European Journal of Oncology Nursing 80 (2026) 103111

Contents lists available at ScienceDirect

European Journal of Oncology Nursing

journal homepage: www.elsevier.com/locate/ejon

Feasibility, acceptability, and preliminary efficacy of Tai Chi versus mindful yoga on psycho-spiritual distress in patients with advanced cancer: A mixed-method pilot randomized controlled trial

Naomi Takemura [a,*], Jojo Yan-Yan Kwok [b], Wing Lok Chan [c], Daniel Yee-Tak Fong [b]

[a] School of Nursing, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong Special Administrative Region of China
[b] School of Nursing, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Pokfulam, Hong Kong Special Administrative Region of China
[c] Department of Clinical Oncology, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Pokfulam, Hong Kong Special Administrative Region of China

ARTICLE INFO

Keywords:
Advanced cancer
Psychological
Spiritual
Tai chi
Yoga

ABSTRACT

Purpose: Psycho-spiritual distress is prevalent and distressing among advanced cancer patients. While mind-body exercises have shown promise in alleviating psychological distress, their effectiveness in advanced cancer patients is still being explored. This study aimed to explore the feasibility and acceptability, and preliminary efficacy of two mind-body exercises—Tai Chi and mindful yoga—each rooted in distinct philosophies, compared to control among patients with advanced cancer.

Methods: We conducted a three-armed mixed-method pilot randomized control trial. Participants were randomized into Tai Chi, mindful yoga, or control groups. Over 12-week, 60-min Tai Chi classes were held twice a week, 120-min mindful yoga classes weekly, and control group received written exercise guidelines. Feasibility outcomes were assessed through questionnaires and semi-structured interviews at 12-week. Effect outcomes were assessed by questionnaire and physical functioning test at baseline, 12-week (post-intervention), and 24-week (12-week post-intervention).

Results: Forty-six patients with advanced cancer, with a mean age 61 years, were enrolled. Both Tai Chi and mindful yoga demonstrated satisfactory feasibility and acceptability, with attendance rates exceeding 86%, satisfactory levels of self-practice, and high satisfaction and credibility. Compared with control group, Tai Chi and mindful yoga groups showed preliminary reductions in depression and improvements in balance ability at 12 and 24 weeks. Additionally, mindful yoga showed additional preliminary enhancements in mindfulness and spiritual outcomes at 24-week. Qualitative interviews revealed three themes that contextualize and may underpin the improvements in depression, mindfulness, spiritual well-being, and physical functioning.

Conclusion: Tai Chi and mindful yoga were feasible, well-accepted, and showed promising trends in psycho-spiritual, mindfulness, and physical outcomes. A large-scale trial is warranted to confirm these findings.

1. Introduction

Spiritual well-being is a multidimensional concept encompassing subjective feelings of happiness, self-worth affirmation, accepting relationships, and internal energy (Yang et al., 2010). It is often expressed through a psychological dimension (Bash, 2004), prompting researchers to examine psychological and spiritual well-being as a single construct. These aspects are closely interrelated in advanced cancer survivors (McCoubrie and Davies, 2006), with an integrative review defining psycho-spiritual well-being as a subjective experience incorporating emotional health and meaning-in-life concerns (Lin and Bauer-Wu, 2003). A cancer diagnosis, particularly advanced cancer, is profoundly stressful and alters life perception (Swensen et al., 1993). The poor prognosis and treatment-related symptom burden often heighten survivors' spiritual concerns, disrupting meaning, value, quality of life, and dignity (Winkelman et al., 2011). Metastatic cancer survivors experience significantly higher psychological distress and poorer spiritual well-being than non-metastatic survivors (Velasco et al., 2022). Despite this, psycho-spiritual distress in advanced cancer survivors remains largely unaddressed (Pearce et al., 2012), negatively impacting overall well-being (Delgado-Guay et al., 2011).

Currently, no evidence-based interventions specifically target

* Corresponding author. GH526, The Hong Kong Polytechnic University, Hung Hom, Hong Kong Special Administrative Region of China.
E-mail address: naomi.takemura@polyu.edu.hk (N. Takemura).

https://doi.org/10.1016/j.ejon.2026.103111
Received 22 October 2025; Received in revised form 9 December 2025; Accepted 22 January 2026
Available online 30 January 2026

psycho-spiritual distress in advanced cancer survivors. Therapies like dignity therapy (Chochinov et al., 2011; Faller et al., 2013) and meaning-centered psychotherapy (Breitbart et al., 2012, 2015) focus on fostering meaning and purpose, while mind-body exercises adopting an integrative body-mind-spirit approach emphasize mindfulness and mental benefits through physical exertion (Chan et al., 2016). This unique integration of physical techniques and mindful focus addresses psycho-spiritual distress more holistically, more accessible, and easier to maintain. Popular mind-body exercises, such as yoga and Tai Chi, have demonstrated potential in improving mood among cancer or chronic illness survivors (Kwok et al., 2019; Takemura et al., 2024; Zeng et al., 2019). A recent meta-analysis of randomized controlled trials (RCTs) evaluating psychosocial interventions on spiritual well-being in cancer patients identified meditation/yoga as the most prevalent intervention, with significantly positive effects (McLouth et al., 2021). Tai Chi and yoga, originating from different countries, are widely practiced mind-body exercises incorporating mindful movements and breath awareness (Ratarasarn and Kundu, 2020). However, they differ significantly in meditation and philosophy focus. Tai Chi, grounded in Taoist tradition, emphasizes meditation, harmony, balance with the rhythms of nature (Brown, 2016). It cultivates spirituality by balancing and harmonizing the body and mind through yin and yang interaction (Brown, 2016). Conversely, yoga, rooted in ancient Indian philosophy, encompasses a broader range of practices, including postures (asanas), breathing techniques (pranayama), and meditation, emphasizing on the philosophical aspects of self-awareness, mindfulness, and spiritual growth for mind-body-spirit unity (Khanna and Greeson, 2013). While both disciplines offer substantial physical and mental benefits, their distinct emphases provide unique pathways for mindfulness and personal development.

Mind-body exercises show promise in alleviating psychological and spiritual distress. However, evidence on their effects specifically on spiritual distress comes primarily from yoga interventions and largely involves survivors in early stages or across all stages (Takemura et al., 2025), with prior studies yielding limited and inconsistent findings (Cramer et al., 2016; Galantino et al., 2013; Leal et al., 2018; Lötzke et al., 2016). Consequently, a well-designed RCT is needed to investigate the potential benefits of these exercises on psycho-spiritual well-being in advanced cancer survivors.

The primary aim of the study was to explore the feasibility and acceptability of conducting a powered RCT comparing Tai Chi and mindful yoga with self-managed control among advanced cancer survivors. We hypothesized that both interventions are feasible and acceptable, and exert comparable effects in alleviating psycho-spiritual distress.

2. Method

2.1. Study design

This study was an outcome assessor-blinded, three-arm RCT employing a sequential exploratory mixed-methods approach to evaluate feasibility and effect outcomes evaluation. The quantitative effect outcomes evaluation was the core focus of the study to first identify the feasibility of treatment and preliminary effects, followed by a supplementary qualitative inquiry to understand how and why the treatment worked or not worked from the participants' perspective (Creswell and Clark, 2017). Due to the nature of the interventions, participants, the Tai Chi and mindful yoga instructors were necessarily unblinded to group assignment. Outcome assessors collecting all data and data analyst were blinded to group allocation. To maintain assessor blinding, participants were reminded not to discuss their group assignment during assessments. Participants were randomly allocated to Tai Chi, mindful yoga, or self-managed control group at a 1:1:1 ratio. The randomized allocation sequence was generated using Random Allocation Software 2.0 by an independent researcher not involved in recruitment or assessment. Allocation details were concealed using sequentially numbered, opaque, sealed envelopes prepared by this assistant. We used block randomization of size 6–12, with stratification by primary cancer treatment modality (targeted therapy vs. non-targeted therapy). Feasibility outcomes were evaluated through mixed-methods at the 12-week follow-up (i.e., post-intervention). Data on effect outcomes were collected and assessed at baseline, as well as the 12- and 24-week follow-ups. Individual semi-structured interviews were conducted at 12-week follow-up. This study adhered to the Consolidate Standard of Reporting Trials (CONSORT) statement for reporting.

