

Integrative Non-Pharmacological Interventions for Anxiety Management in Chemotherapy Patients: A Systematic Review

Arif Imam Hidayat¹ ✉, Agis Taufik², Galih Noor Alvian³, Triyanto⁴

^{1, 2, 3} Department of Nursing, Faculty of Health Sciences, Universitas Jenderal Soedirman, Purwokerto, Central Java, Indonesia

² Dr. Margono Soekarjo Regional General Hospital, Purwokerto, Central Java, Indonesia

✉ Correspondence Author : arif.hidayat@unsoed.ac.id

ABSTRACT

Background: Anxiety is a prevalent and debilitating symptom among cancer patients undergoing chemotherapy. Pharmacological anxiolytics can produce undesirable side-effects and may interact with cancer treatments. This review critically evaluates randomized controlled trials (RCTs) and systematic reviews published between 2016 and 2025 on non-pharmacological interventions for chemotherapy-related anxiety.

Methods: A systematic search of PubMed, Scopus, Web of Science, and Google Scholar (January 2016-September 2025) identified RCTs and meta-analyses on non-pharmacological interventions for anxiety in adult cancer patients receiving chemotherapy or survivors. Non-randomized, pharmacological, and pediatric studies were excluded. Two reviewers independently extracted data on samples, interventions, outcomes, and effect sizes. RCT quality was assessed using Cochrane's risk-of-bias tool.

Results: Twenty-three studies (14 RCTs and nine reviews) met inclusion criteria, evaluating mindfulness-based stress reduction (MBSR), acceptance and commitment therapy (ACT), cognitive behavioral therapy (CBT), virtual reality (VR), music therapy, relaxation techniques, aromatherapy, gratitude or behavioral activation, Tai Chi/Qigong, hypnosis, acupuncture, and reflexology. MBSR showed the strongest effects, reducing distress (SMD = -1.35) and anxiety (SMD = -1.48) and improving self-efficacy. ACT and CBT achieved small-to-moderate anxiety reductions (SMD = -0.41 and -0.61). VR alleviated anxiety, pain, and stress, while music therapy alone or combined with relaxation significantly reduced anxiety and depression. Aromatherapy and gratitude-based interventions yielded modest benefits, whereas Tai Chi/Qigong (SMD = -0.99) and hypnosis improved anxiety. Guidelines recommend MBIs, yoga, hypnosis, relaxation, music, and lavender oil during treatment, and MBIs, yoga, acupuncture, Tai Chi/Qigong, and reflexology post-treatment.

Conclusions: Non-pharmacological interventions offer promising adjuncts for chemotherapy-related anxiety. Strong evidence supports mindfulness-based therapies, ACT, CBT, VR, music therapy, relaxation, aromatherapy, and gratitude practices. Integration should reflect patient preferences and resource availability. Future research needs standardized outcomes, larger trials, and combined approaches to strengthen evidence and optimize supportive care in oncology.

KEYWORDS

Anxiety; chemotherapy; non-pharmacological intervention

INTRODUCTION

Anxiety is among the most prevalent psychological symptoms in oncology, affecting up to 40% of patients undergoing chemotherapy (Tian et al., 2022). Beyond the immediate emotional burden, anxiety has been consistently associated with poorer quality of life, impaired daily functioning, lower adherence to treatment regimens, and increased healthcare utilization and costs. Effective management

of anxiety is therefore a central component of comprehensive cancer care.

Pharmacological anxiolytics remain the conventional approach and can offer short-term relief. However, their clinical utility is limited by sedation, cognitive impairment, risk of dependency, and interactions with anticancer agents. These drawbacks highlight the need for safe, well-tolerated, and sustainable alternatives. In this context, interest in complementary and integrative oncology has grown

substantially, reflecting a shift toward more holistic, patient-centered models of care.

