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Review

Efficacy of Biofield Therapies in Alleviating Pain and Reducing Symptoms Associated with Mental Disorders: A Systematic Review and Meta-Analysis

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Abstract

Biofield therapies (BTs) including Reiki, Therapeutic Touch (TT), Healing Touch (HT), and External Qigong Treatment (EQT) are non-pharmacological interventions proposed to modulate putative energy fields surrounding the human body. Despite growing clinical interest, the evidence base remains methodologically heterogeneous. This study aimed to provide a rigorous synthesis of randomized controlled trial (RCT) evidence on the efficacy of BTs for pain reduction and for the alleviation of symptoms associated with mental disorders (SAMD), including anxiety, depression, stress, and aggressiveness. A systematic review and meta-analysis were conducted following PRISMA 2020 guidelines (PROSPERO: CRD42024618260). RCTs published between 2003 and 2023 were identified in PubMed, Scopus, CINAHL, and Google Scholar. Effect sizes were calculated as Hedges' g under an inverse-variance weighting framework, and random-effects models were fitted using the REML estimator (metafor, R v4.3.2). A three-level multilevel model was applied to the SAMD group to account for nested outcomes. Influence diagnostics and pre-specified sensitivity models were used to address statistically influential observations. Publication bias was assessed via funnel plots, Egger's test, and trim-and-fill. Risk of bias was evaluated with the Cochrane RoB 2 tool. Twenty-eight RCTs were included (Pain: k = 14, N = 918; SAMD: k = 22, N = 1,581). Risk of bias was low in 10.7% of trials, of some concern in 64.3%, and high in 25.0%. For the Pain group, the primary model yielded g = 0.72 (95% CI: 0.27-1.16; I^2 = 88.2%); the sensitivity model, excluding two influential studies, yielded g = 0.27 (95% CI: 0.10-0.44; I^2 = 9.8%). For the SAMD group, primary and sensitivity estimates were g = 0.66 (95% CI: 0.37-0.94; I^2 = 82.6%) and g = 0.42 (95% CI: 0.26-0.57; I^2 = 34.1%), respectively. Subgroup analyses revealed consistent small-to-moderate effects for anxiety (g = 0.32; I^2 = 13.4%) and depression (g = 0.39; I^2 = 0.0%), whereas stress showed a larger but less stable estimate (g = 0.68; I^2 = 73.1%). Session duration was the only moderator with a negative trend, though with limited explanatory power (pseudo-R^2 < 12%). Funnel plot asymmetry in sensitivity models suggested small-study effects, with trim-and-fill estimates of g = 0.16 (Pain) and g = 0.27 (SAMD). Biofield therapies are associated with statistically significant but small effects on pain (g = 0.27) and SAMD (g = 0.42) in methodologically robust models. Evidence is most consistent for anxiety and depression. The findings support BTs as potential complementary adjuncts in integrative care, though clinical impact is modest and context-dependent. Future trials should prioritize adequate sample sizes, active or sham controls, standardized outcomes, and pre-registered protocols.

Keywords
Biofield therapies; chronic pain; anxiety; depression; complementary medicine

1. Introduction

In recent years, the rates of musculoskeletal disorders that generate pain symptoms, such as osteoarthritis of the hip and knee, rheumatoid arthritis, and back and neck pain, have increased globally [1]. Pain symptoms are also observed in cancer patients, despite a reduction in prevalence in recent decades, pain is still common in 44.5% of patients at some stage of treatment [2, 3]. While there is growing concern about deaths attributed to cancer [4], another equally important problem is the increase in the global prevalence of mental disorders, such as anxiety, stress, and depression. Data from the Global Burden of Disease Study show that, between 1990 and 2021, cases of anxiety increased globally by 86%, while those of depression rose from 176 million to 332 million, representing an increase of 88% over the same period. In addition, musculoskeletal disorders, often associated with chronic pain, showed a significant increase of 95% [5]. It is estimated that 71% of the global burden of anxiety disorders could be avoided, for example, if there were adequate access to effective treatments [5].

Although conventional medicine offers effective treatments, many patients seek complementary therapies to alleviate symptoms, especially when allopathic and invasive interventions do not produce the expected results [6]. A cautious yet relevant consensus on the effects of Complementary Alternative Medicine (CAM) emerges from the positions of the National Center for Complementary and Integrative Health (NCCIH), in which it considers these approaches promising, but reinforces the need for rigorous research to validate mechanisms and efficacy [7]. In agreement, the World Health Organization (WHO) recognizes that Traditional Complementary and Integrative Medicine should be incorporated with scientific evidence and global standardization [8].

Within the context of integrative and complementary approaches, energy-based medicine emerges as a field deserving recognition from health agencies and organizations. The National Cancer Institute (NCI) and its Division of Cancer Diagnostic and Treatment (DCTD) recognize the term energy therapies (or energy healing) [9]. Pre-clinical research conducted by the Department of Palliative, Rehabilitation and Integrative Medicine at the MD Anderson Cancer Center, University of Texas, investigates the effects of biofield therapies (BTs) [10, 11], accepted as non-physically invasive and non-instrumental interventions, in which a practitioner works explicitly and intentionally, locally or remotely, with the biofield of another living system (e.g., person, plant, animal, cell), understood as interacting fields of energy, consciousness and/or information that surround and permeate living beings, to facilitate a healing response, namely BTs such as Reiki, Therapeutic Touch, External Qigong, Healing Touch, Pranic Healing, Johrei and others [12]. It was mentioned that according to the Association of Reiki Practitioners, 60% of the top 25 hospitals (according to the U.S. News and World Report ranking) had formal or informal Reiki programs available for their patients and/or staff [13].

Thus, this work focused on reviewing and analyzing the most relevant scientific evidence on BTs, with an emphasis on the attenuation of pain and symptoms associated with mental disorders. In addition, we sought to evaluate and compare the effectiveness of interventions with and without touch in different types of pain (chronic and acute), providing a robust basis to guide future clinical practices and research in the field of Traditional Integrative and Complementary Medicine.

2. Methods

2.1 Protocol and Registration

The protocol for this systematic review and meta-analysis was prospectively registered in the PROSPERO International Prospective Register of Systematic Reviews (CRD42024618260). Reporting follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement [14].

2.2 Eligibility Criteria and Information Sources

We included randomized controlled trials (RCTs) published in English between 2003 and 2023 that evaluated the efficacy of BTs, specifically Reiki, Therapeutic Touch (TT), Healing Touch (HT), and External Qigong Treatment (EQT), on pain or on symptoms associated with mental disorders (SAMD), encompassing anxiety, depression, stress, and aggressiveness. Observational studies, non-randomized designs, case series, reviews, and meta-analyses were excluded to minimize data duplication and bias.

2.3 Search Strategy and Selection Process

Electronic searches were conducted in PubMed (January 2003 to December 2024), Scopus (January 2003 to December 2024), and CINAHL via EBSCOhost (January 2003 to December 2024) using Boolean combinations of intervention terms “Reiki”, “Therapeutic Touch”, “Healing Touch”, “External Qigong”, “Biofield therapy”, “Energy healing”, and “Energy therapy”, crossed with outcome-specific term blocks covering pain, anxiety, depression, stress, aggressiveness, and cancer. In PubMed, additional filters were applied for human participants, English language, and publication type (Randomized Controlled Trial; Clinical Trial); for Scopus and CINAHL, no database-level study design filter was available, and RCT status was verified manually during title/abstract and full-text screening. A complementary manual search in Google Scholar targeted grey literature and studies not indexed in the primary databases. Complete search strings for each database and outcome are provided in Supplementary Material S1. After deduplication, 312 unique records were screened by title and abstract. Thirty-four full-text articles were assessed for eligibility; 28 RCTs met the inclusion criteria and were retained for analysis. The study selection process is illustrated in Figure 1.

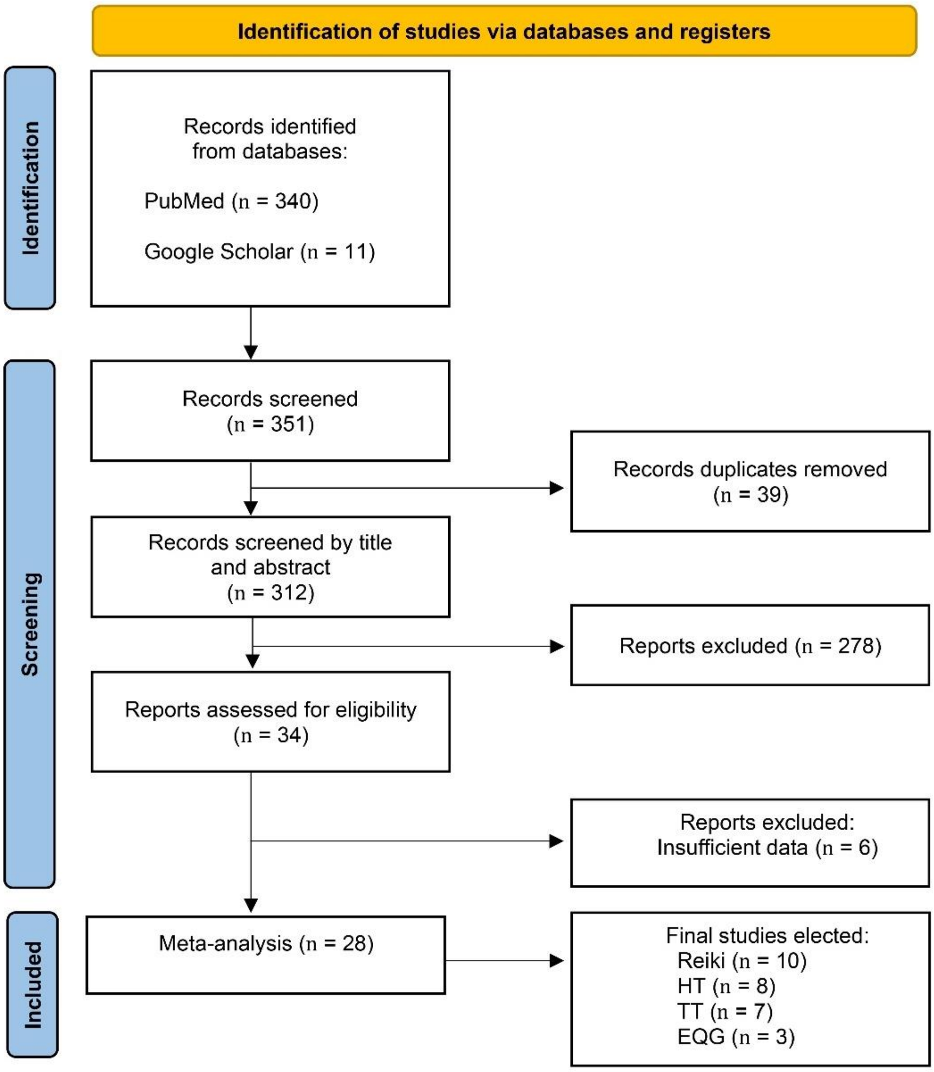

Figure 1 PRISMA 2020 flow diagram detailing the process of identification, screening, eligibility assessment, and inclusion of studies in the systematic review. HT, Healing Touch; TT, Therapeutic Touch; EQT, External Qigong Treatment.