2.2. Participants and setting

Survivors were eligible if they were i) diagnosed with stage III or IV cancer confirmed by pathology; ii) a current Eastern Cooperative Oncology Group Performance Status of 0–2; iii) aged $\geq$18 years; iv) able to communicate in Cantonese or Mandarin; and v) conscious and alert. They were excluded if they suffer from a condition that hinders exercise performance (e.g., active neurological disorder, recent heart attack) and currently participating in any other exercise or mind-body classes.

Potential participants were recruited from the Department of Clinical Oncology at a public hospital in Hong Kong and the community via cancer support groups after screening. Written informed consent was obtained from eligible and interested participants before study commencement.

For qualitative phase, as its main purpose is to identify the feasibility of treatment and preliminary effects, purposive sampling was employed to maximize the sample variation in terms of age, gender, and cancer types.

2.3. Sample size

A sample size of at least twelve per group in a pilot study should provide sufficient methodological experience to conduct a full scale RCT in the future (Julious, 2005). With the assumption of 20% attrition based on previous experience, we aimed to recruit 45 participants.

2.4. Interventions

2.4.1. Tai chi group

The standardized 12-form Yang-style Tai Chi exercise was adopted as the intervention (Lan et al., 2002). Group classes, in small size (maximum 10 participants per group), took place in a community center twice a week for 12 weeks, with each class lasting approximately 60 min. An experienced Tai Chi master led the classes, which included: (1) warm-up and self-massage, (2) Tai Chi movements, (3) breathing and relaxation techniques, (4) standing meditation, and (5) cool down and stretching. Participants were instructed to practice Tai Chi at home at least three times a week for 30 min each session. After 12 weeks, a DVD containing the complete set of 12-form Yang-style Tai Chi exercises was provided to all participants. Class attendance was recorded, and the number of and reasons of missed classes were tracked. Participants were provided with a daily exercise log to record their exercise intensity and frequency.

2.4.2. Mindful yoga group

The program was built upon a previously tested structured mindful yoga exercise protocol for patients with Parkinson's disease (Kwok et al., 2019). Groups of up to 10 participants met weekly for 12 weeks at a community center, with each session lasting approximately 120 min. The intervention was delivered using neutral terminology devoid of religious affiliation by a certified yoga instructor with a minimum of two years of yoga teaching experience among patients with chronic illness and expertise in leading mindful yoga programs. The classes included: (i) warm-up exercises, (ii) mindfulness of movement as yoga practice, (iii) mindfulness awareness of controlled breathing (pranayama), (iv)

guided mindfulness meditation (dhyana), and (v) cool down exercises. The 12 modified postures of sun salutations (asanas of Hatha yoga) were adopted as the yoga sequences, described as the most complete yoga exercise available. Printed materials on mindfulness techniques were provided to facilitate learning and self-practice. Participants were encouraged to perform a 20-min, home-based practice twice a week. Class attendance was recorded, and the number of and reasons of missed classes were tracked. Participants were provided with a daily exercise log to record their exercise intensity and frequency.

2.4.3. Self-managed control group

Participants were given written information on the recommended levels of physical activity by the World Health Organization (at least 150 min of moderate-intensity of 75 min of vigorous aerobic exercise per week).

2.4.4. Treatment fidelity and credibility

Both Tai Chi and mindful yoga interventions were administered by one instructor to avoid intervention delivery bias stemming from individual differences in teaching style or skill. A research team member attended all intervention sessions to ensure adherence to the treatment protocol. Treatment credibility, defined as the participant's expectation of the intervention's effectiveness, was assessed using a 4-item questionnaire after the first session. This questionnaire evaluated (i) the reasonableness of the treatment, (ii) the participant's opinion of the therapist, (iii) their expectation for improvement, and (iv) the likelihood of recommending the treatment to others. Each item was rated on a 10-point scale, with higher scores indicating greater expectation.

2.5. Study outcomes

2.5.1. Feasibility outcomes

Feasibility was assessed through both quantitative and qualitative measures. Quantitative outcomes encompassed recruitment feasibility, program acceptability, intervention class attendance, program satisfaction through a 14-item satisfaction questionnaire. Safety was assessed via self-reported adverse events recorded in exercise logs checked weekly by research personnel, alongside spontaneous reporting from participants. Definitions and benchmarks for all feasibility outcomes are detailed in Appendix 1.

Qualitative outcomes were evaluated through semi-structured interviews conducted with participants in both intervention groups at post-intervention. This approach aimed to gain an in-depth understanding of their experiences, subjective evaluations of the interventions, and acceptance of Tai Chi and mindful yoga as lifestyle interventions. Maximum variation sampling was employed to capture a diverse range of experiences within the interventions, taking into account participant characteristics such as primary cancer treatment during the intervention and gender. The interviews were audio-recorded, transcribed, and anonymized.

2.5.2. Effect outcomes

The following measures were evaluated at three time points: (1) preintervention (T0, baseline), (2) 12-week (T1, post-intervention), and (3) 24-week (T2, 12-week post-intervention).

Anxiety and depression were measured by the Chinese version of the Hospital Anxiety and Depression Scale (HADS), comprising two 7-item subscales for anxiety and depression, rated on a 4-point scale. A score of $\geq$8 on either subscale indicates anxiety or depression (Zigmond and Snaith, 1983).

Sleep disturbance was measured by the Chinese version of the Pittsburg Sleep Quality Index (PSQI), consisting of 19 items across 7 components, rated 0 to 3 (Tsai et al., 2005). The total score ranges from 0 to 21, with higher scores denoting poorer sleep.

Emotion regulation was measured by the Chinese version of the Emotion Regulation Questionnaire (ERQ), with 10 items assessing cognitive reappraisal and expressive suppression on a 7-point Likert scale (Li and Wu, 2018). Higher scores indicate greater usage of the respective strategy.

Mindfulness was measured by the 20-item Chinese version of the Five Facet Mindfulness Questionnaire-Short Form (FFMQ-SF) (Hou et al., 2014), rated on a 5-point Likert scale across five factors, with higher scores indicating high mindfulness levels.

Spirituality was measured by the Chinese version of the 12-item Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp-12) (Liu et al., 2016), assessing faith, meaning, and peace on a 5-point Likert scale. Higher scores denote higher spiritual well-being levels.

Holistic well-being was measured by the Chinese version of the Holistic Well-being Scale (HWS), with 30 items evaluating absence of affliction and the presence of equanimity (Chan et al., 2014). Each item is scored from 0 (totally disagree) to 10 (totally agree), with higher score indicating a worse state of holistic well-being.

Physical function was assessed via the timed up-and-go test for agility and the one-leg balance test for balance, following standardized protocols.

Baseline characteristics were collected via a self-administered questionnaire on demographics, disease, and treatment. Functional status was evaluated using the Karnofsky Performance Status scale. Health behaviors, including smoking and alcohol use, were also assessed.

2.6. Statistical analyses

All statistical analyses were conducted using SPSS 28.0. Difference in background characteristics between the interventions and control groups was assessed by chi-square tests or ANOVA. Feasibility outcomes were summarized using descriptive statistics. Intention-to-treat analysis was performed using a linear mixed-effects model (i.e., a statistical method that includes missing data) to compare the outcomes among the three groups (Tai Chi, mindful yoga, and control) at different time points. The persistence of the intervention effect over time will be examined by incorporating a group $\times$ time interaction. Multiplicity due to multiple comparisons among the 3 groups at the 2 follow-up time points was accounted for using the Bonferroni approach.

All semi-structured interviews were audio-recorded and transcribed verbatim. Field notes will be reviewed with the transcripts during the process. Interview transcripts will be analyzed according to the thematic analysis strategy introduced by Braun and Clarke (2006), using NVivo 11.0. Field notes were reviewed with the transcripts during the process.

2.7. Ethics

The study was approved by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 23–255) in accordance with the Declaration of Helsinki. The trial was registered before the first person was enrolled (Chinese Clinical Trial Registry: ChiCTR2300074249).