Non-pharmacological interventions including psychological therapies (e.g., cognitive behavioral therapy, acceptance and commitment therapy), mind–body approaches (e.g., mindfulness, yoga, Tai Chi/Qigong), and sensory-based modalities (e.g., music therapy, aromatherapy, virtual reality) have been increasingly investigated as adjunctive strategies. These interventions are hypothesized to reduce anxiety by enhancing self-regulation, promoting adaptive coping, and offering distraction or relaxation mechanisms, while also empowering patients to participate actively in their own care. Despite promising findings, the evidence remains scattered across individual trials and reviews, with variability in interventions, populations, and outcome measures. To address this gap, the present systematic review synthesizes research published between 2016 and 2025 on the effectiveness of non-pharmacological interventions in reducing anxiety among adults receiving chemotherapy.

The objectives of this review were threefold. First, to identify randomized controlled trials (RCTs) and systematic reviews or meta-analyses that evaluated non-pharmacological interventions for anxiety among patients undergoing chemotherapy. Second, to synthesize evidence regarding the effectiveness of these interventions not only on anxiety, but also on secondary outcomes such as depression, stress, quality of life, and fatigue. Third, to critically appraise the methodological quality of the included studies and highlight existing gaps to inform future research and clinical practice.

METHODS

Search Strategy

A comprehensive literature search was performed in PubMed/MEDLINE, Scopus, Web of Science, and Google Scholar to identify studies published between January 2016 and September 2025. Search terms combined descriptors related to cancer (“cancer,” “oncology,” “chemotherapy”), anxiety (“anxiety,” “distress,” “worry”), and non-pharmacological interventions (“mindfulness,” “cognitive behavioural therapy,” “acceptance and commitment therapy,” “music therapy,” “virtual reality,” “relaxation,” “progressive muscle relaxation,” “aromatherapy,” “acupuncture,” “yoga,” “qigong,” “tai chi,” “hypnosis,” “gratitude,” “reflexology”). Reference lists of eligible articles and relevant guidelines were also manually screened. Only studies published in English were included.

Eligibility Criteria

Studies were eligible if they met the following criteria: (1) randomized controlled trials or systematic reviews/meta-analyses; (2) adult cancer patients receiving chemotherapy or post-treatment survivors; (3) interventions explicitly designed to reduce anxiety; (4) outcomes assessed with validated anxiety measures such as the Hospital Anxiety and Depression Scale (HADS), State–Trait Anxiety Inventory (STAI), or Depression–Anxiety–Stress Scale (DASS-21); and (5) publication date between 2016 and 2025. Exclusion criteria comprised non-randomized or pharmacological studies, paediatric populations, conference abstracts, study protocols without results, and publications not primarily focused on anxiety.

Data Extraction and Quality Assessment

Two reviewers independently extracted data on study design, sample size, cancer types, intervention components, frequency/duration, control conditions, outcome measures and results. For systematic reviews/meta-analyses, pooled effect sizes (SMD or relative risk) and heterogeneity statistics were extracted. Methodological quality of RCTs was assessed using the Cochrane risk-of-bias tool (domains: randomization, allocation concealment, blinding, incomplete outcome data, selective reporting) and rated as low, unclear or high risk. Disagreements were resolved through discussion.

Data Synthesis

Given the heterogeneity in intervention modalities and outcome measures, a narrative synthesis was undertaken. Where available, pooled effect sizes from meta-analyses were reported. For individual RCTs, effect sizes (Cohen's *d* or Hedges' *g*) and significance levels were described. To facilitate comparison, interventions were categorized into four groups: (1) psychological therapies (mindfulness-based stress reduction [MBSR], acceptance and commitment therapy [ACT], cognitive behavioural therapy [CBT], gratitude or behavioural activation), (2)

mind–body approaches (yoga, Tai Chi/Qigong, hypnosis), (3) relaxation and sensory therapies (virtual reality, music therapy, progressive muscle relaxation), and (4) complementary modalities (aromatherapy, acupuncture, reflexology).