Six full-text reports were excluded after eligibility assessment for the following reasons: one study used a non-randomized quasi-experimental design without a formal allocation procedure meeting the RCT inclusion criterion; four studies did not report sufficient quantitative data to permit effect size calculation, as means, standard deviations, or both were absent or incomplete and could not be recovered from supplementary materials or by contacting the corresponding authors; and one study was excluded because participants were informal caregivers of patients with cancer rather than patients receiving biofield therapy directly, not meeting the population inclusion criterion. Detailed references and specific reasons for exclusion of each full-text report are provided in Supplementary Table S2.

2.4 Data Extraction

Two independent reviewers screened records and extracted data using a prespecified spreadsheet that captured sample characteristics, intervention protocol details (modality, number and duration of sessions, frequency, total weeks), outcome measures, and summary statistics (means, standard deviations, and sample sizes per group). Disagreements were resolved by consensus or adjudication by a third reviewer. When standard deviations were not reported, they were estimated from confidence intervals using the formula:

$$SE = (CI_{upper} - CI_{lower})/(2 \times z_{\alpha/2})$$

where $z_{\alpha/2}$ = 1.96 for a 95% confidence interval, and SD was subsequently derived as.

The 28 RCTs were allocated to two analytic groups: Pain (k = 14) and SAMD (k = 22). Six studies contributed data to both groups; two SAMD studies provided separate effect sizes for anxiety and depression and were counted twice within the SAMD group.

2.5 Statistical Analysis

2.5.1 Effect Size Metric

All effect sizes were computed as Hedges' g (standardized mean difference with small-sample correction), the appropriate metric when constituent studies employ heterogeneous measurement instruments [15]. For each study, the standardized mean difference was calculated as:

$$d_i = (\overline{M}_{E,i} - \overline{M}_{C,i})/S_{p,i}$$

where $S_{p,i}$ is the pooled within-group standard deviation.

The bias-correction factor J_i was applied to obtain Hedges' $g_i = J_i \times d_i$. Variance was computed using study-specific standard errors under the inverse-variance weighting framework.

2.5.2 Random-Effects Models

Random-effects models were fitted using the Restricted Maximum Likelihood (REML) estimator, chosen because constituent studies differed systematically in populations, intervention modalities, session durations, frequencies, and outcome instruments. Between-study heterogeneity was characterized by τ^2, I^2, H^2, and Cochran's Q. Ninety-five percent prediction intervals (PI) were reported alongside confidence intervals to convey the expected range of effects in future comparable studies. All analyses were conducted in R (version 4.3.2) using the metafor package (version 3.8.1) [16].

2.5.3 Multilevel Model for the Samd Group

Because several SAMD studies contributed more than one effect size (e.g., anxiety and depression from the same trial), a three-level random-effects model was fitted using rma.mv to account for the non-independence of effect sizes nested within studies, with the random-effects structure specified as random = ~1|*study_id/symptom*. Both the conventional and multilevel models are reported to allow direct comparison.

2.5.4 Influence Diagnostics and Sensitivity Analyses

Influence diagnostics were conducted for both groups using Cook's distance, standardized residuals, and leave-one-out analyses. Studies with extreme standardized residuals and disproportionate leverage on the pooled estimate or on τ^2 were classified as statistically influential and were excluded from a pre-specified sensitivity model. Two further sensitivity analyses were performed: (i) substitution of study-specific standard errors with pooled standard errors to examine the effect of variance estimation on the pooled estimate; and (ii) a subgroup analysis by symptom type within the SAMD group.

2.5.5 Moderator Analysis

Univariate meta-regression models were fitted to investigate potential sources of heterogeneity. Candidate moderators were: BT modality (Reiki, TT, HT, EQT), intervention frequency (sessions per week), session duration (minutes), total number of sessions, and total duration (weeks). The contribution of each moderator to the reduction of τ^2 was quantified by pseudo-R^2. Given the limited number of primary studies per group, multivariate models were not fitted to avoid over-parameterization.

2.5.6 Publication Bias

Funnel plot asymmetry was assessed visually and formally using Egger's regression test. The trim-and-fill method was applied to estimate the potential impact of unpublished studies on the pooled estimate. Funnel plots were generated on the Hedges' g scale to ensure correct visual scaling. Given the limited number of studies and the high heterogeneity in the primary models, Egger's test results should be interpreted with appropriate caution.

2.6 Risk of Bias Assessment

Two reviewers (RS and PN) independently assessed risk of bias for all 28 included trials using the Cochrane Risk of Bias tool (RoB 2). Disagreements were resolved by consensus or by a third reviewer (RQ).

3. Results

3.1 Study Selection and Characteristics

The search identified 351 records. After deduplication, 312 unique records were screened; 34 full-text articles were retrieved, and 28 RCTs met eligibility criteria (Figure 1). The included trials evaluated four BT modalities: Reiki (n = 10), Healing Touch (n = 8), Therapeutic Touch (n = 7), and External Qigong (n = 3). The total sample comprised N = 2,013 participants, with n = 892 allocated to experimental groups.

Clinical populations encompassed cancer patients (7 trials; N = 447) [17-23], post-surgical or peri-operative patients (6 trials; N = 611) [24-29], patients with chronic pain conditions including fibromyalgia and osteoarthritis (4 trials; N = 281) [30-33], healthy adults (3 trials; N = 281) [34-36], and other specific populations including drug rehabilitation [37], chronic obstructive pulmonary disease [38], neurodegenerative conditions [39, 40], hematopoietic stem cell transplantation [41], HIV [42], sickle cell disease [43], and the elderly [44]. Within the SAMD group (22 trials; N = 1,581), nine trials evaluated anxiety (n_{exp} = 349) [18, 21, 25-27, 29, 38, 42, 44] seven evaluated depression (n_{exp} = 176) [22, 23, 27, 37, 39, 41, 44], five evaluated stress (n_{exp} = 144) [20, 34-36, 43], and one evaluated aggressiveness (n_{exp} = 17) [40]. Key study characteristics are summarized in Table 1.

Table 1 The main characteristics of the included studies.

Study ID	Sample Size		Sex Male/ Female		Age (M ± SD)		Biofield Therapy	Study Population	Treatment Methods		Description of Intervention Protocol	Results
	IG	CG	IG	CG	IG	CG			IG	CG		
Post-White [18]	56	45	7/ 49	6/ 39	NR	NR	HT	Cancer patients undergoing chemotherapy	Techniques used: centering, unruffling, magnetic unruffling, full-body connection, mind clearing, chelation, and lymphatic drainage. Swedish massage protocol lasting 45 minutes, 4 sessions per week, with relaxing music and a controlled environment.	Same environment and duration (45 minutes), with a professional present, but without therapeutic touch. Participants rested on the massage table.	Total period: 4 weeks. Experimental group (Therapeutic Massage and Healing Touch): 1 session of 45 minutes (on the day of treatment). Control group (Presence of caregiver): 1 session of 45 minutes (on the same day).	HT: Reduced fatigue, mood disturbance; MT: Reduced anxiety, pain, mood disturbance; Control: No significant change.
Olson [17]	11	13	2/ 9	9/ 4	NR	NR	Reiki	Patients with advanced cancer	Standard opioid management + Reiki.	Standard opioid management + Rest.	Total period: 1 week. Experimental group (Reiki): 2 sessions of 90 minutes (days 1 and 4). Control group (Rest): 2 sessions of 90 minutes (days 1 and 4).	Reiki improved pain control and quality of life on Days 1 and 4 compared to the control group. No significant reduction in opioid use was observed over the 7 days.

Frank [29]	42	40	0/ 42	0/ 40	51.5 ± 11.6	53.0 ± 10.5	TT	Women undergoing stereotactic core breast biopsy for nonpalpable breast lesions.	Therapeutic Touch (TT) (Krieger-Kunz method) Hand movements 2-6 inches from the body, without physical contact. Focus on "reorganizing the energy field".	Same hand movements, but without therapeutic intent. Practitioners mentally counted backward (without focusing on the patient).	Total period: 1 week. Experimental group (Therapeutic Touch): 1 session of 10 minutes (during the procedure). Control group (Sham TT): 1 session of 10 minutes (simulating TT).	There were no significant differences between the TT group and the control group regarding the reduction of pain, anxiety, or other psychological and physiological parameters.
Potter [27]	17	15	0/ 17	0/ 15	52.0 ± 8.86	51.0 ± 6.19	Reiki	Women undergoing breast biopsy.	Reiki (2 sessions, ~54 min each, pre- and post-biopsy, standardized hand positions).	Conventional care only.	Total period: 1 week. Experimental group (Reiki): 2 sessions of 45 minutes (1 session before and 1 session after the biopsy). Control group (Standard medical care): No additional sessions beyond usual care.	No significant difference in anxiety or depression between the Reiki and control groups. Anxiety levels decreased naturally over time.
Tsang [21]	16	16	3/ 13	3/ 13	59.0 ± 15.23	59.0 ± 15.23	Reiki	Cancer patients.	Reiki (7 sessions total, ~45 min each, Usui method, standardized hand positions).	Rest (5 sessions, ~45 min).	Total period: 1 week. Experimental group (Reiki): 5 sessions of 30 minutes (1 per day). Control group (Rest): 5 sessions of 30 minutes (1 per day).	Reiki significantly reduced fatigue ($p < 0.05$), improved quality of life ($p < 0.05$), and decreased pain and anxiety compared to the rest condition.

