

Self-reported outcomes and associated factors among patients with cancer completing Mongolian mind-body interaction therapy: a cross-sectional study

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ABSTRACT

Introduction Patients with malignant tumors face physical illness and psychological distress. Mongolian mind-body interaction therapy (MMBIT) is a group-based intervention combining modern psychology with traditional Mongolian medicine. As a complementary oncology approach, MMBIT supports conventional evidence-based care. This study characterized the demographic and clinical profiles of MMBIT participants and identified therapeutic factors associated with reported benefits. **Methods** A cross-sectional analysis included 1590 patients with cancer who completed the 21-session MMBIT course. A 121-item questionnaire assessed self-reported outcomes across six domains: physical symptoms, psychological symptoms, positive emotions, life conditions, health knowledge, and perceived treatment efficacy. One-sample *t*-tests, Pearson correlations, nonparametric group comparisons, and multivariable linear regression were used. **Results** Participants reported favorable outcomes across all six domains, with mean scores significantly above the neutral midpoint of the 5-point scale (all $P < 0.001$). The highest ratings were observed for health knowledge (4.55 [0.58]), life conditions (4.43 [0.67]), and positive emotions (4.35 [0.70]). Greater MMBIT engagement, particularly video-based participation, was positively associated with more favorable self-reported outcomes ($r = 0.21$ – 0.34). Farmers, herdsman, and participants with lower educational attainment reported higher outcome scores ($P < 0.001$); lower educational attainment remained the strongest independent predictor after multivariable adjustment. Participants reported lower use of surgery and radiation/chemotherapy and greater use of Mongolian medicine following MMBIT; however, treatment appropriateness and clinical indications were not assessed, so these findings should not be interpreted as evidence that MMBIT can replace conventional treatment. **Conclusions** MMBIT participation was associated with favorable self-reported outcomes across multiple health domains among patients with cancer. However, the cross-sectional design, reliance on self-reported measures, and selection bias from including only therapy completers limit causal interpretation. Future prospective controlled studies incorporating objective clinical outcomes are needed to validate these findings and clarify MMBIT's potential role as a culturally grounded supportive care intervention.

KEYWORDS

cancer patients, group narrative therapy, integrative medicine, Mongolian mind-body interaction therapy, questionnaire

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1. Introduction

Globally, cancer is a leading cause of death and an increasing contributor to chronic disease, with the global burden projected to rise by 47% by 2040, particularly in low- and middle-income countries.¹ Beyond its physical burden, cancer is often accompanied by substantial psychological distress, including anxiety, depression, and insomnia, which can exacerbate physical symptoms.^{2–6} Evidence indicates that psychological interventions, including group support and self-hypnosis, can improve treatment adherence, immune function, quality of life, and even survival among patients with cancer.^{7–10}

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These findings underscore the value of integrated, culturally grounded psychosocial approaches in contemporary oncology care.

Mongolian mind-body interaction therapy (MMBIT) is a novel integrative therapy that combines psychology with Mongolian medicine and emphasizes the “harmony between nature and humanity” and the “unity of mind, body, and spirit.” MMBIT incorporates health education seminars and group narrative therapy to promote both physical and psychological rehabilitation. Its comprehensive model—focusing on “mind-body co-treatment,” “multi-disease co-treatment,” and “multi-patient co-treatment”—has demonstrated promising results across various conditions, including insomnia, esophageal cancer, psoriasis, and hypertension.^{11–19}

MMBIT adopts a patient-centered, holistic paradigm that empowers individuals as active participants in their healing process.^{12–15} It emphasizes interconnected physiological, psychological, and spiritual dynamics and leverages group interactions to foster emotional resonance. Participants occasionally

report transient physiological responses, such as sweating, yawning, or emotional release, during MMBIT sessions. Within the MMBIT framework, these experiences are considered to reflect mind-body adjustment; however, their physiological basis remains unclear and warrants further scientific investigation.^{20,21}

Central to MMBIT is its narrative approach.^{14,22} Sessions are guided by licensed Mongolian psychosomatic medicine doctors, who provide individualized feedback based on assessments of mind-body balance, herbal regimens, and psychosocial support. Patients share their experiences in safe, supportive group sessions that promote self-reflection and emotional mirroring. Health education lectures, music therapy (particularly Mongolian music), mind-body exercises, patient case sharing, meditation, and hypnosis awakening through Mongolian melodies are core features of the sessions (Figure 1).¹⁷ Humanistic teachings on kindness and gratitude reinforce psychological resilience, consistent with the philosophy of “healing the mind before the body”.²³

Delivered through 119 centers (96 in Inner Mongolia, 22 in other locations nationwide, and 1 in Singapore) and remote platforms, MMBIT is accessible and affordable. A full 21-day course costs 173 USD for video and on-site large-group sessions and 26 USD for audio sessions in Mainland China. According to data from Azitai Mongolian Medicine Hospital,²⁴ MMBIT reaches 7 500 000 participants annually and 20 000 users daily.

Prior studies have reported improvements in quality of life among Mongolian patients with esophageal cancer following MMBIT, including reduced treatment side effects and strengthened family support.¹⁷ However, evidence regarding its application across diverse populations remains limited. This study addresses this gap through two objectives: (I) to characterize the demographic and clinical profiles of patients with cancer participating in MMBIT using questionnaire data and (II) to identify factors within MMBIT’s therapeutic approach associated with patient-reported benefits.

2. Methods

2.1. Ethical approval

This observational study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The protocol followed the Declaration of Helsinki and received ethical approval from the Renmin University of China Ethics Committee (approval no.: WY20220001). Written informed consent was obtained from all participants before enrollment. All data were anonymized and stored on secure,

access-restricted servers in compliance with the General Data Protection Regulation (GDPR), the Personal Information Protection Law of the People’s Republic of China (PIPL), and institutional data-protection policies.

2.2. Study design

This study used a cross-sectional observational design to characterize the demographic and clinical profiles of patients with cancer who participated in MMBIT, and to examine factors associated with their self-reported outcomes. Data were collected using a standardized questionnaire administered after participants had completed the 21-session MMBIT course. The study analyzed demographic and clinical characteristics, patterns of MMBIT engagement, self-rated health and treatment-related experiences, and six domains of self-evaluated outcomes.

2.3. Setting and sample

The study was conducted through Azitai Mongolian Medicine Hospital in Ordos, Inner Mongolia, China, and its MMBIT service network. MMBIT was delivered through 119 centers, including 96 centers in Inner Mongolia, 22 centers in other locations in China, and 1 center in Singapore, as well as remote platforms. The standardized intervention consisted of a 21-session course delivered over 3 weeks through video, audio, or on-site large-group formats. Patient records and participation histories were available from Azitai’s internal treatment database, which has recorded MMBIT session attendance since 2012. For the present study, participants who had completed a full 21-session course before the survey period were invited to complete the questionnaire through the Azitai mobile application or WeChat from August 6 to 12, 2022.