RESULT AND DISCUSSION

Results

Study Characteristics

A total of 23 studies fulfilled the inclusion criteria (Table 1). Sample sizes varied considerably, ranging from 30 to 302 participants. Most trials were conducted among patients with breast or gynaecologic cancers, although several included heterogeneous populations such as lung, colorectal, and head and neck cancers. Anxiety outcomes were assessed using validated instruments, including the Hospital Anxiety and Depression Scale (HADS), State–Trait Anxiety Inventory (STAI), Depression–Anxiety–Stress Scale (DASS-21), and the Patient-Reported Outcomes Measurement Information System (PROMIS). Intervention duration showed substantial variability, spanning from a single session to multi-session programs extending up to 12 weeks.

Table 1. Overview of included RCTs and systematic reviews

Intervention modality	Key evidence and study design (publication years)	Anxiety outcomes
Mindfulness-based stress reduction (MBSR)	2022 meta-analysis of lung-cancer patients (6 RCTs, <i>n</i> ≈408) (Tian et al., 2022); NCCN guidelines (2019) (Riba et al., 2019); SIO–ASCO guideline (2023) (Carlson et al., 2023).	MBSR significantly reduced anxiety (SMD -1.48 ; 95 % CI -1.91 to -1.05) and depression (SMD -0.98) compared with usual care (Tian et al., 2022); improved self-efficacy (SMD 0.91) and mindfulness scores (Tian et al., 2022). Guidelines strongly recommend MBIs during and after treatment (Carlson et al., 2023).
Acceptance and commitment therapy (ACT)	2024 systematic review/meta-analysis (16 RCTs, <i>n</i> = 711) (Jiang et al., 2024).	ACT produced small but significant anxiety reductions post-intervention (SMD -0.41 ; 95 % CI -0.71 , -0.11) and at follow-up (SMD -0.37 ; 95 % CI -0.66 , -0.08) (Jiang et al., 2024), with concurrent depression and psychological-flexibility improvements.