3. Results

3.1. Recruitment feasibility

Fig. 1 illustrates the recruitment flow diagram. A total of 1669 survivors with cancer were assessed for eligibility in June through July 2023. Of these, 1624 survivors were excluded for the following primary reasons: not being in the advanced stage (n = 389), having physical limitations (n = 306), and having a second cancer diagnosis (n = 279). Of the 295 eligible participants, 46 were recruited and randomized: 15 were assigned to the Tai Chi group, 15 to the mindful yoga group, and 16 to the self-managed control group. Three participants did not receive the interventions due to family issues, scheduling conflicts, and lack of motivation. At post-intervention, eight participants withdrew from the

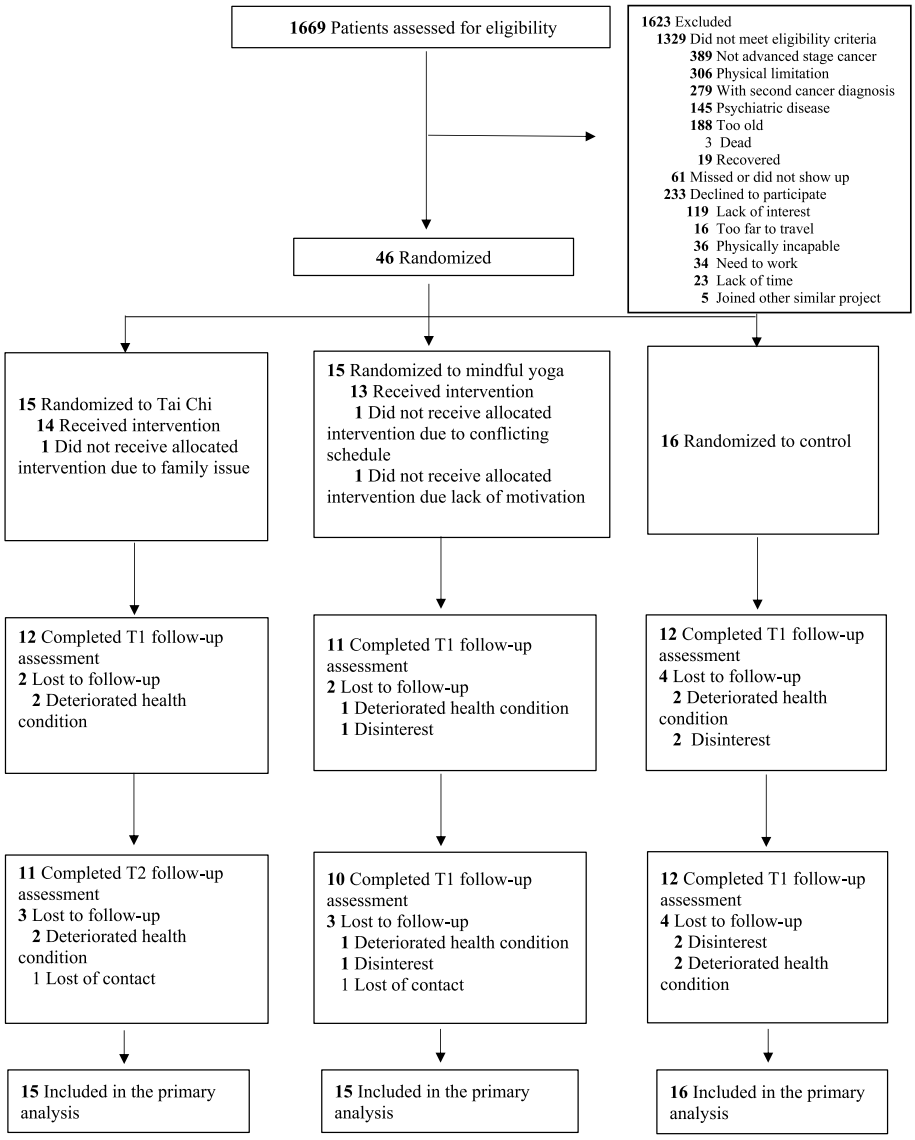

Fig. 1. CONSORT 2020 flow diagram.

study (two from Tai Chi, two from mindful yoga, and four from the control group), with the primary reason being a deteriorating health condition (n = 5).

3.2. Characteristics of participants

Table 1 presents the baseline demographic characteristics of the participants. Baseline demographic and clinical characteristics were well-balanced among the interventions and control groups. The mean age (SD) of participants was 60.26 (12.15) years, with a range of 29–77 years, and 33 of 46 were female (71.7%). The majority of the participants were married or cohabiting (76.1%) and had attained a secondary level of education (52.1%). The most prevalent cancer diagnoses among the participants were breast (23.9%), colorectal (19.6%), and lung cancer (15.2%), and with the majority undergoing cancer treatment (71.7%).

3.3. Outcomes

3.3.1. Feasibility outcomes

All a priori feasibility benchmarks were met. The mean attendance rate for mindful yoga sessions was 87.5%, with an average of 44 min of self-practice per week (110% of the prescribed amount). The mean attendance rate for Tai Chi sessions was 86.9%, with an average of 79.7 min of self-practice per week (88.5% of the prescribed amount). Retention rates was 80% for Tai Chi, 73% for mindful yoga, and 75% for the control group. All participants in the Tai Chi group and 85% in the mindful yoga group rated the intervention as enjoyable. Both intervention programs received positive ratings for their content and arrangement. Participants in both intervention classes rated the credibility items with scores of at least 7 out of 10 in terms of the reasonableness of treatment, opinion of the therapist, expectation for improvement, and likelihood of recommending the treatment to others. All intervention classes demonstrated a satisfactory treatment fidelity. There were no adverse events reported in this study.

3.3.2. Preliminary effect outcomes

Table 2 summarizes the mixed-effect model of all effect outcomes at 12- and 24-week follow-ups between interventions and control groups.

Psychological outcomes. Both Tai Chi (between-group mean change [*d*]: 2.81; 95% CI, −5.23 to −0.38) and mindful yoga groups (*d*: 3.17; 95% CI, −5.76 to −0.57) showed preliminary reductions in depression symptoms at post-intervention compared to the control group. The lower depression persisted in mindful yoga at the 24-week follow-up (*d*:

Table 1
Baseline characteristics of the participants (n = 46).

Characteristic	Participants, No (%)				P Value
	All (N = 46)	Mindful yoga (n = 15)	Tai chi (n = 15)	Control (n = 16)	
Age, mean (SD), y years	60.26 (12.15)	59.07 (13.59)	64.33 (10.17)	57.56 (12.18)	0.28
Sex					0.08
Male	13 (28.3%)	1 (6.7%)	6 (40.0%)	6 (37.5%)	
Female	33 (71.7%)	14 (93.3%)	9 (60.0%)	10 (62.5%)	
Marital status					0.62
Married or cohabiting	35 (76.1%)	12 (80.0%)	12 (80.0%)	11 (68.8%)	
Single	11 (23.9%)	3 (20.0%)	3 (20.0%)	5 (31.2%)	
Education					0.45
Primary or below	9 (19.6%)	2 (13.3%)	5 (33.4%)	2 (12.5%)	
Secondary	24 (52.1%)	8 (53.3%)	7 (46.6%)	9 (56.3%)	
Tertiary or above	13 (28.3%)	5 (33.4%)	3 (20.0%)	5 (31.2%)	
Body mass index, mean (SD)	18.97 (3.08)	18.78 (3.41)	18.51 (3.42)	19.57 (2.44)	0.62
KPS, mean (SD)	89.13 (11.27)	87.67 (10.15)	86.67 (14.23)	92.81 (8.56)	0.27
Type of cancer diagnosis					0.11
Breast	11 (23.9%)	6 (40.0%)	3 (20.0%)	2 (12.5%)	
Colorectal	9 (19.6%)	1 (6.7%)	4 26.7%)	4 (25.0%)	
Lung	7 (15.2%)	4 (26.7%)	0 (0.0%)	3 (18.8%)	
Reproductive system	6 (13.0%)	2 (13.3%)	4 (26.7%)	0 (0.0%)	
Nasopharyngeal	5 (10.9%)	1 (6.7%)	2 (13.3%)	2 (12.5%)	
Others	8 (17.4%)	1 (6.7%)	2 (13.3%)	5 (31.3%)	
Months since diagnosis, mean (SD)	44.67 (44.26)	43.40 (22.78)	52.00 (61.04)	39.00 (42.70)	0.72
Treatment modalities					0.16
Targeted therapy	15 (32.6%)	8 (53.3%)	4 (26.7%)	3 (18.8%)	
Non-targeted therapy	18 (39.1%)	2 (13.3%)	9 (60.0%)	7 (43.8%)	
Chemotherapy	12 (66.7%)	1 (50.0%)	6 (67.7%)	5 (71.4%)	
Other treatment	6 (33.3%)	1 (50.0%)	3 (33.3%)	2 (28.6%)	
No treatment	13 (28.3%)	5 (33.3%)	2 (13.3%)	6 (37.4%)	
Smoking behavior					0.14
Yes	2 (4.3%)	0 (0.0%)	0 (0.0%)	2 (12.5%)	
No	44 (95.7%)	15 (100.0%)	15 (100.0%)	14 (87.5%)	
Drinking behavior					0.23
Yes	5 (10.9%)	0 (0.0%)	2 (13.3%)	3 (18.8%)	
No	41 (89.1%)	15 (100.0%)	13 (86.7%)	13 (81.2%)	
Employment					0.44
Employed	12 (26.1%)	3 (20.0%)	3 (20.0%)	6 (37.5%)	
Unemployed	34 (73.9%)	12 (80.0%)	12 (80.0%)	10 (62.5%)	
Financial hardship					0.61
Yes	6 (13.0%)	1 (6.7%)	2 (13.3%)	3 (18.8%)	
No	40 (87.0%)	14 (93.3%)	13 (86.7%)	13 (81.2%)	