2.4. Participants

Participants were recruited from among patients who had completed MMBIT at centers of Azitai Mongolian Medicine Hospital (Ordos, China).²⁴ Patient records and participation histories were drawn from Azitai’s internal treatment database, which records session attendance for all patients enrolled in MMBIT since 2012. The present sample comprised patients who completed the 21-session course before the survey window. The final survey was administered from August 6 to 12, 2022, through the Azitai mobile application and WeChat (Tencent Holdings Ltd., Shenzhen, China). Eligible participants met the following criteria: (I) diagnosis of a malignant tumor; (II) age 10 years or older and ability to complete the questionnaire (For participants who had not yet reached the legal age of consent, permission from a parent or

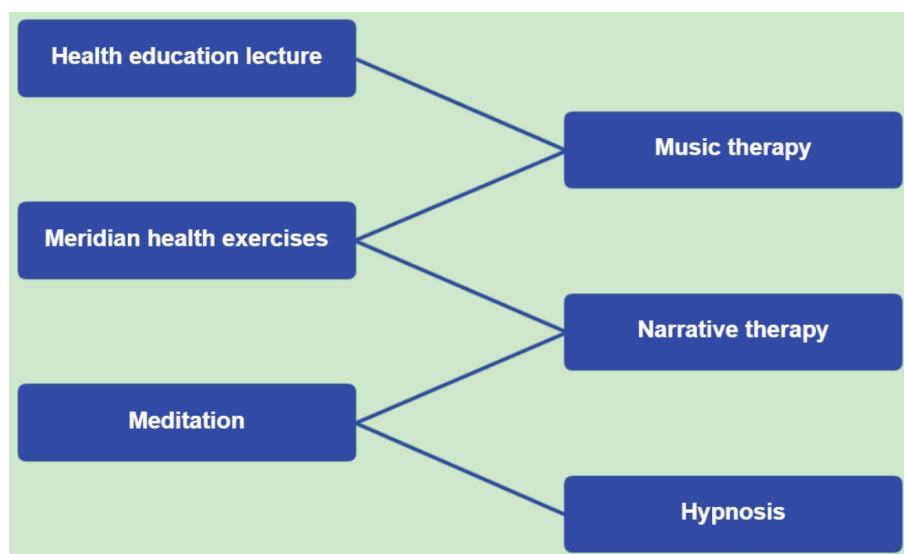


Figure 1 Treatment modalities of Mongolian mind-body interaction therapy

guardian and assent from the minor were obtained in accordance with the requirements of the approving ethics committee.); (III) participation in at least 21 MMBIT sessions (a full course according to the standardized therapeutic protocol); and (IV) provision of informed consent. Of the 1908 respondents, 1590 met the eligibility criteria and completed the full 21-session MMBIT course.

2.5. Intervention (MMBIT protocol)

MMBIT is a standardized, manualized 21-session group intervention delivered over 3 weeks, with 3-hour sessions delivered seven times per week via video, audio, or on-site large-group formats. Each session is led by a licensed Mongolian psychosomatic medicine doctor and integrates five core components: (I) music therapy, consisting of 25 minutes of traditional Mongolian music used to support relaxation and hypnotic induction; (II) health education lectures, comprising 30 minutes of content including disease-specific education and treatment literacy; (III) meditation and mind-body exercises, featuring 30 minutes of guided practices combining breathing and movement rooted in Mongolian medicine principles; (IV) group narrative therapy, which features 90 minutes to structured patient case sharing and facilitated group discussion aimed at meaning-making and emotional processing; and (V) hypnosis awakening, a 5-minute closing practice that uses Mongolian melodies to consolidate the session's therapeutic experience.

2.6. Questionnaire development

Self-rated health is a validated predictor of mortality, disease progression, and healthcare utilization in oncology populations.^{25–27} However, existing assessment instruments often emphasize isolated clinical parameters^{28,29} and may not capture the multidimensional benefits of holistic interventions such as Mongolian mind-body interaction therapy.

To address this limitation, we developed the Questionnaire for Cancer Patients Participating in MMBIT (Appendix 1), a comprehensive 121-item instrument (94 core questions) designed to evaluate therapy-related changes across six domains: physical symptoms, psychological symptoms, positive emotions, life conditions, health knowledge, and treatment efficacy, in addition to demographic and clinical data. Questionnaire development involved consultation with six professionals across psychology, Mongolian psychosomatic medicine, conventional medicine, linguistics, and statistics. Cognitive interviews were also conducted with 12 patients participating in MMBIT, followed by three rounds of pilot testing. The reliability score for the main section of the questionnaire, which comprised 94 key items rated on a 5-point scale, was 0.98. The reliability scores for self-evaluation across the six areas were 0.92, 0.93, 0.96, 0.96, 0.97, and 0.96, respectively, indicating very high reliability. In addition, all item loading values exceeded 0.3, meaning that no items needed to be excluded.¹⁴

Traditional evidence-based medicine generally focuses on objective measures such as tumor growth and survival and may give less attention to patients' psychological and social needs. Recent research emphasizes the importance of dignity, respect, and patient-centered care.^{30,31} In line with this shift, the Questionnaire for Cancer Patients Participating in MMBIT was designed to comprehensively assess physical symptoms, mental well-being, emotional changes, and lifestyle improvements, particularly in Section 2 (Questions 1–94). Like established instruments such as the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Esophageal Cancer Module (EORTC QLQ-OES18)³² and Quality of Life Instruments for Cancer Patients – Esophageal Cancer Scale (QLICP-OES)³³, it captures indicators such as anxiety, fatigue, and positive emotional states. In addition, the MMBIT questionnaire assesses social and emotional dynamics similarly to the Interpersonal Support Evaluation List (ISEL) survey³⁴ (Questions 64–67), addresses anxiety broadly in a manner comparable to the State Trait Anxiety Inventory (STAI),³⁵ and includes mood-related items comparable to the Center for Epidemiologic Studies Depression Scale – Revised (CESD-R-20),³⁶ particularly Questions 22–25.

The MMBIT survey is distinguished by its integration of several elements: evaluations of changes in physical symptoms, patients' understanding of

medical knowledge, reflections on treatment effectiveness, and personalized experiences. It also collects rich contextual data, such as cancer type and therapy participation history, thereby providing a more holistic view of recovery beyond symptom tracking.

While prior research on MMBIT has predominantly focused on its biomolecular efficacy,^{16–19} the present instrument provides insight into broader psychosocial benefits by emphasizing key distinguishing features: “mind-body co-treatment,” “multi-disease co-treatment,” and “multi-patient co-treatment.” Although the instrument demonstrated robust internal consistency ($\alpha = 0.92–0.98$), its cross-cultural validity requires further testing.

2.7. Data analysis

Data were analyzed using IBM SPSS Statistics (Version 26.0; IBM Corp., Armonk, NY). Items across all six domains were administered only to participants who reported symptoms or circumstances relevant to that domain, consistent with the questionnaire's branching design. No imputation was performed. Demographic variables were summarized as means (standard deviation [SD]) or n (%). Participant engagement, self-evaluations, and treatment methods were also reported. Because all questionnaire items were measured on a 5-point Likert scale (1 = strongly disagree/very poor to 5 = strongly agree/very good), a score of 3 represented the neutral midpoint. Therefore, one-sample t -tests were conducted against a value of 3 to assess whether participants' post-therapy evaluations were significantly more positive than a neutral assessment. Two-tailed Pearson's correlations quantified associations between engagement metrics and domain scores. Because the self-evaluation scores exhibited nonnormal distributions and ceiling effects, nonparametric methods were used. Group differences across sociodemographic strata and cancer types were assessed using the Mann–Whitney U test or Kruskal–Wallis test, with median values and asymptotic significance reported. A two-sided $P < 0.05$ indicated statistical significance. Multivariable linear regression analyses were also performed separately for each of the six self-evaluation domains. Age, sex, marital status, ethnicity, residence, education, occupation, income, cancer type, and engagement indicators (video/audio session count, where applicable) were entered simultaneously as independent variables to identify factors independently associated with each outcome after adjustment for the other covariates. A two-sided $P < 0.05$ was considered statistically significant.