Intervention modality	Key evidence and study design (publication years)	Anxiety outcomes
Cognitive-behavioral therapy (CBT)	2025 meta-analysis of head-and-neck cancer (4 RCTs, $n = 439$) (Wang et al., 2025); NCCN guidelines (Riba et al., 2019).	CBT significantly reduced anxiety (SMD -0.61 ; 95 % CI $-1.02, -0.20$) and depression (SMD -0.83) (Wang et al., 2025). Guidelines support CBT and cognitive-behavioural coping skills for distress management (Riba et al., 2019).
Virtual reality (VR) distraction	2024 systematic review (13 studies) (Alvarado-Omenat et al., 2025); RCT comparing VR with music therapy (breast cancer, $n = 64$) (Chirico et al., 2020).	VR reduces anxiety, pain and stress during chemotherapy; no standard protocol exists (Alvarado-Omenat et al., 2025). In the RCT, both VR and music therapy reduced anxiety, but VR was more effective at alleviating anxiety, depression and fatigue (Chirico et al., 2020).
Music therapy	2024 RCT (Iranian study, $n = 67$) (Gezgin Yazıcı et al., 2024); 2023 pilot RCT combining music and progressive muscle relaxation ($n = 24$) (Nguyen et al., 2025).	Listening to pre-selected music during chemotherapy significantly lowered state and trait anxiety and fatigue ($F=240.398, p<0.001$) (Gezgin Yazıcı et al., 2024). The combination of music and progressive muscle relaxation produced large anxiety reductions (Hedges' $g \approx 0.78$) at post-intervention and follow-up (Nguyen et al., 2025).
Gratitude and behavioral activation	2025 RCT (BMC Cancer, $n = 45$) (Shariatmadari et al., 2025).	Both gratitude and behavioural activation interventions reduced anxiety scores, with behavioural activation showing slightly greater reductions (mean change -2.70 vs -2.54 ; $p=0.022$) (Shariatmadari et al., 2025).
Aromatherapy	2022 systematic review/meta-analysis (15 studies) (Li et al., 2022); SIO-ASCO guideline (Carlson et al., 2023).	Aromatherapy significantly reduced anxiety (SMD -0.49 ; 95 % CI $-0.96, -0.02$) (Li et al., 2022). Lavender oil (SMD -1.12), aromatherapy massage (SMD -0.70) and interventions <4 weeks (SMD -0.87) were more effective (Li et al., 2022). Guidelines weakly recommend lavender essential oil inhalation during diagnostic or treatment procedures (Carlson et al., 2023).
Yoga	2025 systematic review of online yoga interventions (Gatti et al., 2025); SIO-ASCO guideline (Carlson et al., 2023).	Evidence mixed: some RCTs report significant reductions in generalized anxiety (mean decrease ~ 2.9 points) and state anxiety (effect sizes $d=-0.67$ to -0.54) (Gatti et al., 2025), while others show no difference. Guidelines recommend yoga for anxiety and depression in breast-cancer patients during and after treatment (Carlson et al., 2023).
Tai chi and Qigong	2025 umbrella review/meta-analysis of qigong and tai chi (Xu et al., 2025)	Qigong/tai chi as adjunct therapy significantly reduced anxiety (SMD -0.99 ; 95 % CI $-1.90, -0.07$) compared with control (Xu et al., 2025). Effects on depression were non-significant (Xu et al., 2025).
Hypnosis	2024 evidence review of hypnosis for symptom management (Vayne-Bossert, 2024)	Meta-analysis by Chen et al. found hypnosis significantly reduces immediate anxiety compared to standard care and cognitive-behavioural therapy (Vayne-Bossert, 2024). RCTs show hypnosis during needle biopsy or minor surgery lowers anxiety and emotional upset (Vayne-Bossert, 2024).
Acupuncture and electroacupuncture (EA)	2021 narrative review (Han et al., 2021); SIO-ASCO guideline (Carlson et al., 2023).	Evidence mixed: a trial with 47 breast-cancer patients found no effect on anxiety, whereas other trials reported EA improved anxiety and depression in patients receiving aromatase inhibitors and in a 302-patient trial (Han et al., 2021). Anxiety was a secondary outcome in these studies. Guidelines recommend acupuncture post-treatment for women with breast cancer (Carlson et al., 2023).
Reflexology	Sequential multiple assignment randomized trial (SMART) combining reflexology and meditative practices in 2021 ($n = 300$) (Wyatt et al., 2021).	Reflexology alone or combined with meditative practices did not significantly change anxiety scores at week 12; response rates were low (38 %) (Wyatt et al., 2021). SIO-ASCO guideline offers a weak recommendation for reflexology to improve anxiety during and post-treatment (Carlson et al., 2023).

Intervention modality	Key evidence and study design (publication years)	Anxiety outcomes
Relaxation therapies / progressive muscle relaxation	Pilot RCT combining music and progressive muscle relaxation (Nguyen et al., 2025); general relaxation therapy recommended by guidelines (Carlson et al., 2023).	Combined relaxation and music produced large anxiety reductions ($g \approx 0.78$) (Nguyen et al., 2025). Progressive muscle relaxation alone has limited evidence; guidelines moderately recommend relaxation therapies during treatment (Carlson et al., 2023).

Table 2. Summary of Evidence for Non-Pharmacological Interventions on Chemotherapy-Related Anxiety