Abbreviations: SD: Standard Deviation.

3.72; 95% CI, −6.33 to −1.11). Tai Chi group showed preliminary reductions in sleep disturbances at post-intervention (*d*: 2.07; 95% CI, −4.02 to −0.11) and 24-week follow-up (*d*: 2.24; 95% CI, −4.36 to −0.12), while mindful yoga showed preliminary reductions in sleep disturbances only at 24-week follow-up (*d*: 2.19; 95% CI, −4.29 to −0.10). Compared to mindful yoga group, Tai Chi group exhibited preliminary improvements in cognitive reappraisal subscale of emotion regulation at post-intervention (*d*: 0.88; 95% CI, 0.05 to 1.72) and 24-week follow-up (*d*: 0.93; 95% CI, 0.19 to 1.66).

Spiritual outcomes. At 24-week follow-up, mindful yoga group showed preliminary improvements in FACIT-Sp12 total score (*d*: 6.01; 95% CI, 0.61 to 11.41), meaning (*d*: 2.28; 95% CI, 0.23 to 4.33), and peace subscales (*d*: 2.29; 95% CI, 0.28 to 4.30), compared to control group. No preliminary differences were observed in FACIT-Sp-12 between Tai Chi and control groups at both follow-ups. Regarding HWS, Tai Chi group exhibited preliminary improvements in equanimity at 24-week follow-up compared to control group (*d*: 43.08; 95% CI, 20.35 to 65.81), whereas mindful yoga showed a preliminary reduction in affliction compared to Tai Chi (*d*: 21.61; 95% CI, 4.04 to 39.19).

Mindfulness outcome. Mindful yoga group showed preliminary improvements in FFMQ total score (*d*: 6.59; 95% CI, 1.27 to 11.92) and act with awareness subscale at 24-week follow-up (*d*: 2.60; 95% CI, 0.15 to 5.06), compared to control. Additionally, mindful yoga group showed preliminary improvements in non-reactivity subscale at post-intervention (*d*: 1.92; 95% CI, 0.50 to 3.34) and 24-week follow-up (*d*: 1.46; 95% CI, 0.02 to 2.89). Moreover, the Tai Chi group demonstrated preliminary improvements in observe subscale (*d*: 2.92; 95% CI, 0.29 to 5.55) and non-reactivity subscale (*d*: 1.71; 95% CI, 0.26 to 3.16) at 24-week follow-up.

Physical functioning outcomes. Compared to control group, both Tai Chi and mindful yoga groups showed preliminary improvements in one-leg balance test at post-intervention (Tai Chi: 36.65; 95% CI, 3.39 to 69.92; Yoga: 51.70; 95% CI, 17.02 to 86.39) and 24-week follow-up (Tai Chi: 62.20; 95% CI, 25.93 to 98.48; Yoga: 59.04; 95% CI, 23.42 to 94.67).

Outcomes were further informed by semi-structured interviews, which are summarized in the subsequent section.

3.3.3. Semi-structured interviews

Twelve participants engaged in semi-structured interviews, with recruitment continuing until data saturation was achieved. Among the interviewees, seven were from mindful yoga and five were from Tai Chi. Three primary themes emerged: i) mindful breathing as a lifestyle practice, ii) shared understanding in advanced cancer community, and iii) regaining motivation and active lifestyle.

3.3.3.1. Mindful breathing as a lifestyle practice. Participants in mindful yoga group reported incorporating mindful breathing and meditation into their daily lives. They found mindful breathing to be an effective method for relieving discomfort and stress, appreciating its adaptability for practice anytime and anywhere.

> "We learned a different way to breathe. I can do this (mindful breathing) while walking or sitting quietly, so it's pretty easy to fit into daily life. For me, it (mindful breathing) is a powerful tool for me to relax, and when combined with meditation, it's incredibly useful for easing pain."

3.3.3.2. Shared understanding in advanced cancer community. Both intervention classes provided a supportive environment where participants connected with others facing similar challenges. This environment not only fostered camaraderie but also encouraged personal growth and achievement. Participants empowered one another to persevere through

Table 2
Mixed effects analysis for the interventional effects (n = 46).