3. Results

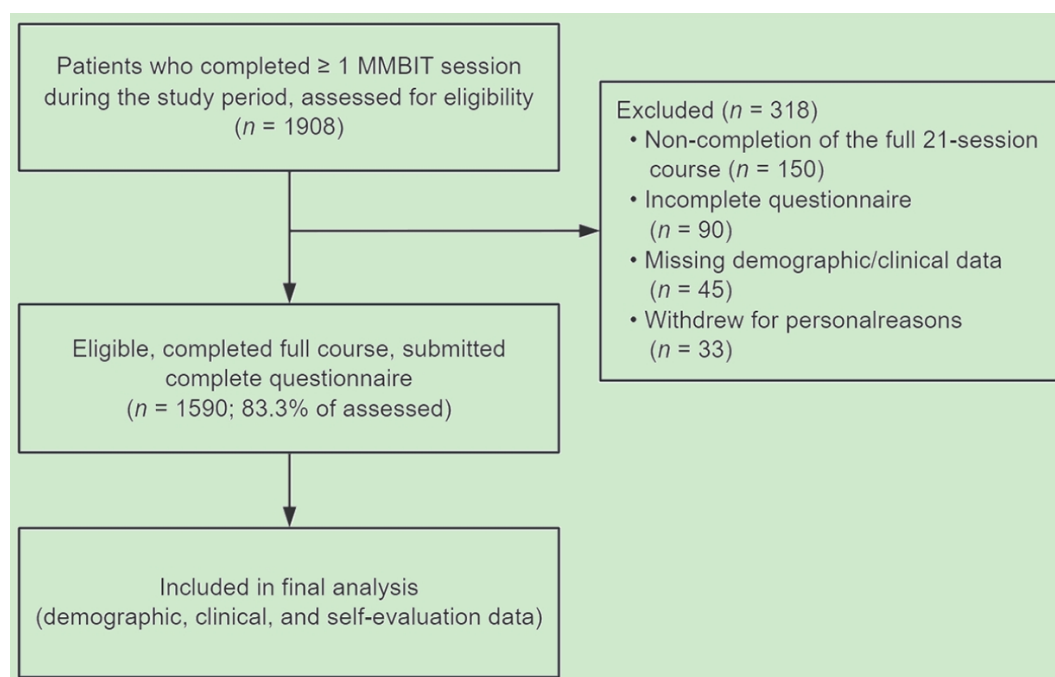
3.1. Demographics of survey participants

Of the 1908 respondents, 1590 met the eligibility criteria and completed the full 21-session MMBIT course. The remaining 318 respondents were excluded because they did not complete the full intervention, submitted incomplete questionnaires, had missing data, or withdrew for personal reasons (Figure 2). Because demographic and clinical information for these excluded respondents was incomplete, completers and noncompleters could not be compared.

Participants had a mean age of 54.5 (9.7) years, and 77.7% were female. Most participants were married (89.18%); 66.67% were Han and 29.43% were Mongolian. More than half (52.51%) had a college or bachelor's degree, and 56.73% lived in urban areas. The most common occupations were retirees (30.88%) and teachers (13.90%). Regarding income, 39.87% earned 1000–5000 CNY (138–688 USD) per month. Breast cancer was the most prevalent cancer type (29.18%), followed by lung and colorectal cancer. Among the 729 participants who provided tumor metastasis data, the most frequently reported metastasis sites were the lymph nodes (36.79%) and lungs (23.71%), followed by other sites, including the liver and bones (Table 1).

3.2. Participants' engagement with therapy and self-rated health assessments

The questionnaire gathered information on participants' engagement with

**Figure 2** Questionnaire response status

Notes: MMBIT: Mongolian mind-body interaction therapy; *n*: number.

Table 1 Demographic distribution and characteristics of survey participants

Characteristic	Category	<i>n</i> (%) / mean (SD)
Sex	Female	1235 (77.7%)
	Male	355 (22.3%)
Age, year		54.5 (9.7)
Marital status	Married	1418 (89.18%)
	Widowed	74 (4.65%)
	Divorced	73 (4.59%)
	Single	25 (1.57%)
Top 4 ethnicity	Han	1060 (66.67%)
	Mongolian	468 (29.43%)
	Manchu	21 (1.32%)
	Hui	9 (0.57%)
Education level	College/bachelor's degree	835 (52.51%)
	High school/technical school	384 (24.15%)
	Junior high school or below	311 (19.56%)
	Master's/doctoral degree	60 (3.78%)
Residence	Urban areas	902 (56.73%)
	Town	549 (34.53%)
	Rural areas	139 (8.74%)
Top 4 occupation	Retirees	491 (30.88%)
	Teachers	221 (13.90%)
	Farmers and herdsmen	135 (8.49%)
	Administrative staff	134 (8.42%)
Top 4 monthly income	1000–5000 CNY [†]	634 (39.87%)
	5000–10 000 CNY	524 (32.96%)
	10 000–15 000 CNY	205 (12.89%)
	15 000–20 000 CNY	98 (6.16%)

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Characteristic	Category	n (%) / mean (SD)
Top 10 cancer types	Breast cancer	464 (29.18%)
	Lung cancer	270 (16.98%)
	Colorectal cancer	128 (8.05%)
	Thyroid cancer	105 (6.6%)
	Ovarian cancer	98 (6.16%)
	Cervical cancer	69 (4.34%)
	Stomach cancer	68 (4.28%)
	Lymphoma	50 (3.15%)
	Liver cancer	39 (2.45%)
	Esophageal cancer	32 (2.01%)
Top 8 metastasis sites	Lymph nodes	585 (36.79%)
	Lungs	377 (23.71%)
	Liver	293 (18.43%)
	Bones	281 (17.67%)
	Breasts	178 (11.19%)
	Brain	142 (8.93%)
	Intestines	92 (5.79%)
	Kidneys	52 (3.27%)

Notes: CNY: Chinese Yuan; n: number; SD: standard deviation. ¹1 CNY ≈ 0.14 USD in August 2022.

therapy. Overall, 75.99% attended audio sessions, 19.87% attended video sessions, and 4.14% attended on-site large-group sessions. Regarding therapy satisfaction, 67.74% of participants were “very satisfied,” 27.11% were “fairly satisfied,” 4.84% rated their satisfaction as “average,” 0.19% were “not very satisfied,” and 0.13% were “not satisfied” (Figure 3).

