition did not receive Reiki, Feiki, or mindfulness training during their period of study involvement. They were instructed to continue their usual pain management routines but to refrain from initiating any new treatment programs during the study period. After completing all study procedures, waitlist control participants were offered the opportunity to receive mindfulness training.

2.4. Sample size determination

A priori power analysis indicated that a sample of 136 adults with chronic KOA pain would provide 90 % power (β=.90) to detect a significant Treatment (Reiki vs. Feiki vs. mindfulness vs. waitlist) × Time (baseline, 1-month, 2-month) interaction, assuming a small effect size (Cohen's F=0.30). To account for an anticipated 20 % attrition rate, the target sample size was increased to 164 participants (136 + 20 % oversampling).

2.5. Outcomes

Our prespecified primary outcome was osteoarthritis symptom severity, which was assessed at baseline, 1-month follow-up (i.e., post-treatment) and 2-month follow-up. Osteoarthritis symptom severity was measured with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).[7] The WOMAC is a well-validated measure that has been widely used in clinical trials involving adults with KOA.[2,21,25,41] The WOMAC consists of twenty-four items and has three susbcales: pain with 5 items, stiffness with 2 items, and physical function with 17 items. Each item is rated on a 5-point Likert scale, with higher scores indicating greater symptom severity.

2.6. Statistical analysis

All data analyses were conducted using SPSS 29.0. Baseline group equivalency was assessed using independent samples t-tests and chi-square tests. Primary (WOMAC Total Symptom Severity Score) and secondary outcomes (WOMAC subscales: physical function, pain, and stiffness) were evaluated using generalized linear mixed models (GLMM) within an intention-to-treat (ITT) framework. All randomized participants were included in the analyses, consistent with standard clinical trial procedures. Full maximum likelihood estimation was used to handle missing data, which allows for the inclusion of all available data under the assumption that data are missing at random. Each model included fixed effects for treatment condition (Reiki, Feiki, mindfulness, or waitlist), time (baseline, 1-month, 2-month), and their interaction (condition × time) in accordance with our prespecified statistical analysis plan (See Statistical Analysis Plan document associated with NCT05541718). Due to a reporting error, the Protocol section of the clinical trial registry omits the 2-month follow-up time point. Responder analysis was conducted using a chi-square test, with response defined as achieving a $\geq$ 30 %[22] reduction in WOMAC Total Symptom Severity Score from baseline to 2-month follow-up. All tests and confidence intervals were two-sided, with statistical significance defined as $p < .05$. No interim analyses or early stopping rules were used.

3. Results

A total of 774 individuals were assessed for eligibility, with 606 excluded due to not meeting inclusion criteria (n = 255), refusal to participate (n = 335), or other reasons (n = 16). The remaining 164 participants were randomized into one of four conditions: Waitlist Control (n = 41), Feiki (n = 41), Reiki (n = 41), or mindfulness (n = 41). 157 participants (95 %) completed the pre-assessment and 132 (80 %) began treatment (Fig. 1). Critically, participants assigned to the three active treatment conditions were not informed of their allocation until