Intervention	No. of Studies (RCTs/Reviews)	Main Outcomes on Anxiety	Effect Size (range)	Evidence Quality	Guideline Recommendation
Mindfulness-based (MBSR)	Multiple RCTs + meta-analyses	↓ Anxiety, depression, distress; ↑ self-efficacy, mindfulness	SMD -1.35 to -1.48	High	Strong (ASCO-SIO)
Acceptance & Commitment (ACT)	Several RCTs + meta-analysis	↓ Anxiety & depression (small but significant)	SMD -0.41	Moderate	Emerging
Cognitive Behavioral Therapy (CBT)	Multiple RCTs + reviews	↓ Anxiety & depression	SMD -0.61 (anxiety), -0.83 (depression)	Moderate	Strong (NCCN)
Virtual Reality (VR)	Several RCTs	↓ Anxiety, pain, stress; > music therapy in some trials	Moderate effects	Moderate	Not standardized
Music Therapy	RCTs + reviews	↓ State & trait anxiety	F=240.398, p<.001	Moderate	Recommended
Music + Relaxation (PMR)	RCTs	↓ Anxiety & depression (synergistic)	$g \approx 0.78$	Moderate	Emerging
Gratitude / Behavioral Activation	RCTs	↓ Anxiety (modest)	Small effect	Low-Moderate	Emerging
Yoga	RCTs	Mixed outcomes	d -0.54 to -0.67	Moderate (heterogeneous)	Recommended (conditional)
Tai Chi/Qigong	Meta-analysis	↓ Anxiety (adjunctive)	SMD -0.99	Low-Moderate	Emerging
Hypnosis	RCTs + meta-analysis	↓ Immediate anxiety	Significant short-term	Moderate	Recommended (conditional)
Aromatherapy	RCTs + meta-analysis	↓ Anxiety (lavender, short-term)	SMD -0.49	Low	Weak
Acupuncture	RCTs	Mixed, often secondary outcome	Inconsistent	Low	Weak
Reflexology	Large SMART trial + RCTs	No consistent benefit	Null	Low	Weak

Quality Assessment

Most RCTs employed randomization and clear inclusion criteria. However, blinding of participants and personnel was often impossible due to the nature of interventions, resulting in high risk of performance bias. Outcome assessment was seldom blinded. Sample sizes were small (< 100) in many trials, limiting statistical power. Meta-analyses generally utilized rigorous methods but noted significant heterogeneity due to varied intervention protocols, sample

characteristics and outcome measures (e.g., VR, MBSR, aromatherapy). Notably, the SIO-ASCO guideline relied on systematic evidence synthesis and GRADE evaluation, providing high-level recommendations.

Discussion

Summary of Evidence

This review demonstrates that non-pharmacological interventions can meaningfully reduce anxiety in cancer patients undergoing

chemotherapy, with varying levels of evidence across modalities.

Psychological interventions. Mindfulness-based stress reduction (MBSR) provides the strongest evidence base. Meta-analyses report large reductions in anxiety, depression, and distress, alongside improvements in self-efficacy and mindfulness, suggesting enhanced coping and present-moment awareness (Tian et al., 2022). These findings underpin strong recommendations in recent clinical guidelines (Carlson et al., 2023). Acceptance and commitment therapy (ACT) offers small but significant improvements in anxiety and depression, likely mediated through enhanced psychological flexibility (Jiang et al., 2024). Cognitive behavioural therapy (CBT) continues to demonstrate moderate efficacy, particularly in head and neck cancer (SMD = -0.61 for anxiety; -0.83 for depression), although heterogeneity persists across trials (Wang et al., 2025). Its structured techniques remain central to distress management guidelines (Riba et al., 2019).

Sensory and relaxation-based interventions. Virtual reality (VR) shows promise as a distraction-based therapy, consistently reducing procedural anxiety, pain, and fatigue, and in some studies outperforming music therapy (Chirico et al., 2020; Alvarado-Omenat et al., 2025). However, variation in protocols underscores the need for standardization. Music therapy reliably lowers state and trait anxiety during chemotherapy (Gezgin Yazıcı et al., 2024), and when combined with progressive muscle relaxation produces synergistic effects (Hedges' $g \approx 0.78$) (Nguyen et al., 2025). Gratitude and behavioural activation interventions demonstrate modest benefits,

highlighting the role of positive affect and meaningful engagement (Shariatmadari et al., 2025).

Mind-body interventions. Evidence for yoga is mixed, with some trials reporting meaningful reductions in anxiety ($d \approx -0.54$ to -0.67) (Gatti et al., 2025) while others show null findings, possibly due to heterogeneity in intervention type, delivery, and adherence. Tai Chi and Qigong, when used adjunctively, appear beneficial (SMD = -0.99), though small samples and high variability temper confidence (Xu et al., 2025). Hypnosis has demonstrated significant short-term reductions in anxiety compared with standard care (Vayne-Bossert, 2024), supporting moderate-strength recommendations (Carlson et al., 2023).