Figure 4 compares reported tumor treatment methods before and after MMBIT therapy. Before therapy, surgery (57.80%) and radiation chemotherapy (52.80%) were the most commonly reported treatments. After therapy, their reported use decreased to 17.50% and 30.30%, respectively. Meanwhile, reported use of traditional Chinese medicine increased from 29.80% to 33.00%, and use of Mongolian medicine increased from 9.30% to 32.70%.

3.3. Statistical analysis of self-reported outcomes

Participants reported favorable ratings across all six domains following MMBIT therapy (Table 2). The number of cases analyzed varied by domain, reflecting the questionnaire’s branching design: items in each domain were administered only to participants who reported symptoms or circumstances relevant to that domain. Mean scores were above the neutral midpoint of 3 for physical symptoms (4.015 [0.814], $P < 0.001$), psychological symptoms

(4.057 [0.737], $P < 0.001$), positive emotions (4.350 [0.695], $P < 0.001$), medical and health knowledge (4.547 [0.578], $P < 0.001$), living conditions (4.428 [0.666], $P < 0.001$), and treatment methods and efficacy (4.075 [0.791], $P < 0.001$). The highest mean scores were observed for medical and health knowledge, living conditions, and positive emotions.

Figure 5 demonstrates statistically significant positive correlations (all $P < 0.05$) between MMBIT participation metrics and self-reported outcomes across all six domains. Total session count correlated with outcomes (range: $r = 0.212$ – 0.338), with the strongest association observed for perceived treatment efficacy ($r = 0.338$). Self-rated health correlated most strongly with physical symptoms ($r = 0.503$), whereas therapy satisfaction showed the highest correlations with life conditions ($r = 0.517$) and perceived treatment efficacy ($r = 0.555$). Video session attendance correlated more strongly than audio session attendance across domains (e.g., physical symptoms: $r = 0.298$ vs. 0.133), with the strongest individual correlation occurring between video sessions and treatment methods and effectiveness ($r = 0.323$). On-site large-group sessions demonstrated domain-specific correlations, most notably with treatment effectiveness ($r = 0.249$), whereas audio sessions showed consistently weaker correlations.

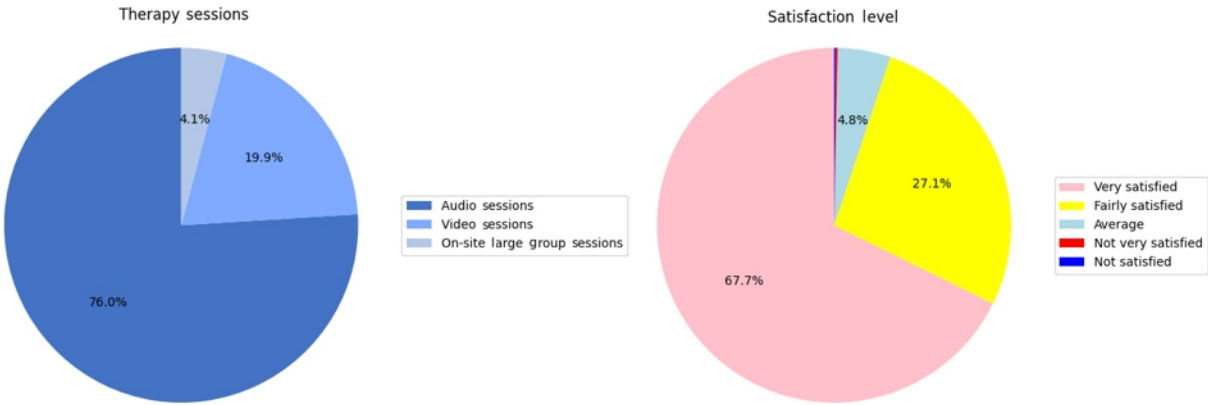


Figure 3 Participants’ engagement with therapy and satisfaction level assessments

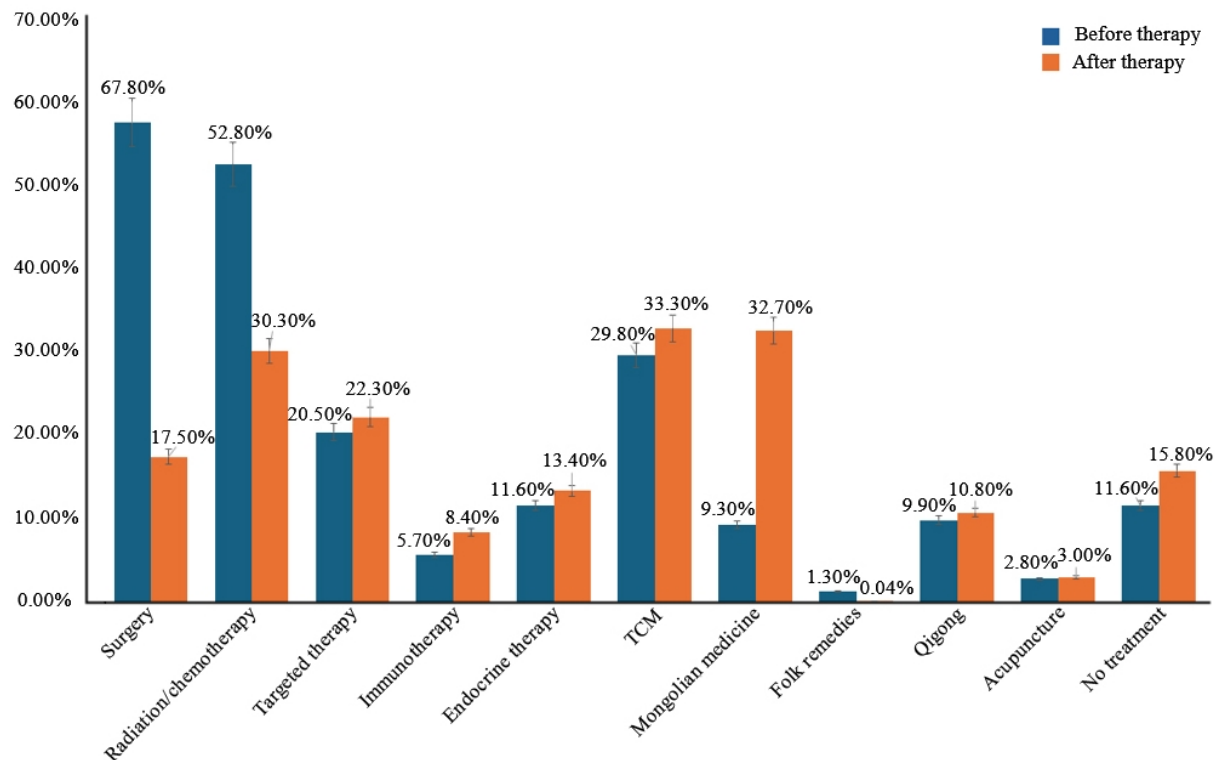


Figure 4 Reported tumor treatment methods among participants by timing relative to Mongolian mind-body interaction therapy

Notes: TCM: traditional Chinese medicine.