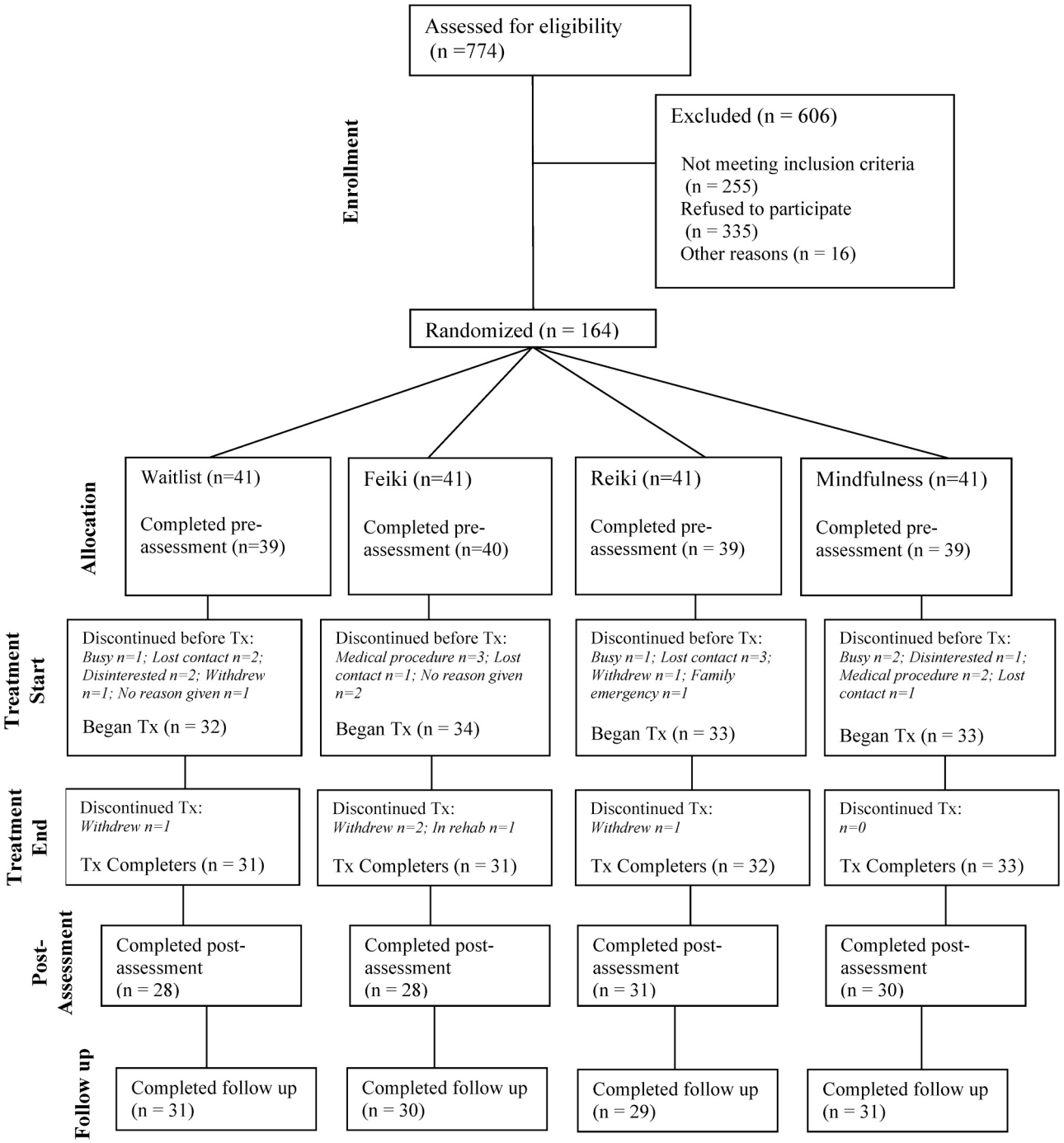

Fig. 1. CONSORT flow diagram of participant recruitment, allocation, and retention.

they arrived for their first session. As a result, most attrition in this trial took place before participants became aware of their assigned treatment. Of the 132 participants that began treatment, 127 (96 %) were treatment completers. All but three participants completed Feiki, all but one completed Reiki, and all participants completed mindfulness training. Of the participants that began treatment, 89 % completed their post-assessment and 92 % completed the 2-month follow-up assessment.

The average participant age was 58.1 years (*SD*=11.3). The sample was predominantly female (64.7 %), with gender distribution similar across conditions. Most participants identified as white (83.4 %) and were married (61.1 %). Educational attainment varied, with 27.4 % holding a bachelor's degree and 19.1 % a graduate degree. Household income ranged widely, with 26.0 % earning between $100,000 and $149,999, while 7.8 % earned less than $15,000. Overall, demographic characteristics were evenly distributed across conditions, with no statistically significant differences at baseline (Table 1).

A significant Condition × Time interaction was observed for osteoarthritis symptom severity across the 2-month follow-up period. The effect size was in the medium to large range (Cohen's F=0.28). Follow-up analyses revealed significant within- and between-condition differences over time (Table 2).

At the 1-month follow-up, the only significant between-group difference in osteoarthritis symptom severity was observed between the Mindfulness ($\bar{x}$=31.99, *95 % CI*=26.27 to 37.70) and WLC ($\bar{x}$=41.65, *95 % CI*=35.85 to 47.52) conditions (t=2.33, p=.020, Cohen's d=.53).

At the 2-month follow-up, participants in both the Reiki ($\bar{x}$=32.64,

Table 1
Baseline demographic and clinical characteristics of study participants by treatment group.