Assefi [32]	50 (25 Direct + 25 Distant)	50 (25 Direct + 25 Distant)	4/ 46	4/ 46	49 ± 13	47 ± 13	Reiki	Adults with fibromyalgia	Reiki (Direct or Distant) by Reiki Masters.	Sham Reiki (Direct or Distant) by Actors.	Total period: 8 weeks. Experimental group (Reiki with touch and distance): 16 sessions of 30 minutes (2 sessions per week). Control group (Sham Reiki with touch and distance): 16 sessions of 30 minutes (2 sessions per week).	Neither touch nor no-touch Reiki significantly improved pain, physical or mental function, or other secondary outcomes compared to control.
Chen [33]	57 (45 Healer 1 + 12 Healer 2)	49	17/ 40	13/ 36	62.9 ± 9.7	62.9 ± 9.2	EQT	Adults with knee osteoarthritis.	External Qigong Therapy (EQT) by two Qigong masters.	Sham Qigong by a trained simulator.	Total period: 3 weeks. Experimental group (External Qigong): 5-6 30-minute sessions. Control group (Sham Qigong): 5-6 30-minute sessions.	EQT significantly reduced pain and improved knee function compared to control, especially in patients treated by one of the healers. The effects persisted after 3 months.
Hawranik [40]	17	18	7/ 10	6/ 12	83.3 ± 8.32	80.9 ± 7.41	TT	Residents of a long-term care facility with Alzheimer's disease	Therapeutic Touch (TT) is performed by certified practitioners (nurses with advanced training in TT).	Usual care without additional intervention.	Total period: 5 days. Experimental group (Therapeutic Touch - TT): 5 sessions of 5-7 minutes (1 session per day). Control group (sham TT and usual care): 5 sessions of 5-7 minutes (1 session per day).	Significant reduction in physically nonaggressive behaviors in the TT group compared to simulated TT and usual care. No significant differences in aggressive or verbally agitated behaviors.

MacIntyre [26]	87	87	18/ 69	20/ 67	64	64	HT	Patients undergoing elective coronary artery bypass surgery.	Healing Touch (HT) by certified practitioners.	Standard care.	Total period: 1 week. Experimental group (Healing Touch - HT): 3 sessions of 20 to 60 minutes (1 before surgery, 1 immediately before, and 1 after surgery). Control group (Standard care): No additional sessions beyond standard medical care.	The HT group showed significant reductions in anxiety and shorter hospital stays compared to the control and visitor groups. No significant differences in pain medication use or incidence of atrial fibrillation.
McCormack [24]	30	30	11/ 19	14/ 16	72.27	71.67	Non-Contact TT	Elderly patients	Non-Contact Therapeutic Touch (NCTT) by a trained occupational therapy student.	Standard post-surgical care	Total period: 1 week. Experimental group (Non-Contact Therapeutic Touch - NCTT): 1 session of 10 minutes. Control group (Standard care): No additional sessions beyond standard medical care. Placebo group (Metronome sound): 1 session of 10 minutes.	The NCTT group showed a significant reduction in pain intensity ($p < 0.001$) compared to the placebo and control groups. Pain reduction was measured by the visual acuity scale (VAS).

Bowden [35]	18	17	3/ 15	3/ 14	23.5 ± 3.1	22.5 ± 3.9	Reiki	Female college students.	The treatment was administered by a Reiki Master, without physical contact, while participants performed self-hypnosis/relaxation exercises.	No Reiki + self-hypnosis/relaxation (Same procedure, without Reiki).	Total period: 2.5 to 12 weeks. Experimental group (Reiki): 10 sessions of 20 minutes. Control group (No Reiki): 10 sessions of 20 minutes with identical procedures, without sending Reiki.	The Reiki group showed significant improvements in stress and health symptoms, while the No-Reiki group showed significant increases in illness symptoms.
Lutgendorf [23]	21 (randomized) | 17 (completed)	34 (17 RT + 17 UC completed)	0/ 21	0/ 39	48.1 ± 16.0	~45.6 ± 11.8	HT	Patients with cervical cancer undergoing chemoradiation.	The procedure was performed during chemoradiation treatment.	CG (RT): Relaxation training (progressive relaxation, imagery), 4 sessions/week, ~20-25 min each. CG (UC): Usual care (no additional intervention).	Total period: 6 weeks. Experimental group (Healing Touch): 4 sessions per week, each session lasting 20 to 30 minutes. Control group 1 (Guided relaxation): 4 sessions per week, each session lasting 20 to 25 minutes. Control group 2 (Usual care): No additional sessions beyond standard care.	HT preserved natural killer cell activity (NKCC) during chemoradiation, with significant reductions in depressive mood compared to RT and UC. No effects on quality of life (QOL), treatment delay, or toxicities were observed.

Richeson [44]	12	8	8/ 14	8/ 0	63.8 ± 4.9	63.8 ± 4.9	Reiki	Community-dwelling older adults.	It included advanced Reiki techniques (Nentatsu-ho, Byssen Reikian-ho, Reiji-ho). The atmosphere featured soft music and low lighting.	Waitlist control - participants did not receive Reiki during the study, but were offered sessions after its completion.	Total period: 8 weeks. Experimental group (Reiki): 8 sessions of 45 minutes (1 per week). Control group (Waiting list): No active intervention during the 8 weeks, but with access to Reiki after the end of the study.	The Reiki group showed a significant reduction in pain, depression, and anxiety compared to the control group. There were no significant changes in heart rate or blood pressure.
Vincent [30]	26	24	7/ 19	6/ 18	56.5 years (median) | Range: 27-86 years	56.5 years (median) | Range: 27-86 years	EQT	Adults with chronic pain.	Sessions conducted by certified Qigong masters.	Equivalent Attention Time - conversation sessions with the researcher's full attention, of equal duration and frequency.	Total period: 8 weeks. Experimental group (External Qigong - EQT): 4 sessions of 30 minutes (1 per week, for 4 weeks). Control group (Equivalent Attention Span - EAT): 4 sessions of 30 minutes (1 per week, for 4 weeks).	EQT resulted in a significant reduction in pain intensity in weeks 2, 3, and 4 compared to EAT. Pain intensity differences persisted but were not statistically significant at 8-week follow-up.
Vandervaart [28]	40	40	0/ 40	0/ 40	35.1 ± 5.0	32.9 ± 6.0	Reiki	Adults with chronic pain.	Usual care + Distant Reiki (3 sessions, one per day).	Usual care only.	Total period: 3 days. Experimental group (Reiki at a distance): 3 sessions of 20 minutes (1 session per day). Control group (Standard medical care): No additional sessions beyond usual care.	Distant Reiki did not significantly reduce pain compared to the control group. There was a significant reduction in heart rate and systolic blood pressure in the Reiki group, but no effect on opioid use or recovery time.

Lu [31]	12	7	2/ 10	1/ 6	75.7 ± 9.2	82.4 ± 13.5	HT	Older adults.	Healing Touch (HT) sessions 3×/week for 6 weeks + Standard Care.	Weekly Friendly Visits (FV) for 6 weeks + Standard Care.	Total period: 6 weeks. Experimental group (Healing Touch - HT): 3 sessions per week, lasting 20 to 30 minutes each. Control group (Friendly Visits - FV): 1 weekly session of 20 minutes, focused on friendly conversations, without any therapeutic intervention.	HT significantly improved pain interference, pain intensity, joint stiffness, and joint function compared to FV. Improvements in joint extension and extensor lag were also significant, with sustained effects 3 weeks post-treatment.
Lu [39]	12	9	3/ 9	2/ 7	83.0 ± 8.54	85.22 ± 8.63	HT	Elderly	The intervention group received weekly Healing Touch sessions and performed the Body Talk Cortices technique daily, in addition to their usual care routine.	Usual Care only	Total period: 6 months. Experimental group (Healing Touch + Body Talk Cortices - HT + BTC): 1 weekly HT session lasting 30 minutes and daily BTC practice performed by patients or caregivers. Control group (Standard care): No additional intervention beyond the usual medical regimen.	Significant improvements in cognitive function, mood, and depression in the treatment group, while the control group showed typical cognitive decline.

Smelson [37]	51	50	49/ 2	48/ 2	36.0 ± 9.4	40.4 ± 11.9	EQT	Recently abstinent cocaine-dependent individuals in residential treatment.	A practitioner directs "qi" (bioenergy) toward the patient.	The physical movements of EQT were replicated, but without the intention or the energetic components of the actual practice.	Total period: 2 weeks. Experimental group (External Qigong - EQT): 4-6 sessions of 15 minutes (2-3 sessions per week). Control group (Sham Qigong): 4-6 sessions of 15 minutes (2-3 sessions per week). Control group (Attention Control with Music): 4 sessions of 30 minutes.	EQT marginally significantly reduced craving (p = 0.06) and depression symptoms (p < 0.05) compared to the sham group.
Thomas [43]	12	12	6/ 6	1/ 11	31.5 years (median) | Range: 22-44 years	31.4 years (median) | Range: 22-49 years	HT	Hospitalized adults with sickle cell disease experiencing vaso-occlusive pain episodes.	Healing Touch with Music (HTM), including Hand Scan, Chakra Connection, Ultrasound, and Pain Drain.	Attention control with music (ACM) - 30 minutes of music with the researcher present and performing a neutral task (e.g., crossword puzzle).	Total period: 1 week. Experimental group (Healing Touch with Music): 4 sessions of 30 minutes. Control group (Attention Control with Music): 4 sessions of 30 minutes.	Reductions in pain were greater in the HT group, with significant reductions in stress and pain on Day 1 (p < 0.01). No statistically significant difference in physiological measures between groups.

Wong [19]	6	3	NR	NR	8.83	7.33	HT	Pediatric cancer patients.	Sessions conducted by Level 1 HT practitioners (18 hours of training).	Reading or recreational activity appropriate to the age, with the presence of a volunteer (not a practitioner of HT).	Total period: 52 weeks. Experimental group (Healing Touch): 200 sessions of 30 minutes (1 session per day). Control group (Reading/Playful activity): 30 sessions of 30 minutes (1 session per day).	The HT group showed significant reductions in pain, stress, and fatigue compared to the reading/activity group.
Demir [20]	8	10	3/ 5	8/ 2	38.62 ± 19.50	28.70 ± 8.88	Reiki	Adults receiving cancer treatment.	Sessions conducted by a Usui Reiki practitioner (Level 2) located more than 8 km away.	Routine medical and nursing care, without additional intervention.	Total period: 1 week. Experimental group (Reiki at a distance): 5 sessions of 30 minutes (1 per night). Control group (Standard medical care): No additional sessions beyond usual care.	The Reiki group showed significant reductions in pain ($p < 0.0001$), stress ($p < 0.001$) and fatigue ($p < 0.001$) compared to the control group.
Midilli [25]	45	45	0/ 45	0/ 45	27.61 ± 4.77	27.61 ± 4.77	Reiki	Postpartum patients.	Sessions applied to 10 body regions for 3 minutes each by a certified practitioner.	Rest without treatment, under the same conditions of time and environment.	Total period: 2 days. Experimental group: 2 sessions of 30 minutes. Control group (Standard medical care): No additional sessions beyond usual care.	Reiki reduced pain intensity, anxiety levels, and respiratory rate, as well as the need for and number of painkillers. However, it did not affect blood pressure or pulse rate.