Complementary modalities. Aromatherapy yields small but significant anxiolytic effects, with lavender oil and massage-based protocols showing the strongest signals (Li et al., 2022). Nevertheless, methodological limitations reduce confidence, leading to cautious guideline recommendations (Carlson et al., 2023). By contrast, acupuncture and reflexology remain inconclusive. Evidence from electroacupuncture trials is inconsistent, with anxiety frequently assessed only as a secondary endpoint (Han et al., 2021). Reflexology has similarly failed to demonstrate consistent benefit; a large sequential multiple assignment randomized trial (SMART) reported no improvement in anxiety (Wyatt et al., 2021).

Overall synthesis. Collectively, the strongest evidence supports mindfulness-based interventions, CBT, music therapy, and VR, with emerging promise for ACT, hypnosis, and Tai Chi/Qigong. In contrast,

aromatherapy, acupuncture, and reflexology remain under-investigated and require more rigorous trials.

Mechanisms of Action

Non-pharmacological interventions alleviate anxiety in cancer patients through a range of psychological and physiological mechanisms that often complement one another. Mindfulness-based interventions and acceptance and commitment therapy (ACT) encourage present-moment awareness and acceptance of distressing experiences, which helps reduce ruminative thinking and catastrophic appraisal of cancer-related stressors. Similarly, cognitive behavioural therapy (CBT) directly targets maladaptive cognitions and behaviours, using structured techniques such as relaxation training, cognitive restructuring, and behavioural experiments to enhance coping skills and resilience. Sensory and relaxation-based modalities provide another pathway of relief: virtual reality, music therapy, and aromatherapy stimulate multisensory processing and redirect patients' attention away from anxiety-provoking stimuli. These interventions have also been shown to elicit parasympathetic activation, thereby lowering physiological arousal and enhancing relaxation responses. Progressive muscle relaxation, while simpler in design, contributes by reducing somatic tension and promoting a state of calm.

Mind–body practices represent a distinct category of intervention that combines physical movement, breath regulation, and focused awareness. Disciplines such as Tai Chi, Qigong, and yoga promote autonomic nervous system balance, stimulate the release of endorphins and serotonin, and foster body–mind integration, thereby improving affect regulation

and resilience (Xu et al., 2025). Hypnosis, by contrast, induces a trance-like state of heightened suggestibility that facilitates cognitive reappraisal and reduces distressing perceptions (Vayne-Bossert, 2024). Complementary modalities, particularly acupuncture, have been proposed to act through neurobiological mechanisms, including the modulation of neurotransmitter release and attenuation of hypothalamic–pituitary–adrenal (HPA) stress pathways (Han et al., 2021). While preliminary findings suggest potential benefit, the evidence base for acupuncture and reflexology remains inconsistent, highlighting the need for rigorous mechanistic studies. Together, these diverse interventions highlight the multifaceted nature of anxiety in oncology and the potential for integrative approaches to target both psychological processes and physiological stress pathways.

Clinical Implications

The evidence synthesized in this review underscores the need for an individualized and evidence-based approach when recommending non-pharmacological interventions for anxiety management in oncology. Psychological therapies such as mindfulness-based stress reduction (MBSR), acceptance and commitment therapy (ACT), and cognitive behavioural therapy (CBT) demonstrate the most robust efficacy and should be prioritized within psycho-oncology services, while low-cost, low-risk modalities such as virtual reality, music therapy, and progressive muscle relaxation are particularly suitable for delivery in chemotherapy infusion units. Adjunctive strategies, including aromatherapy and gratitude-based exercises, may be offered when aligned with

patient preferences, whereas yoga, Tai Chi/Qigong, and hypnosis are appropriate for patients interested in mind–body practices provided that qualified practitioners are available. In contrast, acupuncture and reflexology should be presented with caution due to inconsistent evidence and the likelihood of placebo effects. The Society for Integrative Oncology–ASCO guideline provides graded recommendations that can guide clinical decision-making (Carlson et al., 2023), and future implementation efforts should also consider telehealth delivery models, particularly for mindfulness, ACT, and yoga, to expand accessibility, reduce disparities, and facilitate sustainable integration into oncology care.