	Total	Waitlist	Feiki	Reiki	Mindfulness	Test Statistic	p-value
N	157	39	40	39	39		
Age, mean (SD)	58.08 (11.25)	58.08 (10.90)	58.15 (11.11)	57.59 (11.94)	58.49 (12.22)	F= 0.04	.99
Gender, no. (%)						X^2= 8.49	.49
Female	101 (64.7 %)	24 (61.5 %)	27 (67.5 %)	29 (74.4 %)	21 (55.3 %)		
Male	52 (33.3 %)	14 (35.9)	13 (32.5 %)	9 (23.1 %)	16 (42.1 %)		
Other	3 (1.9 %)	1 (2.6 %)	-	1 (2.6 %)	1 (2.6 %)		
Race/Ethnicity, no. (%)						X^2= 13.19	.78
American Indian	2 (1.3 %)	-	1 (2.5 %)	1 (2.5 %)	-		
Asian	5 (3.2 %)	1 (2.6 %)	2 (5.0 %)	1 (2.6 %)	1 (2.6 %)		
Black	1 (0.6 %)	1 (2.6 %)	-	-	-		
Hawaiian	1 (0.6 %)	-	1 (2.5 %)	-	-		
White	131 (83.4 %)	32 (82.1 %)	30 (75.0 %)	33 (84.6 %)	36 (92.3 %)		
Multiracial	4 (2.5 %)	1 (2.6 %)	2 (5.0 %)	-	1 (2.6 %)		
Latinx	13 (8.3 %)	4 (10.3 %)	4 (10.0 %)	4 (10.3 %)	1 (2.6 %)		
Marital Status, no. (%)						X^2= 5.22	.82
Single	22 (14.0 %)	5 (12.8 %)	5 (12.5 %)	7 (17.9)	5 (12.8 %)		
Married	96 (61.1 %)	24 (61.5 %)	26 (65.0 %)	26 (66.7 %)	20 (51.3 %)		
Divorced	33 (21.0 %)	8 (20.5 %)	8 (20.0 %)	5 (12.8 %)	12 (30.8)		
Widowed	6 (3.8 %)	2 (5.1 %)	1 (2.5 %)	1 (2.6 %)	2 (5.1 %)		
Education, no. (%)						X^2= 19.86	.18
Less than high school	6 (3.8 %)	3 (7.7 %)	1 (2.5 %)	1 (2.6 %)	1 (2.6 %)		
High school	40 (25.5 %)	6 (15.4 %)	9 (22.5 %)	14 (35.9 %)	11 (28.2 %)		
Trade school	15 (9.6 %)	5 (12.8 %)	3 (7.5 %)	3 (7.7 %)	4 (10.3 %)		
Associate's degree	23 (14.6 %)	4 (10.3 %)	9 (22.5 %)	4 (10.3 %)	6 (15.4 %)		
Bachelor's degree	43 (27.4 %)	16 (41.0 %)	13 (32.5 %)	5 (12.8 %)	9 (23.1 %)		
Graduate degree	30 (19.1 %)	5 (12.8 %)	5 (12.5 %)	12 (30.8 %)	8 (20.5 %)		
Household income, no. (%)						X^2= 17.94	.65
< $15,000	12 (7.8 %)	3 (7.7 %)	4 (10.5 %)	2 (5.3 %)	3 (7.7 %)		
$15,001 - $24,999	9 (5.8 %)	2 (5.1 %)	2 (5.3 %)	2 (5.3 %)	3 (7.7 %)		
$25,000 - $49,999	25 (16.2 %)	8 (20.5 %)	5 (13.2)	3 (7.9 %)	9 (23.1 %)		
$50,000 - $74,999	24 (15.6 %)	2 (5.1 %)	6 (15.8 %)	10 (26.3 %)	6 (15.4 %)		
$75,000 - $99,999	27 (17.5 %)	7 (17.9 %)	8 (21.1 %)	7 (18.4 %)	5 (12.8 %)		
$100,000 - $149,999	40 (26.0 %)	11 (28.2 %)	10 (26.3 %)	7 (18.4 %)	12 (30.8 %)		
$150,000 - $199,999	8 (5.2 %)	3 (7.7 %)	1 (2.6 %)	3 (7.9 %)	1 (2.6 %)		
> $200,000	9 (5.8 %)	3 (7.7 %)	2 (5.3 %)	4 (10.5 %)	-		
Prescription Pain Medication, no. (%)	62 (39.5 %)	19 (30.6 %)	13 (21.0 %)	12 (19.4 %)	18 (29.0 %)	X^2= 3.70	.30
Alcohol Use, no. (%)	69 (44.2 %)	19 (27.5 %)	20 (29.0 %)	14 (20.3 %)	16 (23.2 %)	X^2= 1.86	.60
Tobacco Use, no. (%)	15 (9.7 %)	5 (12.8 %)	5 (12.8 %)	0 (0.0 %)	5 (12.8 %)	X^2= 5.26	.15
Other Drug Use, no. (%)	21 (13.5 %)	5 (12.8 %)	6 (15.0 %)	3 (8.1 %)	7 (17.9 %)	X^2= 1.67	.64

Note. SD = standard deviation; F = one-way ANOVA test statistic; X^2 = Chi-squared test statistic.

Table 2
WOMAC total and subscale scores at baseline, 1-month (i.e., post-treatment), and 2-month follow-up by treatment condition.