Bremner [42]	11	18	10/ 1	15/ 0	51.4 ± 8.3	47.9 ± 8.0	Reiki	Adults living with HIV.	Sessions are conducted by a Reiki Master, using traditional hand positions and meditative music.	Participants received a CD of meditative music, without Reiki intervention.	Total period: 10 weeks. Experimental group (Reiki with music): 6 sessions of 30 minutes (1 session per week). Control group (Music only): 6 sessions of 30 minutes (1 session per week).	The Reiki plus music group showed significant reductions in stress and pain compared to the music-only group. Anxiety was also reduced in the Reiki group, while physiological measures such as blood pressure and cortisol showed no significant differences.
Lu [41]	13	20	9/ 13	4/ 7	57.62 ± 7.67	57.25 ± 7.25	HT	Adult patients.	Daily sessions	Usual care (UC) - nutritional support, pain management, protective isolation, etc.	Total period: 3 weeks. Experimental group (Healing Touch - HT): Daily sessions of 20 to 24 minutes, during the hospitalization period after the transplant. Control group (Relaxation Therapy - RT): Daily sessions of approximately 20 minutes, guided by clinical psychology students.	HT and RT both improved emotional well-being. HT was better tolerated, and the HT group was discharged from the hospital on average 2 days earlier than the RT group.

Tabatabaee [22]	30	30	30 (Men only)	30 (Men only)	NR	NR	TT	Male cancer patients in remission.	Therapeutic Touch (TT)	Standard medical care (without additional intervention).	Total period: 4 weeks. Experimental group (Therapeutic Touch - TT): 7 sessions of 10 to 15 minutes (3-day interval between sessions). Control group (Standard care): No additional sessions beyond usual care. Placebo group (sham TT): 7 sessions of 10 to 15 minutes, imitating TT movements without therapeutic intent.	TT had a positive impact on pain parameters (general activity, mood, sleep) compared to placebo and control groups ($p < 0.001$).
Çalışkan [38]	50	50	44/ 6	45/ 5	<65: 30% 66-74: 46% ≥75: 24%	<65: 38% 66-74: 30% ≥75: 32%	TT	Patients in the chest clinic were diagnosed with COPD.	Therapeutic Touch (TT)	Standard medical care (without additional intervention).	Total period: 3 days. Experimental group (Reiki): 3 sessions of 10 minutes (on consecutive days). Control group (Standard nursing care).	The group was compared to the control group following the intervention, and the decrease in the levels of anxiety ($p < 0.001$) and increase in the sleep quality ($p < 0.001$) were found to be significant.

Doğru [34]	32	32	7/ 25	6/ 26	21.12 ± 1.62	22.50 ± 4.21	TT	Nursing and midwifery students.	Therapeutic Touch (TT)	No intervention (only filling out scales)	Total period: 8 days. Experimental group (Therapeutic Touch - TT): 2 sessions per week of 20 minutes (on alternate days). Control group (no intervention).	The TT group was compared to the STT and control groups after the intervention, and decreases in stress levels ($p < 0.001$), fatigue ($p < 0.001$), and daytime sleepiness ($p < 0.001$), and the increase in sleep quality ($p < 0.001$) were considered significant.
Rosamond [36]	75	75	10/ 140	10/ 140	22-29: 56% 30-39: 28% 40-49: 8% 50-59: 6% 60-62: 2%	22-29: 56% 30-39: 28% 40-49: 8% 50-59: 6% 60-62: 2%	HT	Acute care nurses in a tertiary hospital.	"Noel's Mind Clearing" technique.	Deep Breathing (DB) - Reading about stress management + deep breathing practice.	Total period: 3 months. Experimental group (Healing Touch - HT): Daily 4- to 7-minute sessions conducted by certified HT therapists during the nurses' work shift. Control group (Deep Breathing - DB): Daily 4- to 7-minute sessions of deep breathing and guided self-care.	The HT group showed a significant reduction in stress post-intervention and at follow-up ($p = 0.0002$ and $p = 0.0144$). Breathing also improved significantly in the HT group.

Notes: Characteristics of the 28 randomized controlled trials included in the systematic review and meta-analysis, organized by outcome group (Pain and SAMD) and biofield therapy modality. For each study, the following information is reported: first author and year of publication (with reference number); sample size per group; sex distribution; mean age; biofield therapy modality; clinical population and setting; intervention and control treatment methods; description of the intervention protocol (total duration, number and length of sessions per group); and primary results. BT, biofield therapy; EQT, External Qigong Treatment; HT, Healing Touch; Reiki, Usui System of Natural Healing; TT, Therapeutic Touch; NCTT, Non-Contact Therapeutic Touch; SAMD, symptoms associated with mental disorders; RCT, randomized controlled trial; IG, intervention group; CG, control group; M, mean; SD, standard deviation; NR, not reported; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency virus; VAS, Visual Analogue Scale; STAI, State-Trait Anxiety Inventory; CMAI, Cohen-Mansfield Agitation Inventory; NKCC, natural killer cell cytotoxicity; QOL, quality of life; HRV, heart rate variability; BTC, Body Talk Cortices; HTM, Healing Touch with Music; ACM, Attention Control with Music; EAT, Equivalent Attention Time; RT, relaxation training; UC, usual care; FV, Friendly Visits; DB, deep breathing; p, probability value from significance testing.

3.2 Risk of Bias

The majority of included trials, 64.3% (n = 18), were rated as having 'some concerns', 25.0% (n = 7) were classified as high risk, and 10.7% (n = 3) demonstrated low risk of overall bias (Figure 2). Domain 2 (deviations from intended interventions) was the most critical source of bias, with 79% of trials at high risk owing to the inherent inability to blind therapists and participants to BT allocation. Domain 4 (measurement of outcomes) was also problematic (61% high risk), reflecting the subjectivity of pain and psychological symptom assessment. Domain 1 (randomization process) was rated high risk in six of the seven overall high-risk trials. Domains 3 and 5 were predominantly low risk.

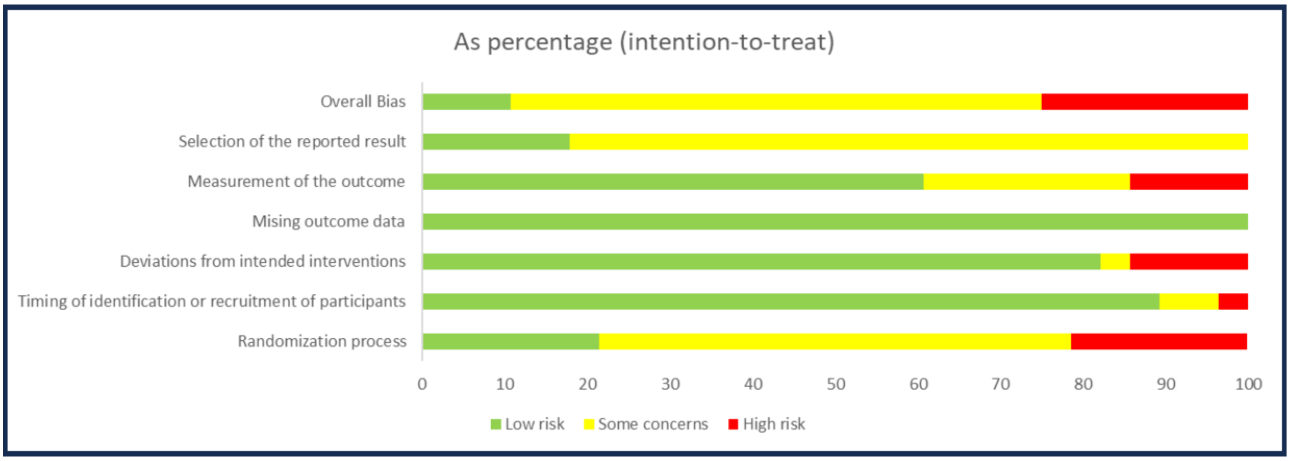

Figure 2 Detailed risk of bias assessment by methodological domain for the 28 included randomized controlled trials, using the Cochrane RoB 2 tool. Domain 2 (Deviations from intended interventions) was the primary source of bias (79% high risk), primarily due to the inability to blind therapists and participants and the inconsistent use of intention-to-treat analysis. Domain 4 (Measurement of the outcome) was also a significant source of bias (61% high risk). Green = Low risk; Yellow = Some concerns; Red = High risk.

3.3 Pain Group

The primary random-effects model, with outliers (k = 14; REML estimator), yielded a pooled Hedges' g = 0.72 (95% CI: 0.27 to 1.16; p = 0.002), indicating a statistically significant small-to-moderate effect of BTs on pain outcomes. Substantial heterogeneity was observed ($\tau^2 = 0.59$; $I^2 = 88.2\%$; Q = 94.7, p < 0.001). The 95% prediction interval (PI: -0.85 to 2.28) crossed zero, indicating that in future comparable clinical contexts the direction of effect cannot be assumed to be consistently positive (Figure 3a).