Table 2 Results of one-sample *t*-tests for the six major aspects

Six major aspects	<i>n</i>	Mean	SD	Cohen's <i>d</i>	95% CI	<i>P</i> (two-tailed)
Physical symptoms	226	4.015	0.814	1.247	1.072, 1.420	< 0.001
Psychological symptoms	369	4.057	0.737	1.435	1.289, 1.579	< 0.001
Positive emotions	1590	4.350	0.695	1.944	1.860, 2.027	< 0.001
Medical and health knowledge	1590	4.547	0.578	2.675	2.570, 2.781	< 0.001
Living conditions	1521	4.428	0.666	2.145	2.054, 2.236	< 0.001
Treatment methods and efficacy	1533	4.075	0.791	1.360	1.290, 1.429	< 0.001

Notes: CI: confidence interval; *n*: number; *P*: probability; SD: standard deviation. The one-sample *t*-tests were conducted against the neutral midpoint (score = 3) of the 5-point Likert scale.

Group comparisons of demographic variables and self-evaluation scores across the six domains revealed several statistically significant associations; median scores are reported in Table 3. Differences by sex were most notable for positive emotions (female median = 4.58 vs. male median = 4.50, $P = 0.003$) and treatment methods and effectiveness (female median = 4.33 vs. male median = 4.07, $P < 0.001$). Marital status was significantly associated with medical knowledge (married median = 4.78 vs. single median = 4.36, $P = 0.001$) and treatment effectiveness (widowed median = 4.58 vs. single median = 3.37, $P < 0.001$). Differences by ethnicity were observed for positive emotions (Mongolian median = 4.67 vs. Manchu median = 4.42, $P < 0.001$). Participants with a junior high school education or less reported greater physical relief (median = 4.44) than college graduates (median = 2.78, $P = 0.001$). An inverse pattern was observed for psychological symptoms, positive emotions, medical knowledge, and treatment effectiveness, with participants holding master's/doctoral degrees reporting the lowest scores.

Occupation was significantly associated with outcomes across all six domains (all $P < 0.001$), with farmers/herdsmen reporting the most favorable outcomes, followed by retirees. Teachers generally reported lower self-evaluation scores across most domains (psychological symptoms: median = 3.31;

treatment effectiveness: median = 3.32) but reported the highest medical knowledge score (median = 5.00). Administrative staff also showed comparatively lower treatment-effectiveness scores (median = 3.37); whether this pattern reflects a lower compatibility between specific occupational stressors and experiential therapy remains a hypothesis that warrants explicit testing in future studies. Income-related differences were evident for psychological symptoms (median = 4.63 in the highest-income group vs. 4.00 in lower-income groups, $P < 0.001$) and treatment effectiveness (median = 4.58 in lower-income vs. 3.79 in higher-income participants, $P < 0.001$), suggesting that socioeconomic factors may modulate perceived therapeutic response. Self-reported outcomes also differed across cancer types ($P < 0.05$ for positive emotions, medical knowledge, life conditions, and treatment effectiveness). Participants with breast cancer reported the most comprehensive favorable outcomes, including the highest medical knowledge score (median = 5.00), a high life-condition score (median = 4.80), and a high treatment-effectiveness score (median = 4.42). Participants with lymphoma had the highest positive-emotion score (median = 4.75), whereas those with esophageal cancer had the lowest medical knowledge score (median = 2.79). Although this may reflect tumor location effects or treatment toxicity, potential confounding by factors

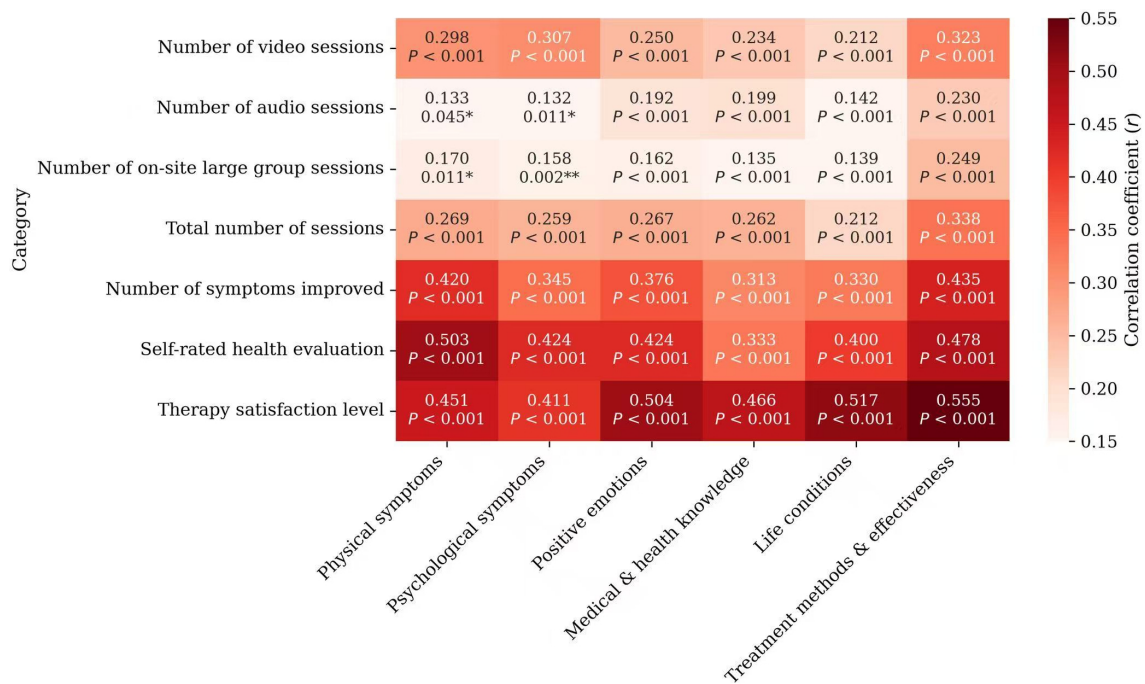


Figure 5 Correlation heatmap with significance levels

Notes: * $P < 0.05$, ** $P < 0.01$.

Table 3 Median self-evaluation scores across six domains by demographic characteristics and difference tests (asymptotic significance)

Characteristic	Category	Physical symptoms	Psychological symptoms	Positive emotions	Medical and health knowledge	Life confidence	Treatment methods and effectiveness
Sex	Female (n = 1235)	4.167	4.125	4.583	4.786	4.733	4.333
	Male (n = 355)	4.167	4.125	4.500	4.786	4.633	4.067
	P	0.774	0.832	0.003***	0.082	0.206	< 0.001***
Marital status	Married (n = 1418)	4.111	4.125	4.583	4.786	4.667	4.211
	Widowed (n = 74)	4.361	4.000	4.667	4.929	4.800	4.579
	Divorced (n = 73)	4.028	4.062	4.583	4.786	4.733	4.105
	Single (n = 25)	4.361	3.900	4.583	4.357	4.800	3.368
	P	0.536	0.265	0.987	0.001***	0.604	< 0.001***
Ethnicity	Han (n = 1060)	4.111	4.063	4.583	4.857	4.667	4.211
	Mongolian (n = 468)	4.167	4.125	4.667	4.643	4.800	4.316
	Manchu (n = 21)	4.250	3.875	4.417	4.786	4.600	4.421
	Hui (n = 9)	3.833	4.313	4.667	4.857	4.667	4.500
	P	0.578	0.178	0.000***	0.64	0.206	0.268
Education level	College/bachelor's degree (n = 835)	2.778	3.094	4.500	4.500	4.667	3.842
	High school/technical school (n = 384)	3.833	4.000	4.458	4.929	4.667	4.579
	Junior high school and below (n = 311)	4.444	4.438	4.750	5.000	4.800	4.842
	Master's/doctoral degree (n = 60)	2.028	2.000	4.458	3.000	4.733	2.158
	P	0.001***	< 0.001***	< 0.001***	< 0.001***	0.138	0.009**
Residence	Urban areas (n = 902)	4.306	4.125	4.583	4.786	4.733	4.211
	Town (n = 549)	4.167	4.125	4.667	4.786	4.733	4.263
	Rural areas (n = 139)	4.000	4.000	4.500	4.643	4.667	4.158
	P	0.54	0.06	0.618	0.198	0.441	0.45
Occupation	Retirees (n = 491)	4.000	4.000	4.667	4.357	4.733	4.053
	Teachers (n = 221)	2.417	3.313	4.083	5.000	4.167	3.316
	Farmers and herdsmen (n = 135)	4.361	4.438	4.917	5.000	5.000	4.526
	Administrative staff (n = 134)	2.500	3.375	4.250	4.929	4.133	3.368
	P	< 0.001***	< 0.001***	< 0.001***	< 0.001***	< 0.001***	< 0.001***