Condition	Baseline	1 Month	2 Months	*F*	*p*	*ES*
Total Score				3.11	.006	0.28
Waitlist	48.18 (42.81–53.55)	41.65 (35.85–47.52)	42.07 (36.40–47.75)			
Feiki	49.70 (44.40–55.00)	35.83 (30.05–41.61)	39.45 (33.76–45.14)			
Reiki	47.74 (42.30–53.17)	36.27 (30.56–41.97)	32.64 (26.85–38.43)			
Mindfulness	44.46 (39.10–49.83)	31.99 (26.27–37.70)	27.62 (21.94–33.29)			
Physical Function				3.02	.007	0.28
Waitlist	33.74 (29.76–37.73)	28.68 (24.40–32.97)	29.15 (24.96–33.35)			
Feiki	35.15 (31.22–39.08)	25.15 (20.88–29.42)	28.19 (23.99–32.40)			
Reiki	33.76 (29.73–37.80)	25.08 (20.86–29.31)	23.00 (18.72–27.28)			
Mindfulness	30.85 (26.86–34.83)	22.18 (17.90–26.35)	18.91 (14.71–23.10)			
Pain				2.83	.011	0.26
Waitlist	9.54 (8.41–10.67)	8.74 (7.48–9.99)	8.61 (7.40–9.83)			
Feiki	9.83 (8.71–10.94)	7.05 (5.80–8.29)	7.71 (6.49–8.93)			
Reiki	9.34 (8.19–10.49)	7.35 (6.13–8.57)	6.49 (5.25–7.74)			
Mindfulness	9.21 (8.07–10.34)	6.51 (5.28–7.73)	5.70 (4.48–6.91)			
Stiffness				1.18	.32	0.17
Waitlist	4.90 (4.37–5.42)	4.21 (3.62–4.81)	4.26 (3.69–4.84)			
Feiki	4.73 (4.21–5.25)	3.55 (2.96–4.15)	3.52 (2.94–4.10)			
Reiki	4.63 (4.10–5.17)	3.83 (3.25–4.40)	3.16 (2.57–3.74)			
Mindfulness	4.41 (3.88–4.94)	3.32 (2.74–3.90)	2.98 (2.41–3.55)			

Note. Values provided are estimated marginal means with 95 % confidence intervals. WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; F = generalized linear mixed model test statistic; p = probability value associated with the test statistic; ES = Cohen's f effect size estimate.

95 % CI=26.85–38.43, $t = 2.29$, $p = .023$, Cohen's d=0.52) and Mindfulness ($\bar{x}$=27.62, *95 % CI*=21.94–33.29, $t = 3.54$, $p < .001$, d=.80) conditions reported significantly lower osteoarthritis symptom severity compared to those in the WLC condition ($\bar{x}$=42.07, *95 % CI*=36.40–47.75). Additionally, Mindfulness participants reported significantly less symptom severity than those in the Feiki condition

($\bar{x}$=39.45, *95 % CI*=33.76–45.14, $t = 2.90$, $p = .004$, d=.65. The difference between the Reiki and Feiki conditions approached statistical significance ($t = 1.65$, $p = .10$, d=.37), while symptom severity did not differ significantly between the Reiki and Mindfulness conditions ($t = 1.22$, $p = .22$, d=.28).

When examining trajectories of change, the Feiki condition exhibited a distinctive pattern. From baseline to post-treatment, Feiki participants showed symptom improvement, and their rate of change did not significantly differ from that of the Reiki ($t = 0.79$, $p = .43$) or Mindfulness ($t = 0.72$, $p = .48$) conditions. However, between post-treatment and the 2-month follow-up, symptoms in the Feiki condition worsened, whereas both the Reiki and Mindfulness conditions continued to show improvement. This divergence in trajectories was supported by significant differences in symptom slopes between the Feiki condition and both the Reiki ($t = 2.85$, $p = .005$) and Mindfulness ($t = 2.84$, $p = .005$) conditions during the follow-up period.

Examining changes in the WOMAC subscale scores revealed significant Condition x Time interactions for the physical function and pain subscales through the 2-month follow-up, but not for the stiffness subscale.

Although the difference in responder rates (i.e., ≥30 % in KOA symptom severity) across conditions did not reach statistical significance, $\chi^2 = 5.21$, $p = .157$, responder rates were notably higher in the Reiki (55 %) and mindfulness (55 %) conditions compared to the Feiki (33 %) and waitlist (36 %) conditions.

4. Discussion

Findings from this study provide the first evidence from a rigorous, placebo-controlled RCT that Reiki is acceptable to American adults with KOA and may be a useful treatment for managing KOA symptoms.

4.1. Feasibility and accessibility of Reiki

Our ability to successfully recruit 164 adults with chronic KOA pain within just 17 months from a single geographic location highlights the interest in complementary therapies among adults with KOA and the feasibility of conducting a large-scale Reiki RCT. Retention was excellent (96 %), consistent with prior studies of Reiki (91 %)[55] or related modalities studies (90 %)[61] for KOA, highlighting strong potential for future participant engagement. Critically, the observed equivalence in retention rates between the Reiki (97 %) and Feiki (91 %) conditions indicates similar treatment acceptability and credibility, which increases confidence that any observed differences are likely to due to Reiki itself. Additionally, Reiki was delivered by providers within the local community, supporting the accessibility and scalability of Reiki beyond specialized clinical settings. Together, these findings provide strong initial evidence that adults with KOA are interested in exploring Reiki as a part of their pain management protocols, that they find Reiki treatment acceptable and credible, and that qualified providers are likely to be readily available to deliver Reiki.