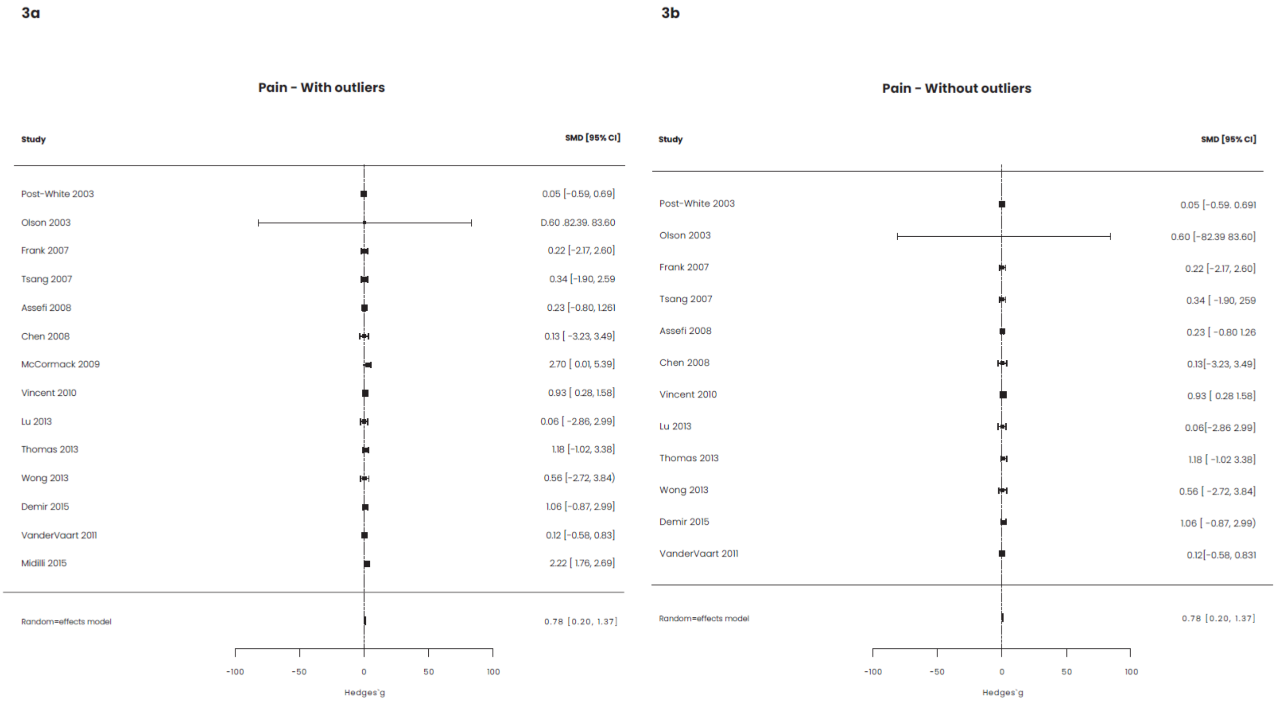

Figure 3 Forest plots for the Pain group. (a) Primary model (k = 14) including all studies, showing pooled Hedges' g = 0.72 (95% CI: 0.27-1.16) with substantial heterogeneity (I^2 = 88.2%). Note the extreme confidence interval of Olson et al. [17], identified as an influential observation. (b) Sensitivity model (k = 12) after exclusion of Olson et al. [17] and McCormack [24], showing pooled g = 0.27 (95% CI: 0.10-0.44) and markedly reduced heterogeneity (I^2 = 9.8%). CI, confidence interval; SMD, standardized mean difference.

3.3.1 Influence Diagnostics and Sensitivity Analysis

Cook's distance and standardized residual analyses identified two statistically influential studies. The first was Olson et al. [17], a trial of Reiki combined with opioid management in advanced cancer patients (n = 24) that yielded an extreme confidence interval (Hedges' g = 0.60; 95% CI: -82.39 to 83.60) attributable to a very small sample size and high within-group variance. The second was McCormack [24], a trial of non-contact Therapeutic Touch in elderly post-surgical patients whose standardized residual exceeded the ± 2.5 threshold. After excluding these two studies, the sensitivity model (k = 12) produced a pooled g = 0.27 (95% CI: 0.10 to 0.44; p = 0.002), representing a small and statistically significant effect. Critically, τ^2 fell from 0.59 to 0.008 (a 98.6% reduction), and I^2 decreased from 88.2% to 9.8%, indicating that heterogeneity in the primary model was almost entirely attributable to these two influential studies. The 95% PI in the sensitivity model (0.03 to 0.52) no longer crossed zero, providing more stable inference (Figure 3b). These results are summarized in Table 2.

Table 2 Summary of random-effects meta-analysis results for the Pain group. The sensitivity model excludes Olson et al. [17] and McCormack [24] as statistically influential observations.

Parameter	Primary model (k = 14)	Sensitivity model (k = 12)
Pooled Hedges' g	0.72	0.27
95% CI	[0.27; 1.16]	[0.10; 0.44]
95% PI	[-0.85; 2.28]	[0.03; 0.52]
p-value	0.002	0.002
τ^2	0.5885	0.0084
I^2	88.2%	9.8%
Egger's test (p)	0.542	0.018
Trim-and-fill (imputed studies)	0	4
Trim-and-fill adjusted g	0.72	0.16

CI, confidence interval; PI, prediction interval.

3.3.2 Publication Bias

The funnel plot for the primary Pain model with outliers (Figure 4a) showed noticeable rightward asymmetry, consistent with the presence of influential outliers whose large effect sizes distort the distribution around the pooled estimate. Egger's test was not significant in the primary model ($z = 0.62$; $p = 0.542$), indicating that the asymmetry visible in Figure 4a did not reach formal statistical significance, likely because the influential outliers suppressed its detection. After removal of the influential studies, significant asymmetry was detected in the sensitivity model ($z = 2.38$; $p = 0.018$), suggesting the presence of small-study effects previously masked by the outliers. The trim-and-fill method, applied to the sensitivity model, imputed four additional studies and reduced the adjusted estimate to g = 0.16 (95% CI: 0.04 to 0.28), as shown in Figure 4b. No studies were included in the primary model.

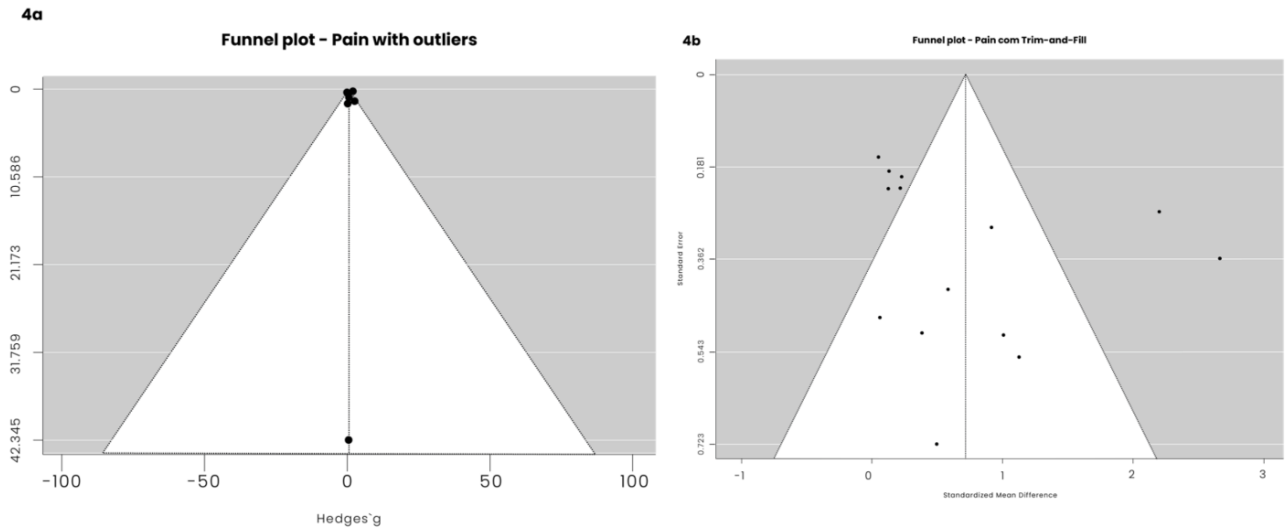

Figure 4 (a) Funnel plot for the Pain primary model (k = 14), including all studies. The dashed vertical line represents the pooled effect estimate (g = 0.72). Noticeable rightward asymmetry is observed, driven by influential outlying observations (Olson et al. [17], McCormack [24]) with extreme effect sizes. Egger's test was not significant in this model (z = 0.62; p = 0.542). SE, standard error; SMD, standardized mean difference. (b) Funnel plot for the Pain sensitivity model (k = 12) with trim-and-fill analysis. After exclusion of influential studies, significant asymmetry was detected (Egger's z = 2.38; p = 0.018), suggesting small-study effects previously masked by outliers. Four studies were imputed (open circles), reducing the adjusted estimate to g = 0.16 (95% CI: 0.04-0.28). SE, standard error; SMD, standardized mean difference.

3.3.3 Meta-Regression

Univariate meta-regression identified a negative association between session duration and effect size magnitude across both the primary (β = -0.03; p = 0.041) and sensitivity Pain models (β = -0.02; p = 0.068), suggesting that shorter sessions may be associated with larger reported effects (Figure 5, upper panels). Pseudo-R^2 for session duration was 11.4% (primary) and 8.9% (sensitivity), indicating limited explanatory power. Intervention modality, frequency, total sessions, and number of weeks did not significantly explain heterogeneity in either model.

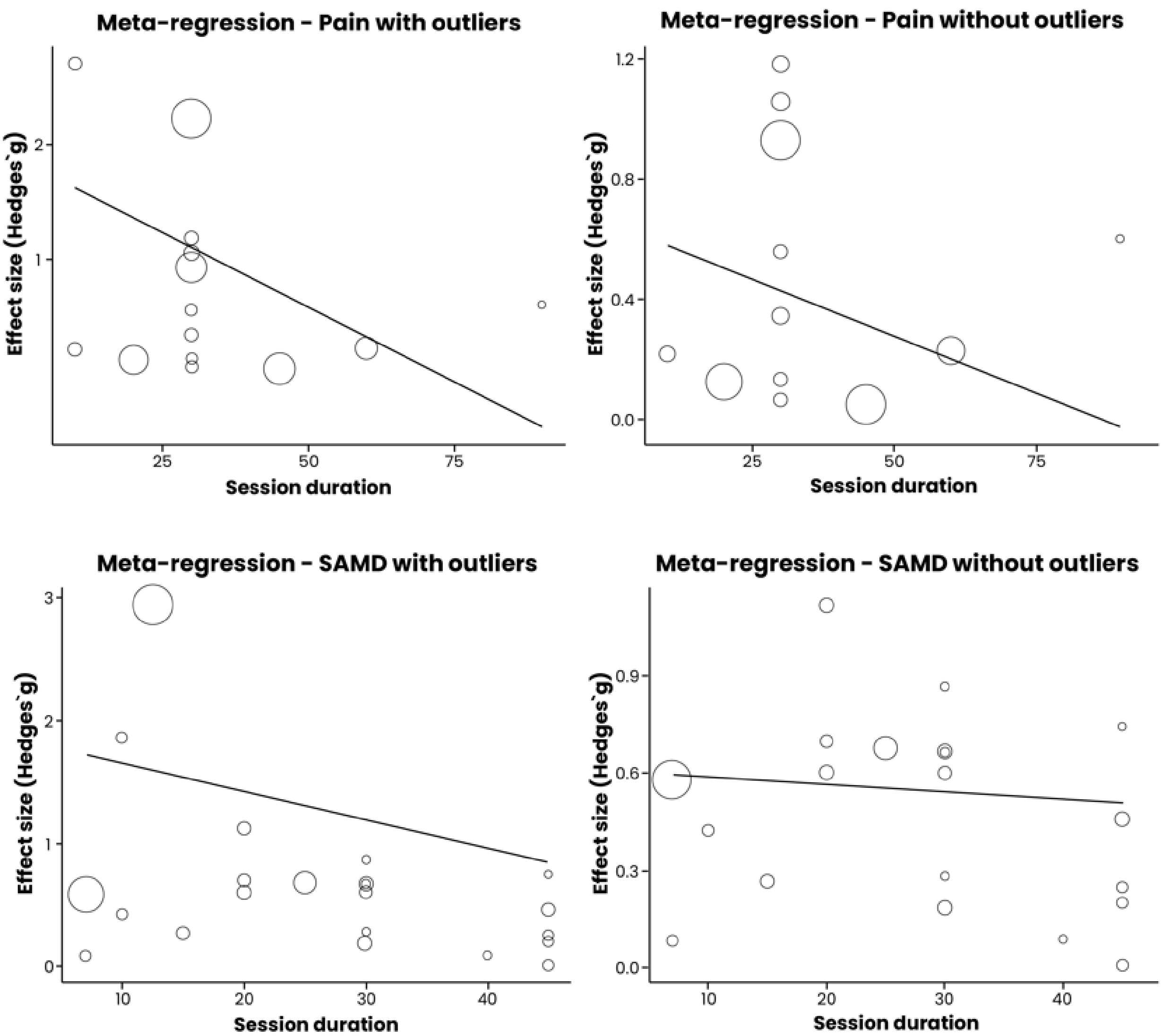

Figure 5 Univariate meta-regression scatter plots for session duration (minutes per session) as a moderator of effect size (Hedges' g), presented separately for the Pain group (upper panels) and SAMD group (lower panels), each with and without influential studies. Circle size is proportional to study weight. A consistent negative slope is observed in the Pain group, particularly in the primary model, suggesting that shorter sessions are associated with larger reported effect sizes. Associations in the SAMD group are attenuated and no longer significant after outlier removal.