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Characteristic	Category	Physical symptoms	Psychological symptoms	Positive emotions	Medical and health knowledge	Life confidence	Treatment methods and effectiveness
Household monthly income	1000–5000 CNY (<i>n</i> = 634)	4.167	4.125	4.667	4.929	4.800	4.579
	5000–10 000 CNY (<i>n</i> = 524)	4.056	4.000	4.583	4.714	4.667	4.079
	10 000–15 000 CNY (<i>n</i> = 205)	4.111	4.000	4.417	4.500	4.667	3.895
	15 000–20 000 CNY (<i>n</i> = 98)	4.028	4.625	4.500	4.500	4.733	3.790
	<i>P</i>	0.954	< 0.001***	0.002**	< 0.001***	0.177	< 0.001***
Cancer type	Breast cancer (<i>n</i> = 464)	4.389	4.063	4.667	5.000	4.800	4.421
	Lung cancer (<i>n</i> = 270)	4.139	4.000	4.500	4.143	4.533	4.105
	Colorectal cancer (<i>n</i> = 128)	4.056	4.000	4.583	4.714	4.667	4.263
	Thyroid cancer (<i>n</i> = 105)	3.806	4.031	4.500	4.786	4.800	4.263
	Ovarian cancer (<i>n</i> = 98)	4.222	4.000	4.583	4.929	4.667	4.316
	Cervical cancer (<i>n</i> = 69)	4.000	3.938	4.583	4.857	4.800	4.368
	Stomach cancer (<i>n</i> = 68)	4.111	4.000	4.583	3.429	4.600	4.053
	Lymphoma (<i>n</i> = 50)	4.056	4.563	4.750	4.857	4.800	4.053
	Liver cancer (<i>n</i> = 39)	4.389	4.063	4.625	4.714	4.800	4.342
	Esophageal cancer (<i>n</i> = 32)	4.000	4.313	4.583	2.786	4.800	4.211
	<i>P</i>	0.547	0.270	0.029*	< 0.001***	< 0.001***	0.001**

Notes: CNY: Chinese Yuan; *n*: number. 1 CNY ≈ 0.14 USD in August 2022. “Sex” was tested using the Mann–Whitney *U* test, whereas other demographic variables were tested using the Kruskal–Wallis test. **P* < 0.05, ***P* < 0.01, ****P* < 0.001.

such as health literacy requires further investigation. Participants with cervical and liver cancer showed intermediate treatment-effectiveness scores (median = 4.37 and 4.34, respectively). Participants with thyroid, cervical, lymphoma, liver, and esophageal cancer scored highly for life conditions (median = 4.80). Participants with ovarian cancer had a high medical knowledge score (median = 4.93). Some cancer subgroups had small sample sizes, which may have resulted in unstable estimates. Therefore, findings for rare cancer types should be interpreted cautiously and validated in larger studies. Overall, while residence showed limited effects, sex, marital status, ethnicity, education, occupation, income, and cancer type were significantly associated with self-reported outcomes.

To identify factors independently associated with self-reported outcomes after adjustment for potential confounders, multivariable linear regression analyses were performed separately for each of the six domains (Table 4). Lower education was significantly associated with higher scores across all six domains (junior high school or below vs. graduate: $\beta = 0.54$ – 1.17 , all $P < 0.001$; high school vs. graduate: $\beta = 0.47$ – 0.63 , all $P < 0.001$), whereas undergraduate education was significantly associated with lower physical-symptom ($\beta = -0.539$, $P < 0.001$) and psychological-symptom ($\beta = -0.210$, $P = 0.002$) scores and significantly higher positive-emotion, medical-knowledge, and life-condition scores ($\beta = 0.09$ – 0.15 , all $P < 0.001$). Cancer type was significantly associated with outcomes in every domain: ear canal, lung adeno-

Table 4 Multivariable linear regression: factors independently associated with self-evaluation domain scores

Domain (<i>n</i> , <i>R</i> ²)	Variable	Category	β	<i>P</i>
Physical symptoms (<i>n</i> = 226, <i>R</i> ² = 0.761)	Cancer type	Intestinal	−1.138	0.017
		Colon	1.344	0.015
		Skin (melanoma)	−1.414	0.019
	Ethnicity	Han	−0.297	0.017
		Mongolian	−0.288	0.028
		Hui	0.951	0.004
	Education	Junior high or below	1.173	< 0.001
		High school	0.587	< 0.001
		Undergraduate	−0.539	< 0.001
Psychological symptoms (<i>n</i> = 369, <i>R</i> ² = 0.695)	Cancer type	Pancreatic adenocarcinoma	0.606	0.010
		Brain	−1.050	0.003
		Breast	0.174	0.020
		Cervix	−0.347	0.013
	Residence	Urban	0.093	0.013
	Ethnicity	Mongolian	−0.207	0.032
	Education	Junior high or below	1.057	< 0.001
		High school	0.548	< 0.001
		Undergraduate	−0.210	0.002