	Mindful yoga		Tai chi		Control		Between-Group Difference[a]						P Value for Group × Time Interaction Effect
							Yoga-Control		Tai chi- Control		Yoga-Tai Chi		
	Within-Group Change From Baseline (95% CI)	P Value	Within-Group Change From Baseline (95% CI)	P Value	Within-Group Change From Baseline (95% CI)	P Value	Estimate (95% CI)	P Value	Estimate (95% CI)	P Value	Estimate (95% CI)	P Value	
PSQI													
T1	1.03 (−0.62, 2.67)	0.39	0.07 (−1.50, 1.64)	1.00	2.08 (0.60, 3.57)	0.003*	−1.12 (−3.17, 0.93)	0.55	−2.07 (−4.02, −0.11)	0.03*	0.94 (−1.12, 3.01)	0.81	0.04*
T2	−0.51 (−2.33, 1.32)	1.00	−0.57 (−2.47, 1.33)	1.00	1.62 (−0.04, 3.28)	0.06	−2.19 (−4.29, −0.10)	0.04*	−2.24 (−4.36, −0.12)	0.04*	0.05 (−2.18, 2.28)	1.00	0.01*
HADS-Anxiety													
T1	1.36 (−0.54, 3.27)	0.25	−0.86 (−2.68, 0.96)	0.75	−0.43 (−2.16, 1.30)	1.00	1.73 (−0.67, 4.13)	0.25	0.55 (−2.82, 1.71)	1.00	2.28 (−0.11, 4.67)	0.07	0.06
T2	−0.80 (−2.91, 1.31)	1.00	−1.04 (−3.24, 1.16)	0.75	−0.39 (−2.32, 1.53)	1.00	−0.48 (−2.94, 1.99)	1.00	−0.77 (−3.23, 1.68)	1.00	0.30 (−2.29, 2.88)	1.00	0.74
HADS-Depression													
T1	0.33 (−1.83, 2.49)	1.00	0.37 (−1.71, 2.45)	1.00	2.98 (1.01, 4.96)	0.001*	−3.17 (−5.76, −0.57)	0.01*	−2.81 (−5.23, −0.38)	0.02*	−0.36 (−2.92, 2.20)	1.00	0.01*
T2	−0.07 (−2.35, 2.20)	1.00	0.96 (−1.42, 3.34)	0.98	3.13 (1.04, 5.21)	0.001*	−3.72 (−6.33, −1.11)	0.002*	−2.36 (−4.97, 0.24)	0.09	−1.36 (−4.09, 1.38)	0.69	0.003*
ERQ-Cognitive reappraisal													
T1	−0.42 (−1.16, 0.31)	0.48	0.43 (−0.21, 1.07)	0.31	0.44 (−0.21, 1.08)	0.29	−1.00 (−1.86, −0.15)	0.02*	−0.12 (−0.87, 0.63)	1.00	−0.88 (−1.72, −0.47)	0.04*	0.01*
T2	0.15 (−0.46, 0.77)	1.00	1.05 (0.41, 4.69)	<0.001*	−0.14 (−0.70, 0.42)	1.00	0.15 (−0.53, 0.83)	1.00	1.08 (0.38, 1.78)	<0.001*	−0.93 (−1.66, −0.19)	0.01*	<0.001*
ERQ-Expressive suppression													
T1	0.10 (−0.93, 0.95)	1.00	−0.07 (−0.89, 0.75)	1.00	−0.07 (−0.88, 0.74)	1.00	−0.05 (−1.23, 1.13)	1.00	−0.04 (−1.10, 1.02)	1.00	−0.01 (−1.18, 1.16)	1.00	0.99
T2	0.52 (−0.36, 1.39)	0.45	0.92 (0.02, 1.82)	0.05*	0.15 (−0.64, 0.95)	1.00	0.23 (−0.78, 1.24)	1.00	0.72 (−0.30, 1.74)	0.27	−0.49 (−1.56, 0.58)	0.80	0.23
FFMQ													
T1	2.79 (−1.07, 6.65)	0.24	0.79 (−2.89, 4.46)	1.00	−0.82 (−4.31, 2.68)	1.00	3.83 (−1.29, 8.94)	0.21	1.46 (−3.40, 6.32)	1.00	2.37 (−2.76, 7.52)	0.80	0.19
T2	3.99 (−0.47, 8.44)	0.10	1.95 (−2.67, 6.56)	0.92	−2.39 (−6.46, 1.69)	0.47	6.59 (1.27, 11.92)	0.01*	4.19 (−1.14, 9.51)	0.18	2.41 (−3.22, 8.03)	0.90	0.01*
FFMQ-Observe													
T1	1.49 (−0.60, 3.58)	0.26	2.71 (0.70, 4.71)	0.004*	1.09 (−0.81, 3.00)	0.49	1.22 (−1.40, 3.83)	0.78	1.37 (−1.05, 3.80)	0.51	−0.16 (−2.79, 2.47)	1.00	0.33
T2	1.89, (−0.38, 4.17)	0.14	4.22 (1.85, 6.60)	<0.001*	1.06 (−1.03, 3.14)	0.65	1.65 (−1.02, 4.33)	0.40	2.92 (0.29, 5.55)	0.02*	−1.27 (−4.09, 1.56)	0.83	0.03*
FFMQ-describe													
T1	0.87 (−0.72, 2.46)	0.56	−0.03 (−1.55, 1.49)	1.00	−0.31 (−1.76, 1.13)	1.00	1.05 (−1.07, 3.16)	0.69	0.23 (−1.79, 2.25)	1.00	0.82 (−1.32, 2.95)	1.00	0.46
T2	0.74 (−1.10, 2.58)	0.99	−0.56 (−2.47, 1.35)	1.00	−0.22 (−1.90, 1.47)	1.00	0.82 (−1.38, 3.02)	1.00	−0.40 (−2.60, 1.81)	1.00	1.22 (−1.11, 3.54)	0.62	0.43
FFMQ-Act with awareness													
T1	−0.03 (−1.82, 1.76)	1.00	−1.59 (−3.30, 0.11)	0.08	−1.62 (−3.23, −0.01)	0.05*	1.79 (−0.58, 4.16)	0.21	0.05 (−2.20, 2.31)	1.00	1.74 (−0.65, 4.12)	0.24	0.13
T2	0.39 (−1.68, 2.45)	1.00	−1.53 (−3.67, 0.61)	0.25	−2.01 (−3.89, −0.14)	0.03*	2.60 (0.15, 5.06)	0.03*	0.51 (−1.96, 2.98)	1.00	2.09 (−0.51, 4.69)	0.16	0.03*
FFMQ-non-judging of inner experience													

(*continued on next page*)

Table 2 (*continued*)

	Mindful yoga		Tai chi		Control		Between-Group Difference[a]						P Value for Group × Time Interaction Effect
							Yoga-Control		Tai chi- Control		Yoga-Tai Chi		
	Within-Group Change From Baseline (95% CI)	P Value	Within-Group Change From Baseline (95% CI)	P Value	Within-Group Change From Baseline (95% CI)	P Value	Estimate (95% CI)	P Value	Estimate (95% CI)	P Value	Estimate (95% CI)	P Value	
T1	−0.71 (−2.26, 0.85)	0.80	−1.32 (−2.81, 0.17)	0.10	0.27 (−1.14, 1.68)	1.00	−0.91 (−2.86, 1.04)	0.78	−1.32 (−3.18, 0.54)	0.26	0.41 (−1.57, 2.40)	1.00	0.21
T2	0.81 (−1.54, 1.91)	1.00	−1.60 (−3.40 0.20)	0.10	−1.08 (−2.66, 0.50)	0.29	1.34 (−0.66, 3.33)	0.32	−0.25 (−2.27, 1.78)	1.00	1.58 (−0.56, 3.72)	0.22	0.15
FFMQ-non-reactivity to inner experience													
T1	1.53 (−2.72, −0.33)	0.01*	1.07 (−0.07, 2.21)	0.07	−0.34, −1.42, −0.75)	1.00	1.92 (0.50, 3.34)	0.004*	1.30 (−0.50, 2.64)	0.06	0.63 (−0.81, 2.06)	0.87	0.004*
T2	1.21 (−0.07, 2.49)	0.07	1.63 (0.31, 2.96)	0.01*	−0.19 (−1.35, 0.97)	1.00	1.46 (0.02, 2.90)	0.05*	1.71 (0.26, 3.16)	0.02*	−0.26 (−1.79, 1.28)	1.00	0.01*
FACIT Sp-12 total													
T1	0.57 (−5.43, 6.58)	1.00	−1.18 (−6.47, 4.10)	1.00	−0.84 (−6.08, 4.40)	1.00	1.29 (−5.64, 8.22)	1.00	−0.29 (−6.35, 5.77)	1.00	1.58 (−5.06, 8.22)	1.00	0.84
T2	4.30 (−0.59, 9.19)	0.10	0.43 (−4.65, 5.50)	1.00	−1.83 (−6.28, 2.63)	0.96	6.01 (0.61, 11.41)	0.02*	2.31 (−3.18, 7.80)	0.92	3.70 (−2.08, 9.48)	0.37	0.03*
FACIT Sp-12- meaning													
T1	−0.54 (−2.70, 1.62)	1.00	−0.27 (−2.18, 1.63)	1.00	−1.79 (−3.67, 0.09)	0.07	1.29 (−1.28, 3.86)	0.67	1.58 (−0.70, 3.86)	0.28	−0.29 (−2.80, 2.21)	1.00	0.22
T2	0.99 (−0.85, 2.84)	0.58	−0.11 (−2.04, 1.82)	1.00	−1.24 (−2.94, 0.46)	0.23	2.28 (0.23, 4.33)	0.02*	1.20 (−0.89, 3.29)	0.50	1.08 (−1.11, 3.27)	0.70	0.03*
FACIT Sp-12- peace													
T1	1.67 (−0.43, 3.78)	0.16	−0.38 (−2.21, 1.46)	1.00	0.10 (1.71, 1.91)	1.00	1.40 (−1.10 3.89)	0.52	−0.42 (−2.64, 1.80)	1.00	1.82 (−0.62, 4.26)	0.22	0.19
T2	2.08 (0.27, 3.90)	0.02*	0.22 (−1.67, 2.10)	1.00	−0.39 (−2.04, 1.26)	1.00	2.29 (0.28, 4.30)	0.02*	0.66 (−1.39, 2.70)	1.00	1.63 (−0.51, 3.77)	0.20	0.02*
FACIT Sp-12- faith													
T1	−1.52 (−4.10, 1.06)	0.46	−0.33 (−2.60, 1.94)	1.00	0.95 (−1.33, 3.23)	0.93	−2.46 (−5.41, 0.50)	0.14	−1.29 (−3.82, 1.24)	0.65	−1.17 (−3.98, 1.64)	0.94	0.13
T2	−0.15 (−2.20, 1.91)	1.00	0.39 (−1.73, 2.52)	1.00	−0.31 (−2.18, 1.55	1.00	0.18 (−2.10, 2.46)	1.00	0.69 (−1.63, 3.01)	1.00	−0.51 (−2.97, 1.95)	1.00	0.76
HWS-absence of affliction													
T1	1.03 (−15.37, 17.43)	1.00	−1.24 (−15.57, 13.09)	1.00	6.60 (−7.63, 30.82)	0.77	−6.65 (−26.69, 13.39)	1.00	−10.06 (−28.11, 8.00)	0.53	3.41 (−16.37, 23.19)	1.00	0.39
T2	−10.56 (−25.19, 4.08)	0.24	12.20 (−3.22, 30.09)	0.15	4.16 (−9.23, 17.55)	1.00	−15.80 (−32.3, 0.74)	0.07	5.82 (−11.06, 22.70)	1.00	−21.62 (−39.19, −4.04)	0.01*	0.01*
HWS-presence of equanimity													
T1	14.11 (−9.78, 37.99)	0.45	5.69 (−15.52, 26.89)	1.00	−2.36 (−23.31, 18.59)	1.00	18.08 (−10.49, 46.64)	0.38	7.30 (−17.73, 32.33)	1.00	10.78 (−16.66, 38.22)	1.00	0.31
T2	4.29 (−15.87, 35.56)	1.00	30.85 (9.81, 51.89)	0.002*	−12.97 (−31.45, 5.51)	0.27	18.88 (−4.00, 41.75)	0.14	43.08 (20.35, 65.81)	<0.001*	−24.20 (−48.46, 0.06)	0.05	<0.001*
One-leg balance													
T1	23.87 (−3.49, 51.24)	0.11	11.66 (−14.57, 37.89)	0.84	−26.46 (−51.34, −1.59)	0.03*	51.70 (17.02, 86.39)	0.001*	36.65 (3.39, 69.92)	0.03*	15.05 (−20.06, 50.16)	0.89	0.001*
T2	12.84 (−17.81, 43.48)	0.93	18.84 (−13.12, 50.79)	0.46	−44.84 (−78.91, −16.77)	<0.001*	59.04 (23.42, 94.67)	<0.001*	62.20 (25.93, 98.48)	<0.001*	−3.16 (−41.16, 34.83)	1.00	<0.001*
TUGT[b]													
T1	1.03 (−0.16, 2.22)	0.11	1.12 (−0.02, 2.26)	0.06	1.32 (0.24, 2.39)	0.01*	−0.53 (−2.09, 1.03)	1.00	−0.29 (−1.79, 1.21)	1.00	−0.24 (−1.82, 1.34)	1.00	0.71
T2	1.38 (0.01, 2.74)	0.05*	1.04 (−0.39, 2.46)	0.24	1.17 (−0.07, 2.41)	0.07	−0.04 (−1.66, 1.57)	1.00	−0.23 (−1.88, 1.42)	1.00	0.19 (−1.54, 1.92)	1.00	0.94