4.2. Differential impacts of treatment conditions on KOA symptoms

Study results indicate that both Reiki and mindfulness led to significant reductions in KOA symptom severity over the 2-month follow-up period. Specifically, participants in the Reiki and mindfulness conditions reported significantly less KOA symptom severity at the 2-month follow-up compared to those in the waitlist control condition, demonstrating the potential benefits of both complementary therapies in managing chronic KOA pain. Decreases in symptom severity did not significantly differ between Reiki and mindfulness, suggesting Reiki may produce outcomes comparable to an established complementary therapy, though likely via distinct mechanisms. Furthermore, mindfulness participants experienced significantly greater improvements than those in the Feiki condition, whereas the difference between Reiki and Feiki participants approached statistical significance ($p = .10$). This indicates that Reiki did not demonstrate a statistically significant effect beyond placebo at the 2-month follow-up. However, from post-treatment to the 2-month follow-up, symptom trajectories diverged significantly: symptoms worsened in the Feiki group but continued to improve in the Reiki group. Given these findings, Reiki's effects should be interpreted with caution, as improvements may reflect placebo responses or expectancy effects rather than specific therapeutic mechanisms. At the same time, the slope analysis indicates a pattern that could suggest influences beyond expectancy, underscoring the need for confirmation in a larger, mechanism-focused RCT. The fact that changes in KOA symptom severity in the Feiki condition did not significantly differ from the waitlist control condition supports its validity as a placebo comparator.

Of more direct clinical relevance, Reiki participants experienced a 32 % reduction in KOA symptom severity through 2-month follow-up, comparable to the 38 % reduction observed among mindfulness participants, 20 % reduction among Feiki participants, and 13 % reduction among waitlist participants. A greater than 30 % reduction in chronic pain is considered clinically meaningful.[22] So, on average, Reiki produced a clinically meaningful reduction in chronic pain in this study, with 55 % of Reiki participants meeting responder criteria. Additionally, the symptom improvements produced by Reiki in this study align with or exceed those reported in large RCTs using the WOMAC to evaluate the impact of other, more common treatments for KOA, such as exercise (% change in WOMAC total score = −10 %),[2] physical therapy (-21 %),[25] oxycodone (-28 %),[41] paracetamol (-28 %),[21] and ibuprofen (-34 %).[21]

Taken together, these results indicate that Reiki produced clinically meaningful, though statistically nonsignificant, benefits beyond placebo. While preliminary, such findings suggest Reiki may offer a non-pharmacologic alternative for KOA pain management with comparable effectiveness to conventional treatments but without the side effects often associated with long-term medication use. This possibility is particularly noteworthy given that conventional pharmacologic pain management strategies, such as over-the-counter and opioid analgesics, typically provide relief lasting only a few hours after each dose, whereas Reiki's effects persisted weeks beyond the end of the active treatment sessions in the present study. Nevertheless, confirmation through larger, mechanism-focused RCTs is essential before firm conclusions can be drawn.

4.3. Limitations and future directions

Despite study strengths, including its randomized controlled design and the use of deception to maintain internal validity, several limitations must be acknowledged. First, while Reiki significantly reduced knee osteoarthritis (KOA) symptom severity compared to the waitlist control, the relatively small sample size divided across four treatment arms limited the study's statistical power to detect differences between Reiki and Feiki. Future research should consider focusing on just two arms (Reiki vs. Feiki) and use the current effect sizes to determine a sufficient sample size for more definitive comparisons. Second, although retention and engagement rates were high, the sample was predominantly white and female, limiting generalizability. To address this, future studies should recruit more diverse participants across racial, ethnic, and gender groups to improve the representativeness of findings. Additionally, future research should more comprehensively describe participant characteristics, including details about pain medication usage and co-occurring physical or mental health conditions, to provide better context for treatment outcomes. Third, the study's two-month follow-up period restricts conclusions regarding Reiki's long-term effectiveness. To assess the durability of treatment effects, future trials should incorporate extended follow-up periods. Fourth, although no treatment-related adverse events were reported, broader adverse events were not systematically documented, potentially limiting insights into the safety profiles of Reiki, Feiki, and mindfulness. Future studies should implement structured adverse event monitoring and collect detailed

participant-reported outcomes over time. Fifth, treatments were delivered in a university-based research lab, which, despite aesthetic enhancements such as dim lighting, nature-themed decor, and a fountain, may not fully replicate real-world clinical environments. To improve ecological validity, future studies should evaluate Reiki in naturalistic clinical settings. Sixth, we did not measure blinding success. While no participants reported awareness of the placebo condition during debriefing, subtle differences between providers, such as nonverbal communication, could have influenced outcomes via expectancy effects. Future research should explicitly measure participant expectations and examine how provider characteristics influence therapeutic outcomes, ensuring a more thorough understanding of the mechanisms behind Reiki's effectiveness. Finally, future studies should investigate potential mediators of Reiki's effects, including established psychosocial factors such as expectancy, therapeutic ritual, and the patient-provider relationship,[20,40,61] as well as proposed energetic mechanisms [4,12,20,33,42,54] and less-studied experiential processes such as self-transcendent [18,28–30] or mystical-type [6,60] experiences. Assessing these psychosocial, biological and experiential pathways in future trials will help clarify whether Reiki's benefits arise primarily from contextual effects or reflect unique therapeutic mechanisms.