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Domain (<i>n</i> , R^2)	Variable	Category	β	<i>P</i>
Positive emotion (<i>n</i> = 1590, R^2 = 0.497)	Cancer type	Adenocarcinoma	0.729	0.045
		Bladder	-1.014	0.047
		Ear canal	-1.353	0.009
		Breast	-1.242	0.015
		Lymphoma	0.184	0.034
		Peritoneum	0.611	0.040
		Solitary fibroid	-1.228	0.017
		Supraglottic	-1.358	0.008
	Marital status	Single	-0.201	0.020
	Education	Junior high or below	0.703	< 0.001
		High school	0.582	< 0.001
		Undergraduate	0.091	< 0.001
	Income	1000–5000 CNY	0.083	0.032
	Video sessions	—	0.0003	0.002
	Audio sessions	—	0.0002	0.020
Medical knowledge (<i>n</i> = 1590, R^2 = 0.459)	Cancer type	Ear canal	-1.337	0.003
		Lung	-1.444	0.001
		Intestinal	-0.564	0.029
		Parotid gland	-0.940	0.035
	Residence	Urban	0.058	0.001
	Education	Junior high or below	0.544	< 0.001
		High school	0.472	< 0.001
		Undergraduate	0.135	< 0.001
	Income	1000–5000 CNY	0.068	0.043
	Video sessions	—	0.0003	0.003
	Audio sessions	—	0.0002	0.020
Life conditions (<i>n</i> = 1521, R^2 = 0.523)	Cancer type	Bladder	-1.492	0.002
		Breast	0.148	0.003
		Ear canal	-1.484	0.002
		Lung adenocarcinoma	-1.334	0.005
		Lymphoma	0.183	0.026
		Peritoneum	0.756	0.007
		Supraglottic	-1.461	0.002
		Thyroid	0.171	0.009
		Uterus	0.203	0.044
		Ethnicity		
	Han	Han	0.213	0.012
		Mongolian	0.239	0.006
		Manchu	0.263	0.039
		Uyghur	-1.488	< 0.001
		Ewenki	0.531	0.010
	Education	Junior high or below	0.722	< 0.001
		High school	0.592	< 0.001
		Undergraduate	0.151	< 0.001
Treatment methods and effectiveness (<i>n</i> = 1533, R^2 = 0.546)	Cancer type	Breast	0.018	0.039
		Bile duct	-1.270	0.029
		Cervix	0.173	0.044
		Ear canal	-1.122	0.044
		Hypopharyngeal	-1.341	0.015
		Esophagus	0.267	0.028
		Lung adenocarcinoma	-1.358	0.014

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Domain (<i>n</i> , <i>R</i> ²)	Variable	Category	β	<i>P</i>
		Lymphoma	1.175	0.033
		Gastroesophageal	1.282	0.021
		Intestinal	−0.617	0.014
		Leg soft tissue sarcoma	1.230	0.027
		Solitary fibroid	−1.106	0.046
		Thyroid	0.178	0.017
	Education	Junior high or below	0.815	< 0.001
		High school	0.630	< 0.001
	Income	15 000–20 000 CNY	−0.137	0.026
	Video sessions	–	0.0006	< 0.001
	Audio sessions	–	0.0003	0.004

Notes: CNY: Chinese Yuan; *n*: number; *P*: probability. 1 CNY ≈ 0.14 USD in August 2022. “–” denotes not applicable.

carcinoma, and supraglottic subtypes were significantly associated with lower scores in multiple domains, whereas breast, lymphoma, and gastroesophageal subtypes were significantly associated with higher scores. Ethnicity was significantly associated with physical symptoms (Han: $\beta = -0.297$, $P = 0.017$; Mongolian: $\beta = -0.288$, $P = 0.028$; Hui: $\beta = 0.951$, $P = 0.004$), psychological symptoms (Mongolian: $\beta = -0.207$, $P = 0.032$), and life conditions (Han: $\beta = 0.213$, $P = 0.012$; Mongolian: $\beta = 0.239$, $P = 0.006$; Manchu: $\beta = 0.263$, $P = 0.039$; Uyghur: $\beta = -1.488$, $P < 0.001$; Ewenki: $\beta = 0.531$, $P = 0.010$). Urban residence was significantly associated with higher psychological-symptom ($\beta = 0.093$, $P = 0.013$) and medical-knowledge ($\beta = 0.058$, $P = 0.001$) scores. Single marital status was significantly associated with lower positive-emotion scores ($\beta = -0.201$, $P = 0.020$). Income was significantly associated with higher positive-emotion (1000–5000 CNY: $\beta = 0.083$, $P = 0.032$) and medical-knowledge (1000–5000 CNY: $\beta = 0.068$, $P = 0.043$) scores and with lower treatment-effectiveness scores at higher income (15 000–20 000 CNY: $\beta = -0.137$, $P = 0.026$). Video and audio session engagement were significantly associated with higher positive-emotion, medical-knowledge, and treatment-methods-and-effectiveness scores ($\beta = 0.0002$ – 0.0006 , all $P < 0.05$).

4. Discussion

Cross-sectional study provides initial evidence that participation in MMBIT is associated with favorable self-reported physical, psychological, and social outcomes among patients with cancer. Using a rigorously validated six-domain questionnaire (Cronbach’s $\alpha = 0.92$ – 0.98), participants reported favorable scores for physical symptoms (4.02 [0.81]), psychological well-being (4.06 [0.74]), positive emotions (4.35 [0.70]), medical and health knowledge (4.55 [0.58]), life conditions (4.43 [0.67]), and treatment methods and efficacy (4.08 [0.79]). Scores across all domains were substantially above the neutral midpoint of the scale (Cohen’s $d = 1.247$ – 2.675), although these findings should be interpreted cautiously given the cross-sectional design and absence of a control group. The findings are broadly consistent with previous research on group-based psychosocial interventions such as mindfulness-based stress reduction (MBSR), which has demonstrated similar benefits in symptom burden and emotional regulation among patients with cancer.³⁷

Therapeutic engagement emerged as a key factor associated with participant-reported outcomes, with video-based participation showing a stronger correlation with physical symptom relief ($r = 0.30$) than audio-based participation ($r = 0.13$). This difference may stem from video’s capacity to synchronize group dynamics through multimodal inputs: visual cues may improve technique precision, immersive audiovisual elements may deepen meditative states, and real-time social presence may foster emotional resonance, collectively promoting mindfulness and therapeutic adherence.³⁸ On-site large-group sessions may provide additional benefits through face-to-face interac-

tion and stronger group cohesion. However, participation format was not randomized, and participants selecting video-based or on-site formats may have been more motivated or engaged at baseline. Therefore, causal conclusions regarding the superiority of any delivery format cannot be drawn from the present study.

A striking inverse education gradient was observed, with participants having a junior high school education or less reporting more favorable outcomes than college graduates across physical (median = 4.44 vs. 2.78; $P = 0.001$), psychological, and knowledge domains. While this finding may suggest that MMBIT’s oral storytelling traditions, culturally embedded communication, and experiential learning approaches are particularly accessible to individuals with lower formal education, alternative explanations should also be considered. Differences in response styles, such as a greater tendency toward extreme or positive ratings, variations in health literacy, differing expectations regarding complementary therapies, or greater familiarity with traditional healing approaches may have influenced self-reported outcomes. In addition, unmeasured clinical factors, including disease stage, symptom severity, or time since diagnosis, may have contributed to the observed association. Therefore, this education-related difference should be considered exploratory and hypothesis-generating rather than definitive and requires replication in future studies using longitudinal designs and objective outcome measures. This gradient persisted in multivariable analyses adjusting for age, sex, marital status, ethnicity, residence, occupation, income, cancer type, and engagement, with lower education remaining the strongest independent predictor of favorable self-evaluation across all six domains (junior high school or below vs. graduate: $\beta = 0.54$ – 1.17 , all $P < 0.001$; Table 4). This suggests that the association is not fully explained by income, cancer type, or other measured factors, lending weight to the hypothesis that MMBIT’s oral, experiential format may be particularly accessible to less formally educated participants. However, because disease stage, symptom severity, time since diagnosis, and response-style tendencies were not included in the model, residual confounding cannot be excluded, and the finding remains hypothesis-generating pending longitudinal confirmation. In contrast, teachers—while demonstrating the highest scores in medical knowledge acquisition (median = 5.00)—reported lower perceived benefits for psychological symptoms (median = 3.31) and treatment effectiveness (median = 3.32), suggesting that greater health-related knowledge does not necessarily correspond to stronger perceived therapeutic benefits. Socioeconomic factors further modulated outcomes, with lower-income participants reporting significantly higher perceived effectiveness ($P < 0.001$). Similarly, farmers and herdsmen reported the most favorable outcomes across all six domains. These socioeconomic and cancer-type associations were likewise independently significant in multivariable models, suggesting that they are not solely explained by co-occurring demographic differences. These findings may reflect MMBIT’s ability to address unmet psychosocial, educational, and supportive-care needs among

resource-constrained populations.³⁹ However, future comparative studies are needed to determine whether these benefits are unique to MMBIT or would also be observed with other supportive-care interventions.