Abbreviations: ERQ: Emotion Regulation Questionnaire; FACIT-Sp-12: Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale; FFMQ-SF: Five Facet Mindfulness Questionnaire-Short Form; HADS: Hospital Anxiety and Depression Score; HWS: Holistic Well-being Scale; PSQI: Pittsburgh Sleep Quality Index; TUGT: Timed up and Go Test; T1: immediately after intervention (12 weeks); T2: 3 months after intervention (24 weeks).
*$p < 0.05$.
[a] Effect estimates are designated as *d* in the description of the study results.
[b] Log transformation was performed.

their health.

> "Being part of the class feels so nice. My friends might not understand what I'm dealing with, but in this class, everyone's on the same journey. We support each other without having to explain everything. Plus, it's really great to see everyone working hard and giving it their all for each movement – it's genuinely touching."

3.3.3.3. Regain motivation and active lifestyle. Participants from both groups successfully integrated mind-body exercises into their daily routine. This consistent practice highlights a positive shift in their approach to health and self-care.

> "Before, I only exercised when I realized I'd been sitting for ages, and it was mood-dependent. But now, meditation and yoga are regular parts of my routine. I practice for an hour in the morning and another hour and a half in the evening."

In terms of future directions, participants recommended enhancing interpersonal interactions and group sharing following the class sessions. Additionally, some yoga participants suggested that a 90-min session would be more suitable for their physical condition and attention span, particularly during the cancer treatment period.

3.3.4. Integration of qualitative and quantitative findings

The potentially sustained reductions in depression and gains in mindfulness among mindful yoga participants at 24 weeks align with the theme of "mindful breathing as a lifestyle practice". Participants described using breath and meditation daily, anywhere and anytime, to regulate stress and discomfort. This routinized self-regulation plausibly supports durable improvements in mood and in mindfulness facets such as non-reactivity and acting with awareness, mirroring the promising 24-week effects observed in depression, FFMQ total, non-reactivity, and act with awareness. The theme "Regaining motivation and active lifestyle" further contextualize the maintenance of preliminary benefits in psycho-spiritual and physical functioning outcomes. The mindful breathing theme also aligns with the 24-week gains in spiritual well-being (meaning and peace) in the mindful yoga group. Across both interventions, the shared understanding within the advanced cancer community likely enhanced adherence and confidence, supporting the durability of physical functioning gains. These integrated, exploratory meta-inferences inform the design of a definitive trial.

4. Discussion

This study is the first to explore the feasibility, acceptability, and potential implementation of two popular movement-based mind-body interventions – Tai Chi and mindful yoga-among advanced cancer survivors. Results indicated the 12-week interventions were feasible, well-received, and demonstrated preliminary efficacy in enhancing psycho-spiritual, mindfulness outcomes, and physical function. The study reported an attendance rate exceeding 86% for both interventions, with most participants achieving the recommended amount of self-practice and no adverse events reported.

Participants reported high satisfaction with both interventions. Although mindful yoga employed a single 2-h weekly session to facilitate deeper mindfulness states compared to Tai Chi's format, both were dosage-matched. Notably, despite the significant symptom burden characteristic of advanced cancer, we observed strong adherence to both attendance and home practice requirements. Participants recommended structured post-class group sharing to enhance interpersonal support and suggested shortening mindful yoga sessions to approximately 90 min to better align with fatigue and attentional limits for this population.

Though preliminary in nature, participants in both groups experienced a preliminary reduction in depression after 12 weeks of intervention, with promising effects persisting up to 24 weeks for the mindful yoga group. This sustained promising improvement suggested that mindful yoga may offer enduring mental health benefits, potentially due to its emphasis on cultivating mindfulness and spiritual well-being. Additionally, the mindful yoga group demonstrated preliminary enhancements in mindfulness, particularly in the subscales of acting with awareness and non-reactivity. They also showed preliminary improvements in spiritual well-being, notably in the subscales of meaning and peace, at 24 weeks. Experiential mindful awareness is a common goal shared by both Tai Chi and mindful yoga. Rooted in Buddhist traditions, mindfulness is characterized by nonjudgmental awareness of the present moment, with focused attention on the body and breath, enabling the mind to reset from rumination and worry (Kabat-Zinn and Hanh, 2009). Mindfulness practice helps individuals recognize distressing feelings and emotions with reduced reactivity and judgment, which promotes greater acceptance and overall well-being (Felsted, 2020). The preliminary beneficial effects on depression aligned with previous meta-analysis indicating that mindfulness-based therapy and Tai Chi offered significant benefits for anxiety and depression in cancer survivors (Piet et al., 2012; Takemura et al., 2024, 2025). Depression was fueled by engagement in worry and rumination. Practicing mindfulness allowed individuals to stand back from thoughts and remain present in the unfolding experience by paying attention nonjudgmentally to thoughts and feelings (Kabat-Zinn and Hanh, 2009), which is a crucial faculty for the health regulation of emotions.