5. Conclusion

This RCT provides preliminary evidence that Reiki may reduce osteoarthritis symptom severity and could serve as an effective, non-invasive alternative to conventional pharmacologic treatments, which often carry risks of adverse effects. The feasibility of conducting large-scale Reiki trials, the availability of effective practitioners, and apparent favorable comparisons to conventional treatments support further investigation of Reiki's clinical applications. While additional research is needed to confirm efficacy and elucidate underlying mechanisms, study findings contribute to the growing literature on Reiki and other Biofield Therapies as possible means of chronic pain management.

CRediT authorship contribution statement

Garland Eric: Writing – review & editing, Methodology, Funding acquisition, Conceptualization. **Elizabeth Bridge:** Writing – review & editing, Investigation, Data curation. **Samantha Vaca-St. Claire:** Writing – review & editing, Investigation, Data curation. **Ruthie Schnitt:** Writing – review & editing, Investigation. **Jim Faulkner:** Writing – review & editing, Project administration, Investigation. **Kennedi Childs:** Writing – review & editing, Project administration, Investigation, Data curation. **Ayaka Lingard:** Writing – review & editing, Project administration, Investigation, Data curation. **Edwards Robert:** Writing – review & editing, Methodology, Conceptualization. **Yoshio Nakamura:** Writing – review & editing, Project administration. **Hanley Adam Wesley:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization.

Ethics approval

The University of Utah approved all study procedures (IRB_00153103). This study was prospectively registered on clinicaltrials.gov as NCT05541718.

Consent to participate

All participants provided informed consent prior to participation in the study, in accordance with institutional guidelines and the 1964 Declaration of Helsinki.

Consent for publication

Not applicable. This manuscript does not contain any identifiable information in any form.

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Declaration of Competing Interest

Dr. Garland reported serving as director of University of California, San Diego, Optimized Neuroscience-Enhanced Mindfulness Intervention Design (ONEMIND), which provides Mindfulness-Oriented Recovery Enhancement (MORE), mindfulness-based therapy, and cognitive behavioral therapy in the context of research trials for no cost to research participants; receiving honoraria and payment for delivering seminars, lectures, and teaching engagements related to training clinicians in MORE, including those sponsored by institutions of higher education, government agencies, academic teaching hospitals, and medical centers; receiving royalties from the sale of books related to MORE; and serving as a licensor to BehaVR. No other disclosures were reported.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ctim.2025.103278.

Data availability

Data will be made available to qualified individuals following a written request.

References

1. Aghabati N, Mohammadi E, Pour Esmaiel Z. The effect of therapeutic touch on pain and fatigue of cancer patients undergoing chemotherapy. *Evid Based Complement Altern Med*. 2010;7:375–381.
2. Allen KD, Woolson S, Hoenig HM, et al. Stepped exercise program for patients with knee osteoarthritis: a randomized controlled trial. *Ann Intern Med*. 2021;174:298–307.
3. Assefi N, Bogart A, Goldberg J, Buchwald D. Reiki for the treatment of fibromyalgia: a randomized controlled trial. *J Alter Complement Med*. 2008;14:1115–1122.
4. Baldwin AL, Rand WL, Schwartz GE. Practicing Reiki does not appear to routinely produce high-intensity electromagnetic fields from the heart or hands of Reiki practitioners. *J Alter Complement Med*. 2013;19:518–526.
5. Baldwin AL, Vitale A, Brownell E, Scicinski J, Kearns M, Rand W. The touchstone process: an ongoing critical evaluation of Reiki in the scientific literature. *Holist Nurs Pract*. 2010;24:260–276.
6. Barrett FS, Johnson MW, Griffiths RR. Validation of the revised Mystical Experience Questionnaire In experimental sessions with psilocybin. *J Psychopharmacol (Oxf)*. 2015;29:1182–1190.
7. Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. *J Rheumatol*. 1988;15:1833–1840.
8. Bhatia D, Bejarano T, Novo M. Current interventions in the management of knee osteoarthritis. *J Pharm Bioallied Sci*. 2013;5:30–38.
9. Birtwhistle R, Morkem R, Peat G, et al. Prevalence and management of osteoarthritis in primary care: an epidemiologic cohort study from the Canadian Primary Care Sentinel Surveillance Network. *Can Med Assoc Open Access J*. 2015;3:E270–E275.
10. Burden B, Herron-Marx S, Clifford C. The increasing use of reiki as a complementary therapy in specialist palliative care. *Int J Palliat Nurs*. 2005;11:248–253.
11. Cleveland RJ, Alvarez C, Schwartz TA, et al. The impact of painful knee osteoarthritis on mortality: a community-based cohort study with over 24 years of follow-up. *Osteoarthr Cartil*. 2019;27:593–602.
12. Cohen L, Delorme A, Cusimano A, et al. Examining the effects of biofield therapy through simultaneous assessment of electrophysiological and cellular outcomes. *Sci Rep*. 2024;14:1–15.
13. Colloca L, Barsky AJ. Placebo and nocebo effects. *N Engl J Med*. 2020;382:554–561.