3.4 SAMD Group

3.4.1 Primary Model (With Outliers)

The primary random-effects model for the SAMD group, with outliers (k = 22; REML estimator), yielded a pooled Hedges' g = 0.66 (95% CI: 0.37 to 0.94; p < 0.001), indicating a statistically significant small-to-moderate effect of BTs on SAMD outcomes. High heterogeneity was present (τ^2 = 0.35; I^2 = 82.6%; Q = 117.7, p < 0.001). The 95% PI (-0.54 to 1.86) crossed zero, underscoring that the effect magnitude and direction are not consistent across clinical contexts (Figure 6a).

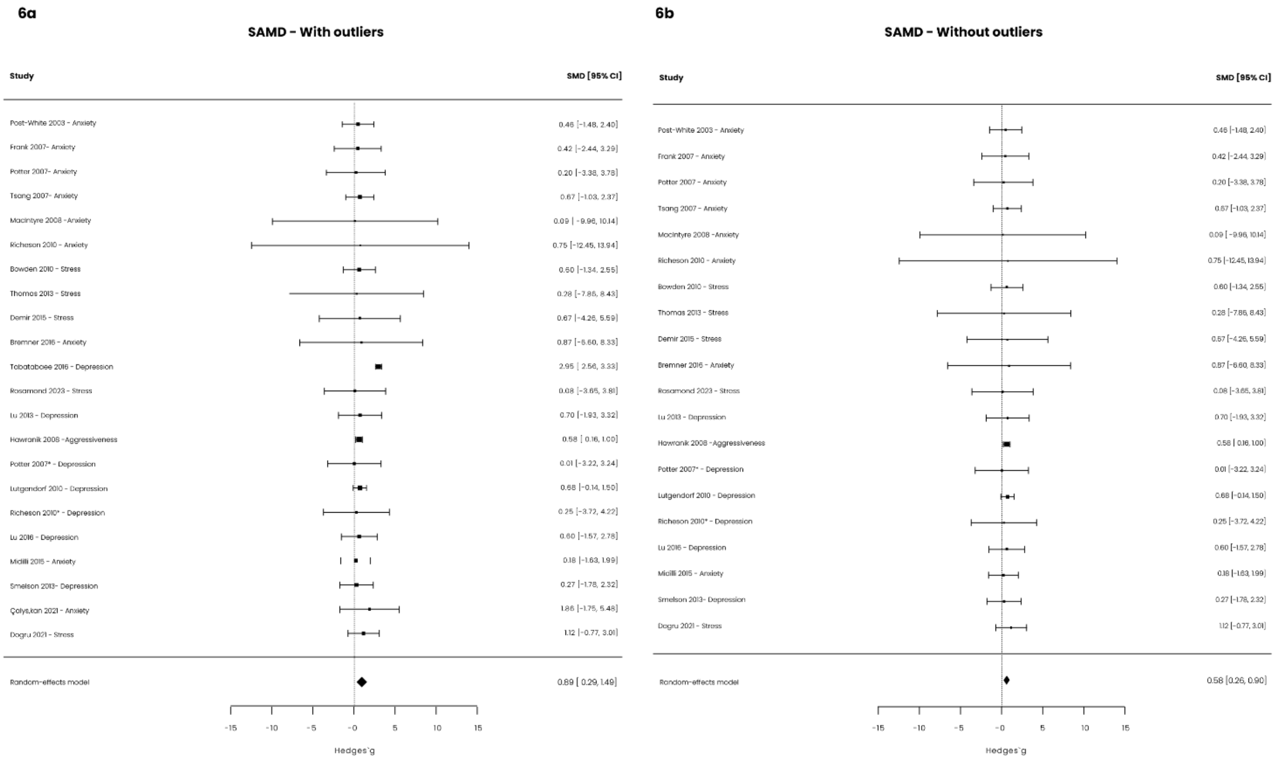

Figure 6 Forest plots for the SAMD group. (a) Primary model (k = 22) including all studies, showing pooled Hedges' g = 0.66 (95% CI: 0.37-0.94) with substantial heterogeneity (I^2 = 82.6%). Note the extreme effect size of Tabatabaee et al. [22] for depression, identified as an influential observation. (b) Sensitivity model (k = 20) after exclusion of Richeson et al. [44] and Tabatabaee et al. [22], showing pooled g = 0.42 (95% CI: 0.26-0.57) and reduced heterogeneity (I^2 = 34.1%). CI, confidence interval; SMD, standardized mean difference.

3.4.2 Multilevel Model

A three-level random-effects model was fitted to account for within-study dependence arising from multiple effect sizes per study. The multilevel model yielded an equivalent pooled estimate (g = 0.66; 95% CI: 0.37 to 0.94; $p < 0.001$), with between-study variance $\sigma^2 = 0.176$ and within-study variance $\sigma^2 = 0.176$. The near-equal partition of variance across levels confirms that symptom-level variability within studies is as substantial as between-study variability, reinforcing the need for symptom-specific subgroup reporting.

3.4.3 Influence Diagnostic and Sensitivity Analysis

Cook's distance and standardized residual analyses identified two influential studies. The first was Richeson et al. [44], a Reiki trial in community-dwelling older adults (n = 20) that reported large effect sizes for pain, depression, and anxiety from a very small sample (n = 12), producing standardized residuals >3.0. The second was Tabatabaee et al. [22], a Therapeutic Touch trial in male cancer patients whose reported effect size for depression (Hedges' g ≈ 2.95) was implausibly large relative to the remaining evidence base. After exclusion of these two observations, the sensitivity model (k = 20) yielded a pooled g = 0.42 (95% CI: 0.26 to 0.57; $p < 0.001$). τ^2 declined from

0.352 to 0.038 (89.2% reduction), and I^2 fell from 82.6% to 34.1%. The 95% PI in the sensitivity model (0.01 to 0.83) was marginally above zero (Figure 6b).

3.4.4 Subgroup Analyses by Symptom

Symptom-specific subgroup analyses were conducted within the sensitivity model (k = 20). Results are summarized in Table 3. Anxiety (k = 8; g = 0.32; 95% CI: 0.14 to 0.50; I^2 = 13.4%) and depression (k = 6; g = 0.39; 95% CI: 0.14 to 0.63; I^2 = 0.0%) demonstrated consistent small-to-moderate effects with low heterogeneity. Stress exhibited the largest point estimate (k = 5; g = 0.68; 95% CI: 0.13 to 1.24) but also the highest residual heterogeneity (I^2 = 73.1%; Q = 16.6, p = 0.002), suggesting that stress-specific trials remain methodologically and clinically diverse. Aggressiveness could not be formally modeled owing to the availability of only one trial (Hawranik et al., [40]; g = 0.57).

Table 3 Symptom-specific subgroup analyses within the SAMD sensitivity model (k = 20, after exclusion of Richeson et al. [44] and Tabatabaee et al. [22]).

Symptom	k	Hedges' g	95% CI	I^2 (%)	Prediction Interval
Anxiety	8	0.32	[0.14; 0.50]	13.4	[0.09; 0.55]
Depression	6	0.39	[0.14; 0.63]	0.0	[0.25; 0.52]
Stress	5	0.68	[0.13; 1.24]	73.1	[-0.29; 1.65]
Aggressiveness	1	0.57	[-0.11; 1.25]	n/a	n/a

CI = confidence interval; I^2 = percentage of variance attributable to heterogeneity.

3.4.5 Publication Bias

In the primary SAMD model (Figure 7a), Egger's test did not reach significance (z = 1.25; p = 0.213) and trim-and-fill imputed zero additional studies, suggesting that asymmetry was not formally detectable at this stage. The wide dispersion of points visible in Figure 7a, particularly the presence of studies with extreme effect sizes extending beyond ±10 on the standardized mean difference scale, is consistent with the influence of the two outlying observations identified in the sensitivity analysis rather than with genuine publication bias. After exclusion of the influential studies, Richeson et al. [44] and Tabatabaee et al. [22], significant asymmetry was detected in the sensitivity model (z = 2.60; p = 0.009) and trim-and-fill imputed seven additional studies (Table 4), reducing the adjusted estimate to g = 0.27 (95% CI: 0.13 to 0.41) (Figure 7b). This pattern indicates that the influential outliers had suppressed the detection of small-study effects in the primary model, and that publication bias cannot be excluded after methodological corrections.