Mindfulness meditation practice manifests differently in Tai Chi and mindful yoga, which may reflect differing effects on mindfulness and spiritual well-being. Tai Chi incorporates mindfulness through standing meditation, whereas in mindful yoga uses mindful movement of asana, controlled breathing, and guided meditation. Notably, the preliminary effects of mindful yoga on mindfulness and spiritual outcomes became evident at 24 weeks. The delayed yet profound impact suggested that regular and in-depth practice of mindful yoga is necessary to cultivate deep mindfulness and spiritual awareness (Creswell, 2017). While we hypothesize that these practice-specific mechanisms underlie the observed timing of effects, these hypotheses require empirical testing in future studies. Qualitative findings provided important context, elucidating the benefits observed at a longer follow-up, when participants reported integrating mindful breathing as a lifestyle practice and incorporating meditation and yoga into their daily routines. These lifestyle changes may contribute to the long-term benefits observed, highlighting the potential of mindful yoga as a sustainable intervention for enhancing psychological and spiritual health. Future research could explore the specific components of mindful yoga that contribute most to these outcomes and investigate the optimal frequency and duration of practice needed to maximize benefits. Although Tai Chi group has yet to show significant findings, there is a trend of improvement in mindfulness and spiritual well-being measures at 24 weeks. A fully powered study is warranted to examine its effectiveness on these health outcomes.

Interestingly, Tai Chi participants demonstrated potentially greater improvement in cognitive reappraisal for emotion regulation compared to mindful yoga, lasting up to 24 weeks. We hypothesize this difference

may reflect the distinct philosophical foundations of the two practices and their alignment with the mechanisms captured by the ERQ subscales. Tai Chi, grounded in Taoist principles, emphasizes the harmonious balance of yin and yang, encouraging participants to flow with life changes and adapt to new experiences, emotions, and thoughts. The dynamic, gentle, and continuous movements of Yang-style Tai Chi embody these principles, fostering a state of mental and physical equilibrium that may cultivate cognitive flexibility and attentional shifting, thereby facilitating cognitive reappraisal, a subscale of the ERQ (Li et al., 2003). In contrast, mindful yoga is based on the philosophical principle of non-judgmental awareness, focusing on acceptance and observation of thoughts and feelings rather than transformation. This approach may nurture a stable and calm state of mind but may not actively promote reinterpretation of emotional experiences. These proposed mechanistic links are exploratory; future work is warranted to test them via mediation analyses.

4.1. Implications

The feasibility, acceptability, and preliminary efficacy of Tai Chi and mindful yoga interventions indicated a strong potential for future research to focus on standardizing the components and delivery methods. This would enhance the understanding of their specific effects on psychological and spiritual outcomes in cancer survivors. Conducting large-scale randomized controlled trials to assess the efficacy of these interventions in reducing psycho-spiritual distress in advanced cancer survivors is warranted. Furthermore, exploring the long-term benefits and potential mechanisms through which Tai Chi and mindful yoga influence well-being could provide deeper insights into their role in cancer care.

4.2. Limitations

This study has several strengths and limitations. One notable strength is the utilization of a mixed-method approach, which facilitates a more comprehensive understanding of participants' experiences and perspectives by providing rich data that supplements the quantitative findings. This method adheres to the recommendations of the Medical Research Council of the evaluation of complex interventions. Several limitations must be acknowledged. Firstly, the feasibility nature of the study confines it to a single center and cultural context, diminishing generalizability and potentially introducing bias; a multicentered RCT would be necessary to improve generalizability. Secondly, the majority of the outcome measures are collected via self-reported questionnaires. Future research could integrate objective measures to enhance the validity and reliability of the assessments. Thirdly, the sample was predominantly female (71.7%) and consisted mostly of breast cancer patients, limiting generalizability to the broader advanced cancer population. Fourthly, this study was not powered to detect statistically significant differences in the effects outcomes. Hence, all the findings are preliminary in nature and require confirmation in a future adequately powered trial. Fifthly, despite applying Bonferroni correction, the exploratory analysis of multiple outcomes remains susceptible to Type I errors.

5. Conclusion

This study provided evidence supporting the feasibility and acceptability of Tai Chi and mindful yoga program in advanced cancer survivors, evidenced by satisfactory attendance rates and levels of self-practice. Both interventions showed preliminary beneficial effects on psychological, spiritual, mindfulness outcomes, and physical function. A fully powered randomized controlled trial is warranted to investigate the long-term effectiveness of these interventions on psycho-spiritual outcomes and to determine the optimal implementation strategies.

CRediT authorship contribution statement

Naomi Takemura: Writing – original draft, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jojo Yan-Yan Kwok:** Writing – review & editing, Methodology. **Wing Lok Chan:** Writing – review & editing, Resources, Project administration. **Daniel Yee-Tak Fong:** Writing – review & editing, Formal analysis.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Consent to publish

Not applicable.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster (UW 23–255).

Funding

This work was supported by The Seed Fund for Basic Research for New Staff, The University of Hong Kong (Grant number: 2201101857).

Declaration of competing interest

There are no conflicts of interest to declare.

Appendix 1. Definitions of feasibility outcomes

Parameters	Assessment method	Benchmark (if any)
Eligibility rate	The number of participants who met the inclusion criteria divided by the number of people screened for eligibility	N/A
Recruitment rate	The number of participants who consented to participate in the study divided by the number of participants who met the inclusion criteria	N/A
Attendance rate	The number of sessions participants have attended divided by the total number of scheduled sessions. (benchmark >80%)	≥80%
Retention rate	The number of participants who completed the study at post-intervention divided by the number of randomized participants (benchmark >70%).	≥70%
Participant satisfaction	A 14-item investigator-designed questionnaire.	N/A
Adverse events	Records in logbook	None

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

References

Bash, A., 2004. Spirituality: the emperor's new clothes? J. Clin. Nurs. 13, 11–16.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3, 77–101.

Breitbart, W., Poppito, S., Rosenfeld, B., Vickers, A.J., Li, Y., Abbey, J., Olden, M., Pessin, H., Lichtenthal, W., Sjoberg, D., Cassileth, B.R., 2012. Pilot randomized controlled trial of individual meaning-centered psychotherapy for patients with advanced cancer. J. Clin. Oncol. 30, 1304–1309.

Breitbart, W., Rosenfeld, B., Pessin, H., Applebaum, A., Kulikowski, J., Lichtenthal, W.G., 2015. Meaning-centered group psychotherapy: an effective intervention for improving psychological well-being in patients with advanced cancer. J. Clin. Oncol. 33, 749–754.

Brown, D., 2016. Taoism Through Tai Chi Chuan: Physical Culture as Religious or Holistic Spirituality? Spirituality Across Disciplines: Research and Practice, pp. 317–328.

Chan, C.H., Chan, T.H., Leung, P.P., Brenner, M.J., Wong, V.P., Leung, E.K., Wang, X., Lee, M.Y., Chan, J.S., Chan, C.L., 2014. Rethinking well-being in terms of affliction and equanimity: development of a holistic well-being scale. J. Ethnic Cult. Divers. Soc. Work 23, 289–308.

Chan, C.H., Ji, X.-W., Chan, J.S., Lau, B.H., So, K.-F., Li, A., Chung, K.-F., Ng, S.-M., Chan, C.L., 2016. Effects of the integrative mind-body intervention on depression, sleep disturbances and plasma IL-6. Psychother. Psychosom. 86, 54–56.

Chochinov, H.M., Kristjanson, L.J., Breitbart, W., Mcclement, S., Hack, T.F., Hassard, T., Harlos, M., 2011. Effect of dignity therapy on distress and end-of-life experience in terminally ill patients: a randomised controlled trial. Lancet Oncol. 12, 753–762.