14. da Costa BR, Nüesch E, Kasteler R, et al. Oral or transdermal opioids for osteoarthritis of the knee or hip. *Cochrane Database Syst Rev*. 2014.
15. da Costa BR, Pereira TV, Saadat P, et al. Effectiveness and safety of non-steroidal anti-inflammatory drugs and opioid treatment for knee and hip osteoarthritis: network meta-analysis. *Bmj*. 2021;375.
16. da Costa BR, Reichenbach S, Keller N, et al. Effectiveness of non-steroidal anti-inflammatory drugs for the treatment of pain in knee and hip osteoarthritis: a network meta-analysis. *Lancet*. 2017;390:e21–e33.
17. Cui A., Li H., Wang D., Zhong J., Chen Y., Lu H. Global, regional prevalence, incidence and risk factors of knee osteoarthritis in population-based studies. EClinicalMedicine 2020;29. Available: ⟨https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370⟩(20)30331-X/fulltext. Accessed 5 May 2025.
18. Dambrun M. When the dissolution of perceived body boundaries elicits happiness: The effect of selflessness induced by a body scan meditation. *Conscious Cogn*. 2016;46:89–98.
19. Deshpande BR, Katz JN, Solomon DH, et al. Number of persons with symptomatic knee osteoarthritis in the US: impact of race and ethnicity, age, sex, and obesity. *Arthritis Care Res*. 2016;68:1743–1750.
20. Doğan MD. The effect of reiki on pain: a meta-analysis. *Complement Ther Clin Pr*. 2018;31:384–387.
21. Doherty M, Hawkey C, Goulder M, et al. A randomised controlled trial of ibuprofen, paracetamol or a combination tablet of ibuprofen/paracetamol in community-derived people with knee pain. *Ann Rheum Dis*. 2011;70:1534–1541.
22. Dworkin RH, Turk DC, Farrar JT, et al. Core outcome measures for chronic pain clinical trials: IMMPACT recommendations. *Pain*. 2005;113:9–19.
23. Dyer NL, Baldwin AL, Rand WL. A large-scale effectiveness trial of Reiki for physical and psychological health. *J Alter Complement Med*. 2019;25:1156–1162.
24. FitzHenry F, Wells N, Slater V, Dietrich MS, Wisawatapnimit P, Chakravarthy AB. A randomized placebo-controlled pilot study of the impact of healing touch on fatigue in breast cancer patients undergoing radiation therapy. *Integr Cancer Ther*. 2014;13:105–113.
25. Fransen M, Crosbie J, Edmonds J. Physical therapy is effective for patients with osteoarthritis of the knee: a randomized controlled clinical trial. *J Rheuma*. 2001;28:156–164.
26. Garland EL. *Mindfulness-oriented recovery enhancement. An Evidence-Based Treatment for Chronic Pain and Opioid Use*. New York, NY: Guilford Press; 2024.
27. Gillespie EA, Gillespie BW, Stevens MJ. Painful diabetic neuropathy: impact of an alternative approach. *Diabetes Care*. 2007;30:999–1001.
28. Hanley AW, Bettmann JE, Baker AK. The self-extension dimensional assessment: an instrument development study. *Psychol Conscious Theory Res Pract*. 2023;10:313.
29. Hanley AW, Garland EL. Spatial frame of reference as a phenomenological feature of self-transcendence: measurement and manipulation through mindfulness meditation. *Psychol Conscious Theory Res Pract*. 2019.
30. Hanley AW, Nakamura Y, Garland EL. The Nondual Awareness Dimensional Assessment (NADA): new tools to assess nondual traits and states of consciousness occurring within and beyond the context of meditation. *Psychol Assess*. 2018;30:1625.
31. Herron-Marx S, Price-Knol F, Burden B, Hicks C. A systematic review of the use of Reiki in health care. *Alter Complement Ther*. 2008;14:37–42.
32. Hilton L, Hempel S, Ewing BA, et al. Mindfulness meditation for chronic pain: systematic review and meta-analysis. *Ann Behav Med*. 2017;51:199–213.
33. Jain S, Hammerschlag R, Mills P, et al. Clinical studies of biofield therapies: summary, methodological challenges, and recommendations. *Glob Adv Health Med*. 2015;4.
34. Jain S, Hammerschlag R, Mills P, et al. Clinical studies of biofield therapies: summary, methodological challenges, and recommendations. *Glob Adv Health Med*. 2015;4.
35. Jain S, McMahon GF, Hasen P, et al. Healing touch with guided imagery for PTSD in returning active duty military: a randomized controlled trial. *Mil Med*. 2012;177:1015–1021.
36. Kadam UT, Jordan K, Croft PR. Clinical comorbidity in patients with osteoarthritis: a case-control study of general practice consulters in England and Wales. *Ann Rheum Dis*. 2004;63:408–414.
37. Kaptchuk TJ, Miller FG. Placebo effects in medicine. *N Engl J Med*. 2015;373:8–9.
38. Katz JN, Arant KR, Loeser RF. Diagnosis and treatment of hip and knee osteoarthritis: a review. *Jama*. 2021;325:568–578.