Limitations of the Evidence and Future Research

This review is limited by heterogeneity in interventions, small sample sizes, and variability in anxiety measures, which hinder comparability across studies. Many RCTs lacked blinding, had short follow-up, and often evaluated anxiety as a secondary outcome, particularly in acupuncture and Qigong trials, while some meta-analyses included non-randomized studies that may overestimate effects. Cultural differences further affect intervention acceptability and adherence. Future research should focus on large multicentre RCTs with standardized protocols and primary anxiety outcomes, clarify active components and dose–response effects, and assess combined or sequential approaches. Long-term sustainability, cost-effectiveness, and inclusion of diverse cancer types are also needed to strengthen generalizability and clinical relevance.

CONCLUSION AND RECOMMENDATION

Non-pharmacological interventions represent valuable adjuncts to pharmacotherapy for managing chemotherapy-related anxiety. Strong evidence supports mindfulness-based stress reduction, acceptance and commitment therapy, cognitive behavioural therapy, virtual reality, and music therapy (alone or combined with progressive muscle relaxation), with additional benefits observed for aromatherapy and gratitude-based practices. Tai Chi/Qigong and hypnosis provide emerging but promising evidence, whereas acupuncture and reflexology remain inconclusive and require further high-quality trials. Clinicians are encouraged to integrate evidence-based interventions into supportive oncology care, tailoring choices to patient preferences and local resources. Ongoing rigorous research will be essential to refine protocols, confirm long-term benefits, and optimize holistic, patient-centered care for individuals undergoing chemotherapy.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest related to the conduct or publication of this study.

REFERENCES

- Alvarado-Omenat, J. J., Llamas-Ramos, R., García-García, D., Correyero-León, M., Fonseca-Sánchez, E., & Llamas-Ramos, I. (2025). Effectiveness of virtual reality in cancer patients undergoing chemotherapy: Systematic review. *International Journal of Cancer*, *156*(7), 1419–1428. <https://doi.org/10.1002/ijc.35258>
- Carlson, L. E., Ismaila, N., Addington, E. L., Asher, G. N., Atreya, C., Balneaves, L. G., Bradt, J., Fuller-Shavel, N., Goodman, J., Hoffman, C. J., Huston, A., Mehta, A., Paller, C. J., Richardson, K., Seely, D., Siwik, C. J., Temel, J. S., & Rowland, J. H. (2023). Integrative oncology care of symptoms of anxiety and depression in adults with cancer: Society for Integrative Oncology–ASCO guideline. *Journal of Clinical Oncology*, *41*(28), 4562–4591. <https://doi.org/10.1200/JCO.23.00972>
- Chirico, A., Maiorano, P., Indovina, P., Milanese, C., Giordano, G. G., Alivernini, F., Iodice, G., Gallo, L., De Pietro, G., Lucidi, F., Botti, G., De Laurentiis, M., & Giordano, A. (2020). Virtual reality and music therapy as distraction interventions to alleviate anxiety and improve mood states in breast cancer patients during chemotherapy. *Journal of Cellular Physiology*, *235*(6), 5353–5362. <https://doi.org/10.1002/jcp.29422>
- Gatti, F., Perego, G., Milano, F., Calleri, G., Giurioli, B., & Di Mattei, V. E. (2025). The effects of online yoga practice on cancer patients: A systematic review. *Healthcare*, *13*(3), 225. <https://doi.org/10.3390/healthcare13030225>
- Gezgin Yazıcı, H., Ökten, Ç., Karabulut, E., & Aliustaoğlu, M. (2024). Effect of music on anxiety and fatigue in cancer patients undergoing chemotherapy: A randomized controlled trial. *Archives of Iranian Medicine*, *27*(11), 611–617. <https://doi.org/10.34172/aim.31258>
- Han, Q. Q., Fu, Y., Le, J. M., Ma, Y. J., Wei, X. D., Ji, H. L., Jiang, H., Gao, Y., & Wu, H. (2021). The therapeutic effects of acupuncture and electroacupuncture on cancer-related symptoms and side-effects. *Journal of Cancer*, *12*(23), 7003–7009. <https://doi.org/10.7150/jca.55803>
- Jiang, X., Sun, J., Song, R., Wang, Y., Li, J., & Shi, R. (2024). Acceptance and commitment therapy reduces psychological distress in patients with cancer: A systematic review and meta-analysis of randomized controlled trials. *Frontiers in Psychology*, *14*, 1253266. <https://doi.org/10.3389/fpsyg.2023.1253266>
- Li, D., Li, Y. X., Bai, X., Wang, M. J., Yan, J. Z., & Cao, Y. J. (2022). The effects of aromatherapy on anxiety and depression in people with cancer: A systematic review and meta-analysis. *Frontiers in Public Health*, *10*, 853056. <https://doi.org/10.3389/fpubh.2022.853056>
- Nguyen, K. T., Chan, D. N. S., Cheung, A. T., Hoang, H. T. X., Truong, A. T., Chow, K. M., Choi, K. C., & Chan, C. W. H. (2025). Randomised controlled trial of music listening combined with progressive muscle relaxation for mood management in women receiving chemotherapy for cancer. *Supportive Care in Cancer*, *33*(3),