Participants reported that surgery utilization decreased by 40.3 percentage points and radiation/chemotherapy utilization by 22.5 percentage points following participation in MMBIT. It is critical to emphasize that, in the absence of data on disease stage, physician recommendations, and treatment completion, these findings do not support the use of MMBIT as a substitute for guideline-directed oncological therapy. Patients should be counseled against delaying or forgoing conventional treatment based on these observational results. Participants reported high levels of health knowledge following MMBIT (4.55 [0.58]), which may have shaped their perceptions of treatment options and decision-making processes. In addition, the relatively low cost of MMBIT compared with conventional cancer treatments may influence healthcare choices, particularly among lower-income populations, which comprised a substantial proportion of the study sample.⁴⁰ MMBIT is intended as a complementary supportive intervention rather than a substitute for evidence-based oncology care. While the combined use of conventional and Mongolian medicine increased substantially, the observed lower reported rates in surgery and radiation/chemotherapy should not be interpreted as evidence that MMBIT reduced the medical necessity of these treatments. In the absence of objective clinical outcomes, including survival and disease progression data, encouraging patients to replace guideline-directed treatment with complementary therapies would be inappropriate.⁴¹ Future studies should evaluate whether the observed treatment changes were medically appropriate and whether MMBIT influences treatment adherence, decision-making, or supportive-care utilization.

MMBIT's narrative framework may foster coping through meaning-making, while Mongolian cultural practices may contribute to emotional support and stress reduction. The integration of traditional practices with modern psychosocial techniques represents a culturally tailored, patient-centered approach that may enhance accessibility and acceptability among patients seeking complementary supportive care.⁴² Further research is needed to examine the mechanisms underlying these perceived benefits and determine the extent to which cultural, social, and psychological factors contribute to the observed outcomes.

This study has several strengths, including its large sample size, use of a rigorously validated questionnaire, and comprehensive evaluation of physical, psychological, social, and treatment-related patient-reported outcomes. Several limitations should be considered when interpreting the findings. First, the cross-sectional design precludes causal inference, and the observed associations cannot establish whether MMBIT directly produced the reported outcomes. Second, all outcomes were self-reported and assessed using a self-designed questionnaire. Consequently, social desirability bias, treatment expectancy effects, and recall bias may have influenced participant responses. Third, only participants who completed the full 21-session MMBIT course were included in the analysis. Individuals who discontinued participation may have experienced different outcomes; therefore, selection bias and survivorship bias may have resulted in overestimation of perceived benefits. Because information on participants who discontinued therapy was limited, we were unable to compare baseline characteristics or outcomes between completers and noncompleters. Consequently, participants who completed the intervention may have been more motivated, healthier, or more satisfied with MMBIT than those who discontinued. Future prospective studies should record reasons for discontinuation and compare completers with noncompleters to better quantify attrition bias. Fourth, the sample was predominantly female (77.7%), and breast cancer represented the largest diagnostic subgroup, potentially limiting generalizability to male patients and other oncology populations. Fifth, multiple comparisons were conducted without adjustment, increasing the risk of Type I error; the findings should generally be considered exploratory and require confirmation using appropriate correction methods. The association with education remained significant in multivariable analysis, although it remains subject to the same cross-sectional design limitations. Finally, objective clinical outcomes, including tumor biomarkers, treatment adherence, disease progression, recurrence, and sur-

vival, were not assessed.

Future randomized controlled trials should prioritize recruitment of more sex-balanced cohorts, longitudinal follow-up, and multivariable analyses that additionally control for disease stage and baseline comorbidities. Comparative trials evaluating MMBIT against standard psychosocial support or other supportive-care interventions would help clarify its specific contribution and the relative effects of different delivery formats. In addition, objective clinical indicators such as tumor biomarkers, treatment adherence, recurrence rates, hospitalization, quality-of-life measures, and survival outcomes should be incorporated to complement self-reported outcomes. Incorporating biomarkers such as cortisol levels and inflammatory cytokines may further elucidate the potential biological mechanisms underlying the observed outcomes. These methodological improvements would strengthen the evidence base and help determine whether the observed differences reflect true therapeutic effects or broader psychosocial influences.

Ongoing registered trials (ChiCTR1900027996, ChiCTR1900027986) are systematically evaluating longitudinal clinical outcomes and biomarker trajectories associated with MMBIT. Pending confirmatory evidence, this culturally resonant intervention may represent a promising supportive-care approach that warrants further investigation in controlled trials as a complementary therapy alongside standard oncology treatment. Future research should continue to explore scalable delivery models and cross-cultural adaptations to enhance accessibility while maintaining fidelity to the core principles of MMBIT.

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Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to privacy and ethical considerations but may be available from the corresponding author upon reasonable request, subject to approval of the relevant ethical requirements.

Author Contribution Statement

Nagongbilige: Conceptualization, methodology, investigation, resources, supervision, project administration, funding acquisition, and writing – original draft. **Hong-yun Wu:** Conceptualization, methodology, resources, investigation, supervision, project administration, writing – original draft, and writing – review & editing. **Bao-jun De:** Software, validation, formal analysis, investigation, visualization, and data curation. **Wen-feng Bao:** Methodology, validation, resources, and investigation. **Jing-peng Yang:** Software, validation, formal analysis, investigation, data curation, and writing – original draft. **Sarnai Arlud:** Investigation, resources, data curation, and funding acquisition. **Jun Fang:** Investigation, writing – review & editing, and funding acquisition. **Narisu De:** Investigation and resources. **Da-hua Wang:** Validation and formal analysis. **Haorile Chagan-Yasutan:** Investigation, writing – review & editing, and funding acquisition. **Caihela Hushud:** Investigation and resources. **Yu Du:** Conceptualization, methodology, validation, formal analysis, supervision, project administration, and writing – review & editing. **Li-ping Gong:** Writing – review & editing. **Zhao-lan Liu:** Writing – review & editing. **Zhi-qiang Li:** Investigation and writing – review & editing.

Use of AI statement

During the preparation of this work, the authors used GPT-5.6 Luna (OpenAI, San Francisco, CA) and Gemini 3.8 Live (Google, Mountain View, CA) to improve language and readability. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility

ty for the content of the publication.

Declaration of Competing Interest

The authors declare no competing interests.

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