Cramer, H., Pokhrel, B., Fester, C., Meier, B., Gass, F., Lauche, R., Eggleston, B., Walz, M., Michalsen, A., Kunz, R., Dobos, G., Langhorst, J., 2016. A randomized controlled bicenter trial of yoga for patients with colorectal cancer. Psychooncology 25, 412–420.

Creswell, J.D., 2017. Mindfulness interventions. Annu. Rev. Psychol. 68, 491–516.

Creswell, J.W., Clark, V.L.P., 2017. Designing and Conducting Mixed Methods Research. Sage publications.

Delgado-Guay, M.O., Hui, D., Parsons, H.A., Govan, K., De La Cruz, M., Thorney, S., Bruera, E., 2011. Spirituality, religiosity, and spiritual pain in advanced cancer patients. J. Pain Symptom Manag. 41, 986–994.

Faller, H., Schuler, M., Richard, M., Heckl, U., Weis, J., Küffner, R., 2013. Effects of psycho-oncologic interventions on emotional distress and quality of life in adult patients with cancer: systematic review and meta-analysis. J. Clin. Oncol. 31, 782–793.

Felsted, K.F., 2020. Mindfulness, stress, and aging. Clin. Geriatr. Med. 36, 685–696.

Galantino, M.L., Callens, M.L., Cardena, G.J., Piela, N.L., Mao, J.J., 2013. Tai chi for well-being of breast cancer survivors with aromatase inhibitor-associated arthralgias: a feasibility study. Alternative Ther. Health Med. 19, 38–44.

Hou, J., Wong, S.Y.-S., Lo, H.H.-M., Mak, W.W.-S., Ma, H.S.-W., 2014. Validation of a Chinese version of the five facet mindfulness questionnaire in Hong Kong and development of a short form. Assessment 21, 363–371.

Julious, S.A., 2005. Sample size of 12 per group rule of thumb for a pilot study. Pharm. Stat. 4, 287–291.

Kabat-Zinn, J., Hanh, T.N., 2009. Full Catastrophe Living: Using the Wisdom of your Body and Mind to Face Stress, Pain, and Illness. Delta.

Khanna, S., Greeson, J.M., 2013. A narrative review of yoga and mindfulness as complementary therapies for addiction. Compl. Ther. Med. 21, 244–252.

Kwok, J.Y.Y., Kwan, J.C.Y., Auyeung, M., Mok, V.C.T., Lau, C.K.Y., Choi, K.C., Chan, H.Y. L., 2019. Effects of mindfulness yoga vs stretching and resistance training exercises on anxiety and depression for people with parkinson disease: a randomized clinical trial. JAMA Neurol. 76, 755–763.

Lan, C., Lai, J.-S., Chen, S.-Y., 2002. Tai chi chuan. Sports Med. 32, 217–224.

Leal, I., Engebretson, J., Cohen, L., Fernandez-Esquer, M.E., Lopez, G., Wangyal, T., Chaoul, A., 2018. An exploration of the effects of Tibetan yoga on patients' psychological well-being and experience of lymphoma: an experimental embedded mixed methods study. J. Mix. Methods Res. 12, 31–54.

Li, C.-H., Wu, J.-J., 2018. Psychometric evaluation of the Chinese version of the emotion regulation questionnaire in Taiwanese college students. Assessment 27, 1300–1309.

Li, F., Fisher, K.J., Harmer, P., Shirai, M., 2003. A simpler eight-form easy tai chi for elderly adults. J. Aging Phys. Activ 11, 206–218.

Lin, H.R., Bauer-Wu, S.M., 2003. Psycho-spiritual well-being in patients with advanced cancer: an integrative review of the literature. J. Adv. Nurs. 44, 69–80.

Liu, X., Wei, D., Chen, Y., Cheng, Q., Liang, S., Xu, X., Zhang, M., 2016. Reliability and validity of the Chinese version of the functional assessment of chronic illness therapy-spiritual well-being in cancer patients. Chin. J. Nurs. 9, 1085–1090.

Lötzke, D., Wiedemann, F., Rodrigues Recchia, D., Ostermann, T., Sattler, D., Ettl, J., Kiechle, M., Büssing, A., 2016. Iyengar-yoga compared to exercise as a therapeutic intervention during (Neo)adjuvant therapy in women with stage I-III breast cancer: Health-related quality of life, mindfulness, spirituality, life satisfaction, and cancer-related fatigue. Evid. Based Complement. Alternat. Med. 2016, 5931816.

Mccoubrie, R.C., Davies, A.N., 2006. Is there a correlation between spirituality and anxiety and depression in patients with advanced cancer? Support. Care Cancer 14, 379–385.

Mclouth, L.E., Ford, C.G., Pustejovsky, J.E., Park, C.L., Sherman, A.C., Trevino, K., Salsman, J.M., 2021. A systematic review and meta-analysis of effects of psychosocial interventions on spiritual well-being in adults with cancer. Psychooncology 30, 147–158.

Pearce, M.J., Coan, A.D., Herndon, J.E., Koenig, H.G., Abernethy, A.P., 2012. Unmet spiritual care needs impact emotional and spiritual well-being in advanced cancer patients. Support. Care Cancer 20, 2269–2276.

Piet, J., Würtzen, H., Zachariae, R., 2012. The effect of mindfulness-based therapy on symptoms of anxiety and depression in adult cancer patients and survivors: a systematic review and meta-analysis. J. Consult. Clin. Psychol. 80, 1007.

Ratarasarn, K., Kundu, A., 2020. Yoga and Tai Chi: a mind–body approach in managing respiratory symptoms in obstructive lung diseases. Curr. Opin. Pulm. Med. 26, 186–192.

Swensen, C.H., Fuller, S., Clements, R., 1993. Stage of religious faith and reactions to terminal cancer. J. Psychol. Theol. 21, 238–245.

Takemura, N., Cheung, D.S.T., Fong, D.Y.T., Lee, A.W.M., Lam, T.-C., Ho, J.C.-M., Kam, T.Y., Chik, J.Y.K., Lin, C.-C., 2024. Effectiveness of aerobic exercise and Tai chi interventions on sleep quality in patients with advanced lung cancer: a randomized clinical trial. JAMA Oncol. 10, 176–184.

Takemura, N., Chung, K.C.-W., Kwok, J.Y.-Y., Fong, D.Y.T., 2025. Effect of yoga on psychological and spiritual outcomes in cancer patients: a systematic review and meta-analysis of randomized controlled trials with meta-regression. Psychother. Psychosom. 94, 289–301.

Tsai, P.-S., Wang, S.-Y., Wang, M.-Y., Su, C.-T., Yang, T.-T., Huang, C.-J., Fang, S.-C., 2005. Psychometric evaluation of the Chinese version of the Pittsburgh sleep quality index (CPSQI) in primary insomnia and control subjects. Qual. Life Res. 14, 1943–1952.

Velasco, V., Cruz-Castellanos, P., Hernandez, R., Rodriguez-Gonzalez, A., Montes, A.F., Gallego, A., Manzano-Fernandez, A., Sorribes, E., Zafra, M., Carmona-Bayonas, A., 2022. Assessment of psychological distress, coping, and spirituality in patients with resected, non-metastatic vs unresectable advanced cancer. Data from the NEOcoping and NEOetic_SEOM studies. medRxiv 05.16, 22275172, 2022.

Winkelman, W.D., Lauderdale, K., Balboni, M.J., Phelps, A.C., Peteet, J.R., Block, S.D., Kachnic, L.A., Vanderweele, T.J., Balboni, T.A., 2011. The relationship of spiritual concerns to the quality of life of advanced cancer patients: preliminary findings. J. Palliat. Med. 14, 1022–1028.

Yang, C.-T., Yen, S.-Y., Chen, J.-O., 2010. Spiritual well-being: a concept analysis. Hu Li Za Zhi 57, 99–104.

Zeng, Y., Xie, X., Cheng, A.S.K., 2019. Qigong or Tai chi in cancer care: an updated systematic review and meta-analysis. Curr. Oncol. Rep. 21, 48.

Zigmond, A.S., Snaith, R.P., 1983. The hospital anxiety and depression scale. Acta Psychiatr. Scand. 67, 361–370.