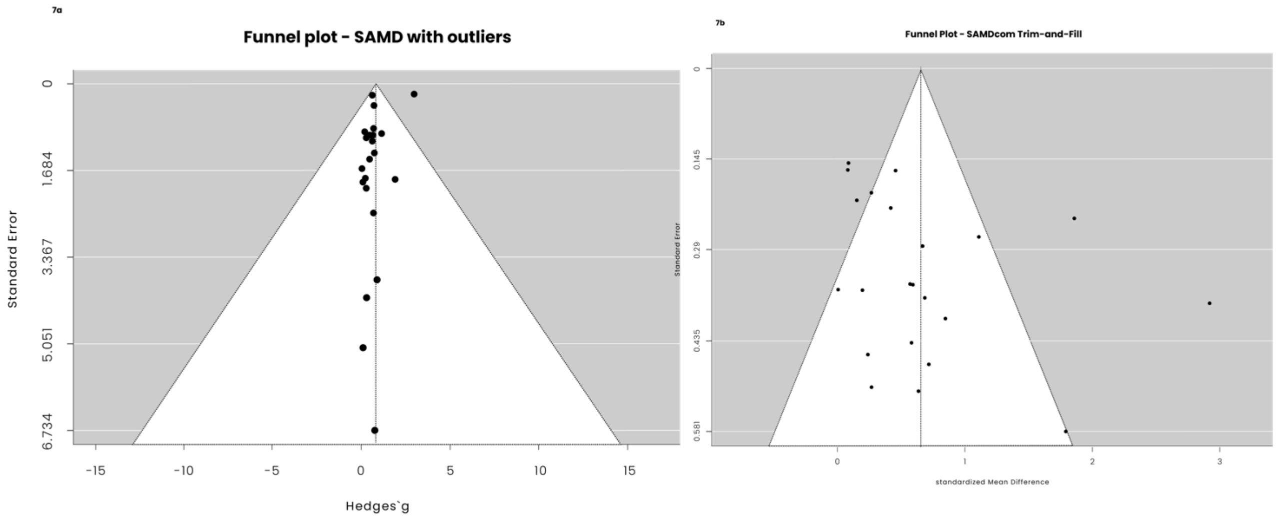

Figure 7 (a) Funnel plot for the SAMD primary model (k = 22). Wide rightward dispersion reflects the influence of outlying observations. Egger's test: z = 1.25; p = 0.213 (non-significant); no studies imputed by trim-and-fill. SE, standard error; SMD, standardized mean difference. (b) Funnel plot for the SAMD sensitivity model (k = 20) with trim-and-fill analysis. Seven studies were imputed (open circles); adjusted estimate g = 0.27 (95% CI: 0.13-0.41). SE, standard error; SMD, standardized mean difference.

Table 4 Summary of random-effects meta-analysis results for the SAMD group. Sensitivity model excludes Richeson et al. [44] and Tabatabaee et al. [22] as statistically influential observations.

Parameter	**Primary model (k = 22)**	**Sensitivity model (k = 20)**
Pooled Hedges' g	0.66	0.42
95% CI	[0.37; 0.94]	[0.26; 0.57]
95% PI	[-0.54; 1.86]	[0.01; 0.83]
p-value	<0.001	<0.001
τ^2	0.3520	0.0381
I^2	82.6%	34.1%
Egger's test (p)	0.213	0.009
Trim-and-fill (imputed studies)	0	7
Trim-and-fill adjusted g	0.66	0.27

CI, confidence interval; PI, prediction interval.

3.4.6 Meta-Regression

None of the protocol moderators (BT modality, frequency, total sessions, treatment weeks) achieved statistical significance in the SAMD meta-regression. Session duration showed a modest, non-significant negative trend ($\beta = -0.01$; $p = 0.19$; pseudo-$R^2 = 9.3\%$), consistent with the pattern observed in the Pain group (Figure 5, lower panels). The limited explanatory power of all moderators implies that unmeasured factors, such as therapist expertise, patient clinical profile, and delivery fidelity, are likely the primary drivers of between-study variability.

3.4.7 Touch-Based Versus Non-Touch Interventions

Descriptive analysis of the Pain group, based on the primary model including all studies, revealed that touch-based BT trials produced a higher mean effect size (Hedges' g = 0.83; SD = 0.78; CV = 0.94) than non-touch trials (g = 0.68; SD = 0.90; CV = 1.33). The Bar Plot (Figure 8) corroborates this pattern, and the standard errors between modalities were comparable (SE = 0.317 vs. 0.319), indicating that the observed difference in variability does not reflect differences in estimation precision.

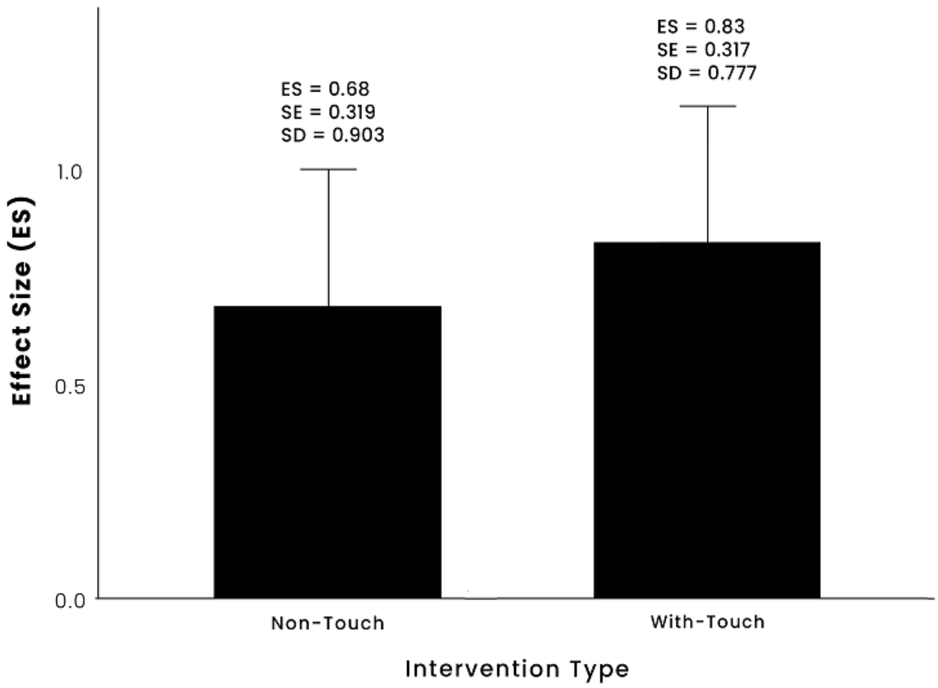

Figure 8 Bar plot illustrating mean effect size (Hedges' g) and standard deviation for non-touch (Intervention 1) and touch-based (Intervention 2) biofield therapy modalities in the Pain group. Touch-based interventions yielded a higher mean effect size (g = 0.83; SD = 0.777; SE = 0.317) compared with non-touch interventions (g = 0.68; SD = 0.903; SE = 0.319). Error bars represent ±1 SD.

However, this comparison must be interpreted with caution. The two statistically influential studies identified in the sensitivity analysis, Olson et al. [17], a touch-based Reiki trial, and McCormack [24], a non-contact TT trial, contributed disproportionately to the mean and variance estimates of the touch and non-touch subgroups, respectively. The apparent advantage of touch-based modalities in terms of both effect size magnitude and consistency (CV = 0.94 vs. 1.33) may therefore be partially attributable to the influence of these extreme observations rather than reflecting a genuine differential therapeutic effect of physical contact.

The Raincloud Plots (Figure 9) provide complementary distributional evidence. In the Pain group (Figure 9a), Intervention 1 (non-touch trials) showed a wider distribution of effect sizes ranging from 0 to approximately 2.7, with density concentrated around g = 1.0, and included both acute (purple) and chronic (yellow) pain studies. Notably, chronic pain trials were distributed across the full range of observed effect sizes, while acute pain trials tended to cluster at higher values, suggesting potentially greater responsiveness to non-touch biofield interventions. Intervention 2 (touch-based trials) yielded a more compact distribution, predominantly reflecting chronic pain outcomes, with effect sizes concentrated between 0 and 1.0. These distributional patterns suggest that non-touch interventions may be associated with larger and more variable effects in acute pain contexts, whereas touch-based interventions appear to produce more consistent, moderate effects regardless of pain type. In the SAMD group (Figure 9b), touch-based trials showed lower and more homogeneous effect sizes, while non-touch interventions targeting anxiety and depression contributed disproportionately to overall variability. Stress and aggressiveness trials showed sparse density with limited dispersion, reflecting the small number of available studies in those subgroups.

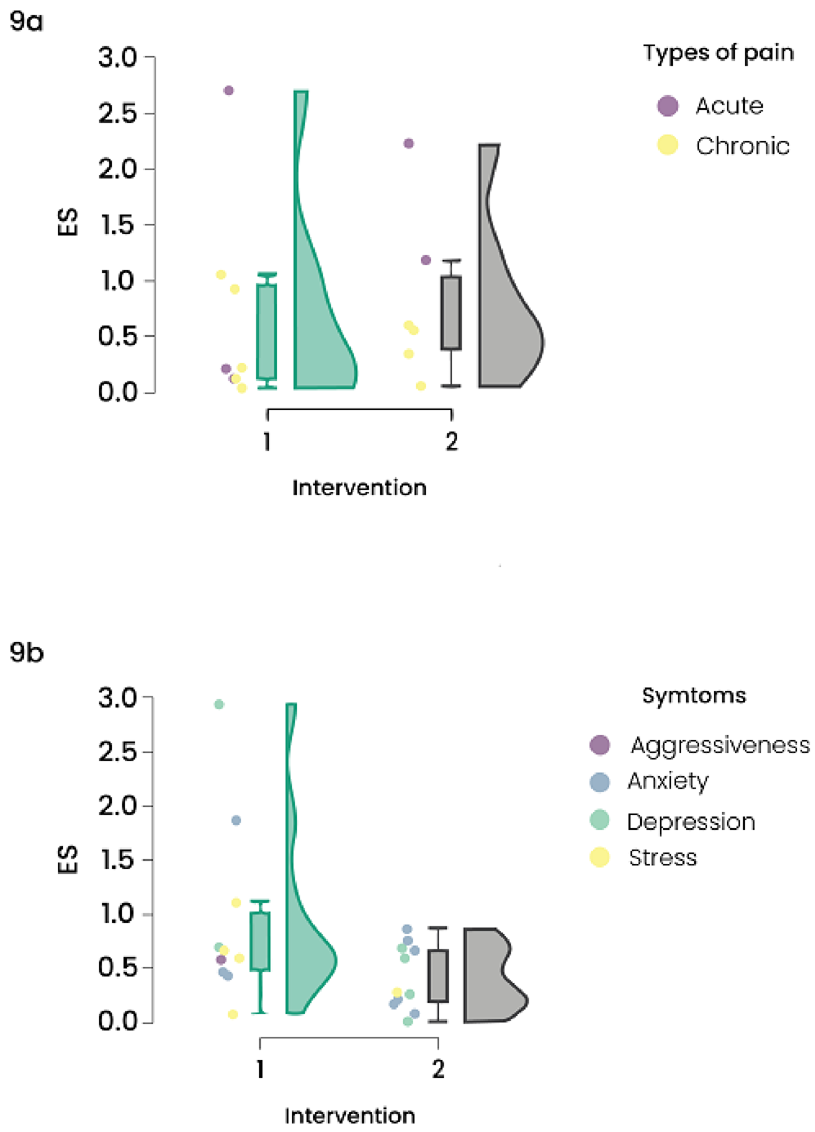

Figure 9 Raincloud plots illustrating the distribution of individual study effect sizes (Hedges' g) by intervention type (1 = Non-touch; 2 = With-touch) for (a) the Pain group, categorized by pain type (acute vs. chronic), and (b) the SAMD group, categorized by symptom (anxiety, depression, stress, aggressiveness). Each panel combines a half-violin density curve, a box plot, and individual data points. Touch-based interventions show more compact distributions in both groups, while non-touch interventions display wider dispersion, particularly for acute pain and anxiety/depression outcomes.