39. Lee MS, Pittler MH, Ernst E. Effects of reiki in clinical practice: a systematic review of randomised clinical trials: effects of reiki in clinical practice. *Int J Clin Pract*. 2008;62:947–954.
40. Lu D-F, Hart LK, Lutgendorf SK, Perkhounkova Y. The effect of healing touch on the pain and mobility of persons with osteoarthritis: a feasibility study. *Geriatr Nur (Lond)*. 2013;34:314–322.
41. Markenson JA, Croft J, Zhang PG, Richards P. Treatment of persistent pain associated with osteoarthritis with controlled-release oxycodone tablets in a randomized controlled clinical trial. *Clin J Pain*. 2005;21:524–535.
42. Matos LC, Machado JP, Monteiro FJ, Greten HJ. Perspectives, measurability and effects of non-contact biofield-based practices: a narrative review of quantitative research. *Int J Environ Res Public Health*. 2021;18:6397.
43. McManus DE. Reiki is better than placebo and has broad potential as a complementary health therapy. *J EvidBased Complement Alter Med*. 2017;22:1051–1057.
44. Namba RS, Inacio MC, Pratt NL, Graves SE, Roughead EE, Paxton EW. Persistent opioid use following total knee arthroplasty: a signal for close surveillance. *J Arthroplast*. 2018;33:331–336.
45. Nielen MM, Van Sijl AM, Peters MJ, Verheij RA, Schellevis FG, Nurmohamed MT. Cardiovascular disease prevalence in patients with inflammatory arthritis, diabetes mellitus and osteoarthritis: a cross-sectional study in primary care. *BMC Musculoskelet Disord*. 2012;13:150.
46. Nüesch E, Dieppe P, Reichenbach S, Williams S, Iff S, Jüni P. All cause and disease specific mortality in patients with knee or hip osteoarthritis: population based cohort study. *Bmj*. 2011;342.
47. Parisi A, Roberts RL, Hanley AW, Garland EL. Mindfulness-oriented recovery enhancement for addictive behavior, psychiatric distress, and chronic pain: a multilevel meta-analysis of randomized controlled trials. *Mindfulness*. 2022;13:2396–2412.
48. Park J, McCaffrey R, Dunn D, Goodman R. Managing osteoarthritis: comparisons of chair yoga, Reiki, and education (pilot study). *Holist Nurs Pract*. 2011;25:316–326.
49. Rossettini G, Carlino E, Testa M. Clinical relevance of contextual factors as triggers of placebo and nocebo effects in musculoskeletal pain. *BMC Musculoskelet Disord*. 2018;19:27.
50. Shan L, Shan B, Suzuki A, Nouh F, Saxena A. Intermediate and long-term quality of life after total knee replacement: a systematic review and meta-analysis. *JBJS*. 2015;97:156–168.
51. Sharma L. Osteoarthritis of the knee. *N Engl J Med*. 2021;384:51–59.
52. Sprengel ML, Teo L, Allen S, et al. Biofield therapies clinical research landscape: a scoping review and interactive evidence map. *J Integr Complement Med*. 2025;31:406–430.
53. Stürmer T, Brenner H, Re Brenner K. Non-insulin dependent diabetes mellitus (NIDDM) and patterns of osteoarthritis: the Ulm osteoarthritis study. *Scand J Rheumatol*. 2001;30:169–171.
54. Trivedi MK, Branton A, Trivedi D, Mondal S, Jana S. The use of biofield energy therapy as complementary and alternative medicine in human health care system: a narrative review and potential mechanisms. *J Complement Integr Med*. 2024;21:451–460.
55. Unal N, Akpinar NB, Bek D, Yurtsever S. The effect of Reiki on pain, functional status, and holistic well-being in patients with knee osteoarthritis: a randomized controlled trial. *Orthop Nurs*. 2024;43:109–118.
56. Vago D.R., Silbersweig D.A. Self-awareness, self-regulation, and self-transcendence (S-ART): a framework for understanding the neurobiological mechanisms of mindfulness. Front Hum Neurosci 2012;6. Available: ⟨http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3480633/⟩. Accessed 7 Sept 2015.
57. Van Dijk GM, Veenhof C, Schellevis F, et al. Comorbidity, limitations in activities and pain in patients with osteoarthritis of the hip or knee. *BMC Musculoskelet Disord*. 2008;9:95.
58. vanderVaart S, Gijsen VMGJ, De Wildt SN, Koren G. A systematic review of the therapeutic effects of Reiki. *J Alter Complement Med*. 2009;15:1157–1169.
59. Wylde V, Bruce J, Beswick A, Elvers K, Gooberman-Hill R. Assessment of chronic postsurgical pain after knee replacement: a systematic review. *Arthritis Care Res*. 2013;65:1795–1803.
60. Yaden DB, Kaufman SB, Hyde E, et al. The development of the Awe Experience Scale (AWE-S): a multifactorial measure for a complex emotion. *J Posit Psychol*. 2019;14:474–488.
61. Zacaron KAM, Dos Santos CS, Corrêa CPS, et al. Effect of laying on of hands as a complementary therapy for pain and functioning in older women with knee osteoarthritis: a randomized controlled clinical trial. *Int J Rheum Dis*. 2021;24:36–48.