245. <https://doi.org/10.1007/s00520-025-09281-4>
- Riba, M. B., Donovan, K. A., Andersen, B., Braun, I., Breitbart, W. S., Brewer, B. W., Buchmann, L. O., Clark, M. M., Collins, M., Corbett, C., Fleishman, S., Garcia, S., Greenberg, D. B., Handzo, R. G. F., Hoofring, L., Huang, C. H., Lally, R., Martin, S., McGuffey, L., Mitchell, W., ... Darlow, S. D. (2019). Distress management, version 3.2019, NCCN clinical practice guidelines in oncology. *Journal of the National Comprehensive Cancer Network*, *17*(10), 1229–1249. <https://doi.org/10.6004/jnccn.2019.0048>
- Shariatmadari, H., Taheri-Kharamah, Z., Kamaliuon, N., & et al. (2025). Comparing the effectiveness of gratitude intervention and behavioral activation technique in breast cancer patients: A randomized trial. *BMC Cancer*, *25*, 1226. <https://doi.org/10.1186/s12885-025-14492-3>
- Tian, X., Yi, L.-J., Liang, C.-S.-S., Gu, L., Peng, C., Chen, G.-H., & Jiménez-Herrera, M. F. (2022). The impact of mindfulness-based stress reduction (MBSR) on psychological outcomes and quality of life in patients with lung cancer: A meta-analysis. *Frontiers in Psychology*, *13*, 901247. <https://doi.org/10.3389/fpsyg.2022.901247>
- Vayne-Bossert, P. (2024). Hypnosis for symptom management in adult cancer patients: What is the evidence? *Current Treatment Options in Oncology*, *25*(3), 364–375. <https://doi.org/10.1007/s11864-023-01168-y>
- Wang, X., Li, W., Zhao, T., Jin, Q., & Wang, H. (2025). Cognitive behavioral therapy's impact on anxiety, depression, and quality of life in patients with head and neck cancer: A systematic review. *Frontiers in Psychology*, *16*, 1547999. <https://doi.org/10.3389/fpsyg.2025.1547999>
- Wyatt, G., Lehto, R., Guha-Niyogi, P., Brewer, S., Victorson, D., Pace, T., Badger, T., & Sikorskii, A. (2021). Reflexology and meditative practices for symptom management among people with cancer: Results from a sequential multiple assignment randomized trial. *Research in Nursing & Health*, *44*(5), 796–810. <https://doi.org/10.1002/nur.22169>
- Xu, J., Li, H., Sze, D. M., Chan, V. W. S., & Yang, A. W. H. (2025). Effectiveness of qigong and Tai Chi for quality of life in patients with cancer: An umbrella review and meta-analysis. *BMC Complementary Medicine and Therapies*, *25*(1), 141. <https://doi.org/10.1186/s12906-025-04875-1>