4. Discussion

This systematic review and meta-analysis synthesized evidence from 28 RCTs examining the efficacy of BTs on pain and SAMD. After rigorous re-analysis applying Hedges' g with study-specific standard errors, REML estimation, multilevel modeling, and formal influence diagnostics, the evidence supports a statistically significant positive effect of BTs in both outcome domains. However, effect magnitudes are smaller and more uncertain than previously reported. For Pain, the robust estimate after excluding two statistically influential studies is g = 0.27 (95% CI: 0.10 to 0.44), and for SAMD the corresponding estimate is g = 0.42 (95% CI: 0.26 to 0.57). These findings require careful contextualization, given the methodological profile of the included literature.

4.1 Effects on Pain

The near-complete reduction of heterogeneity after removal of Olson et al. [17] and McCormack [24] is methodologically instructive. Reiki was applied as an adjunct to opioid therapy in patients with advanced cancer (n = 24), producing an effect size with confidence intervals spanning approximately 166 standard deviation units, a result driven entirely by extreme intragroup variance given the very small sample size [17]. Conducted in elderly post-surgical patients with a non-contact, single-session targeted therapy design, the BT represented a markedly different clinical context from most other clinical trials on pain [24]. The contribution of these studies to the pooled estimate is better characterized as a sign of methodological heterogeneity than of genuine clinical effect, reinforcing the importance of influence diagnosis in systematic reviews.

The small positive effect of BTs on pain (g = 0.27 in the sensitivity model) is biologically plausible and consistent with evidence suggesting that non-pharmacological interventions can modulate pain perception through neurophysiological and psychosocial pathways. Specific mechanisms include: activation of the endogenous μ-opioid system via the descending pain inhibitory circuit [45]; facilitation of the relaxation response [46]; expectancy-driven analgesia mediated by prefrontal-limbic networks [47]; and, for touch-based modalities specifically, reduction of cortisol and modulation of oxytocin signaling at spinal and supraspinal levels [48, 49].

A negative association between session duration and effect size magnitude was consistently observed across both the primary and sensitivity Pain models. While counterintuitive, this association may reflect study design artifacts: shorter sessions may have been tested in populations with more acute or higher-intensity pain where baseline scores allow greater absolute change, or in studies using more sensitive pain measurement tools. Alternatively, practitioner attention intensity during brief contacts may produce acute relaxation responses that attenuate pain transiently. These hypotheses require prospective investigation with standardized dosing protocols.

The descriptive finding that touch-based BTs (mean g = 0.83; CV = 0.94) produced more consistent outcomes than non-touch modalities (mean g = 0.68; CV = 1.33) for pain corroborates earlier work identifying physical contact as a moderator of BT efficacy [50]. The tactile component may facilitate muscle relaxation, reduce cortisol, and enhance the therapeutic alliance, mechanisms absent in distant or non-contact modalities. However, this comparison is exploratory; formal meta-regression with adequate sample sizes is required before clinical recommendations can be made.

4.2 Effects on Symptoms Associated with Mental Disorders

The robust SAMD estimate (g = 0.42) is compatible with effect sizes reported for other non-pharmacological complementary interventions, such as mindfulness-based stress reduction and relaxation therapies, across anxiety and depression outcomes [51]. Symptom-specific subgroup analyses revealed an important internal gradient: anxiety and depression exhibited small, consistent effects (g = 0.32 and 0.39, respectively) with low heterogeneity ($I^2 < 14\%$), whereas stress, despite showing the highest point estimate (g = 0.68), was characterized by substantial residual heterogeneity ($I^2 = 73.1\%$) even after outlier exclusion.

This heterogeneity pattern is clinically meaningful: anxiety is well established as a condition characterized by autonomic dysregulation, specifically reduced vagal tone and sympathetic dominance [52], and reactive aggressiveness has similarly been theorized to involve impaired parasympathetic recovery from arousal states [53]. BTs, particularly touch-based modalities, appear to engage these autonomic pathways: Reiki has demonstrated significant anxiolytic effects (SMD = -0.82) across 824 participants in a recent meta-analysis [54], and mechanical stimulation of C-tactile afferents, the peripheral pathway activated by gentle touch, has produced measurable reductions in anxiety with corresponding EEG biomarker changes [55]. The low heterogeneity observed in the anxiety and depression subgroups of the present analysis supports the internal consistency of autonomic modulation as a plausible common therapeutic mechanism.

The influence analysis in the SAMD group identified Richeson et al. [44] and Tabatabaee et al. [22] as statistically decisive observations. Richeson et al., despite its small sample (n = 20) and waitlist control design, contributed multiple large effect sizes for pain, depression, and anxiety, a pattern consistent with high-expectancy, open-label contexts with minimal blinding. Tabatabaee et al. reported an implausibly large effect for depression (Hedges' g ≈ 2.95) in cancer patients; such a magnitude could reflect scale directionality inconsistencies, ceiling-floor effects at baseline, or reporting errors. The selective sensitivity of the pooled SAMD estimate to these two studies (89.2% reduction in τ^2) highlights how meta-analytical conclusions in this field can be dominated by a small number of underpowered or methodologically imprecise trials.

The multilevel model partitioned variance equally across levels ($\sigma^2 \approx 0.18$ between studies; $\sigma^2 \approx 0.18$ within-study across symptoms), confirming that anxiety, depression, stress, and aggressiveness are not interchangeable outcomes within a meta-analytical framework. Although an aggregate SAMD summary is statistically permissible for global synthesis, clinical interpretation requires symptom-specific reporting, as the mechanisms, instruments, and patient populations differ substantially across these outcomes.

A methodologically important observation is that publication bias, as assessed by Egger's test and trim-and-fill, was not detectable in the primary models for either Pain (p = 0.542) or SAMD (p = 0.213), but became statistically evident in both groups after removal of the influential studies (Pain: p = 0.018; SAMD: p = 0.009). This paradoxical pattern suggests that influential outliers with large positive effect sizes may have obscured funnel plot asymmetry in the primary models, leading to a falsely symmetric appearance. After trim-and-fill adjustment in the Pain sensitivity model, the pooled estimate falls to g = 0.16, a value of limited clinical relevance. Although the trim-and-fill method has known limitations under high heterogeneity [15, 56], this convergence of evidence warrants transparency in reporting. It should be incorporated in future updates as additional studies accumulate.

4.3 Limitations of the Review Processes Used

Several limitations should be acknowledged. First, the absolute number of trials per subgroup is small (k = 5-8), which limits the power of subgroup and meta-regression analyses. Second, 25% of included trials were rated as high overall risk of bias, and 64.3% had some concerns, primarily due to the inherent inability to blind therapists and recipients of BTs. Third, the stress subgroup retained substantial heterogeneity (I^2 = 73.1%) even after outlier removal, indicating the presence of additional sources of variability not captured by the available moderators. Fourth, the use of estimated SDs in some studies introduces measurement error into the calculation of effect sizes. Fifth, the trim-and-fill estimates should be interpreted with caution, given the residual heterogeneity and the limited number of studies in the sensitivity models. Finally, the analysis did not include unpublished trial data or grey literature beyond Google Scholar, which may introduce selection bias.

The BiFi REGs [57], developed through a Delphi consensus process specifically to standardize reporting of practitioner training, intervention fidelity, and protocol details in BT trials, provide a framework directly relevant to the limitations identified in this review. The null findings from meta-regression for protocol-related variables (intervention type, session frequency, duration) may partly reflect inconsistent and incomplete reporting of these variables in primary studies, precisely the reporting gaps that BiFi REGs were designed to address. We recommend that future systematic reviews in this area employ BiFi REGs as a complementary reporting quality assessment tool alongside RoB2 for methodological quality.

5. Conclusion

This meta-analysis provides evidence that BTs are associated with small but statistically significant reductions in pain and symptoms associated with mental disorders when assessed in sensitivity models that exclude statistically influential studies. These estimates are more conservative than those derived from primary models, reflecting the substantial influence of a small number of methodologically extreme trials, the pooled effect, and heterogeneity statistics.

Symptom-specific subgroup analyses indicate that anxiety and depression demonstrate the most consistent and reproducible responses to BTs, with low residual heterogeneity suggesting a coherent underlying signal. Stress may also respond favorably, though the corresponding evidence base is more heterogeneous and warrants further investigation. The observation that touch-based modalities produce more consistent outcomes than non-touch interventions for pain deserves prospective evaluation in adequately powered trials.

The findings support the potential utility of BTs as complementary, non-pharmacological adjuncts in integrative care settings, particularly for patients with chronic pain and anxiety-related symptoms. However, several cautions apply: effect sizes are small and depend on the clinical context, publication bias cannot be excluded, and the methodological quality of available trials is predominantly moderate. Prediction intervals that approach or cross zero in several analyses underscore the uncertainty of extrapolating findings to new clinical populations and settings.

To advance this field, future trials should adopt: (i) adequate sample sizes with a priori power calculations; (ii) active or sham control conditions to isolate specific BT mechanisms from non-specific therapeutic contact effects; (iii) standardized, validated outcome instruments permitting cross-study meta-analytic synthesis; (iv) detailed reporting of intervention fidelity and practitioner training; and (v) pre-registration of analysis plans. High-quality evidence from such trials will be essential to determine whether and under which conditions BTs can be confidently integrated into evidence-based integrative medicine practice.

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Author Contributions

R.S.: Writing - original draft, visualization, software, methodology, investigation, formal analysis, data curation, conceptualization and review. R.Q.: review, data curation and supervision. P.N.G.: review and data curation.

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Competing Interests

The authors declare that no known competing financial interests.

AI-Assisted Technologies Statement

Artificial intelligence tools were used exclusively for the English translation in the preparation of the graphical abstract of this manuscript. All scientific content, data analysis, interpretation, and conclusions are the sole responsibility of the authors.

Additional Materials

The following additional materials are uploaded at the page of this paper.

1. Supplementary Material S1.
2. Supplementary Table S2.

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