

Review

A network meta-analysis of the impact of psychological interventions on stigma in cancer patients: A systematic review

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Abstract: This study systematically examined the impact of various psychological interventions on stigma in cancer patients through a network meta-analysis. Findings indicate that cognitive behavioral therapy (CBT) is the most effective intervention for reducing stigma, leading to improvements in psychological outcomes and quality of life. Other interventions such as Narrative Nursing (NN), Mindfulness-Based Stress Reduction (MBSR), Solution-Focused Approach (SFA), and Expert Patient Program (EPP) also demonstrated significant effects. However, the study faced limitations, including a narrow scope, low-quality evidence, and significant heterogeneity. Future research should expand the scope of searches, enhance the quality of evidence, and explore innovative psychological intervention strategies to optimize the psychological support system for cancer patients. The results provide a solid scientific foundation for the implementation and promotion of such interventions in clinical practice, contributing to the reduction of cancer-related stigma and the enhancement of patients' lives.

Keywords: psychological interventions; stigma; cancer patients; cognitive behavioral therapy (CBT); network meta-analysis

1. Introduction

Stigma is a complex social phenomenon that manifests as a negative perception or discrimination against individuals based on certain characteristics or conditions, such as cancer. The causes of cancer-related stigma are multifaceted, often rooted in societal beliefs about the disease, its causes, and its implications. For instance, lung cancer patients frequently experience heightened stigma due to the association of the disease with smoking, which is often viewed as a self-inflicted condition. This stigma can lead to feelings of shame and self-blame, significantly impacting patients' mental health and their willingness to seek medical help [1–3].

The adverse consequences of stigma among cancer patients are profound and multifaceted. Stigma can lead to psychological distress, including increased rates of depression and anxiety [4–6]. Research indicates that cancer patients who internalize stigma are more likely to experience depressive symptoms, which can further exacerbate their overall quality of life [7,8]. Additionally, stigma can hinder patients' engagement with healthcare services, delaying diagnosis and treatment, which is particularly critical in the context of cancer where early intervention can significantly improve outcomes [9–11]. The social isolation stemming from stigma can also limit the support systems that are vital for coping with the disease [12].

Reducing cancer-related stigma is essential for improving the overall well-

being of cancer patients. Interventions aimed at addressing stigma can lead to better psychological outcomes and enhance the quality of life for patients [13,14]. For instance, cognitive behavioral therapy (CBT) has been shown to effectively reduce internalized stigma and its associated mental health consequences [5,13]. Furthermore, fostering a supportive environment that encourages open discussions about cancer can mitigate feelings of shame and promote help-seeking behaviors [15]. Addressing stigma not only benefits individual patients but can also enhance public health outcomes by encouraging more individuals to participate in cancer screening and treatment [16,17]. Therefore, it is imperative that healthcare providers and policymakers prioritize stigma reduction strategies as part of comprehensive cancer care.

Psychological inflexibility is a key factor associated with stigma, highlighting the importance of addressing psychological factors in interventions designed to reduce stigma [18,19]. Mindfulness, self-compassion, and social support have also been explored as potential mitigating factors against the negative effects of cancer-related stigma on both psychological and cancer-related symptoms [20]. Despite the demonstrated efficacy of psychological interventions, the overall impact on stigma remains unclear due to the diversity of cancer types and the variability in intervention content, form, and duration. A systematic assessment of these interventions is currently lacking, which is a significant gap in the literature. This study aims to fill this gap by conducting a meta-analysis to evaluate the impact of psychological interventions on stigma in cancer patients. The findings will provide a robust scientific foundation for the implementation and promotion of such interventions in clinical practice, ultimately contributing to the reduction of cancer-related stigma and the improvement of patients' lives.

2. Data and methods

2.1. Literature search

We conducted a computer-based search of PubMed, Web of Science, Cochrane Library, Embase, CINAHL Complete, China National Knowledge Network (CNKI), Wanfang Medical Online, VIP Information Chinese Journal Service Platform (VIP), Chinese Biomedical Literature Service System (CBM), and other relevant Chinese and English databases, covering the period from database inception to July 2024. The retrieval strategy employed a combination of subject headings and free-text terms. In addition to the automated search, we manually screened references from included studies and relevant systematic reviews to identify and supplement any unretrieved relevant information.

The Chinese search terms included: “cancer/tumor/stigma/shame” and “psychological/intervention/nursing/cognitive therapy/behavioral therapy/cognitive behavioral therapy/supportive therapy/mindfulness therapy/counseling/relaxation/self-confidence training/interpersonal therapy/verbal behavior therapy/compassionate therapy/self-control therapy/focused therapy”. The English search terms comprised: “neoplasm/tumor/cancer/carcinoma/malignancy/malignant neoplasm/advanced cancer” and “stigma/social stigma/stigmatized/shame” and “psychotherapy/psychological intervention/cognitive therapy/behavioural therapy/cognitive behavioral therapy/problem-solving intervention/mindfulness therapy/counseling/relaxation/assertiveness training/interpersonal therapy/exposure therapy/metacognitive therapy/solution focused treatment/compassion focused treatment/self-control therapy” among others.

2.2. Inclusion criteria

- (1) The study type was a randomized controlled trial (RCT), with allocation

concealment and blinding procedures in place.

(2) The study subjects consisted of patients aged 18 years or older, who had been diagnosed with cancer.

(3) The intervention measures for patients in the intervention group primarily comprised psychological interventions, accounting for over 50% of the intervention, including cognitive therapy, mindfulness therapy, and physical interventions (e.g., music, exercise) which could constitute less than 50% of the intervention. In contrast, patients in the control group received routine treatment and care.

(4) The primary outcome measure was the Social Impact Scale (SIS) score, where a lower SIS score indicates a reduced level of stigma [21]. Calculated effect size is based on the SIS scores of the intervention and control groups post-intervention.

(5) The literature was published in either Chinese or English, with no restrictions on the type of cancer.

2.3. Exclusion criteria

(1) Repeated publications, case studies, reviews, dissertations, systematic evaluations, and literature for which the original text is not accessible through various channels.

(2) Studies where the type is unknown.

(3) Studies where the control group includes psychological interventions.

(4) Studies where the baseline data is not comparable.

(5) Studies where the original data cannot be transformed or extracted.

2.4. Quality evaluation

According to the Jadad scale, as proposed by the Oxford EBM Literature Review project, two investigators independently conducted a quality evaluation of each included RCT. The evaluation items encompassed random sequence generation, allocation concealment, blinding procedures, and the reporting of withdrawals and losses to follow-up. Scores of 1 to 3 were considered indicative of low quality, while scores of 4 to 7 were classified as high quality.

2.5. Data extraction method

The data will be independently extracted and cross-checked by two researchers according to the inclusion and exclusion criteria. In case of disagreement between the two parties, the data will be decided by a third party. The extracted content included the author's name, year of publication, study area, sample size, disease name, intervention time, intervention measures, intervention method, intervention mode, evaluation time, SIS score, and other relevant information.

2.6. Statistical treatment

Traditional Meta-analysis was performed using RevMan 5.3 software, and the continuous variable pooled effect size was indicated using standardized mean difference (SMD) and 95% confidence interval (95%CI). The Q test was used to determine whether there was interstudy heterogeneity, while the magnitude of heterogeneity was assessed in combination with I^2 . When $P < 0.1$ and $I^2 > 50\%$, large inter-study heterogeneity was considered and analyzed using a random effects model; when $P \geq 0.1$ and $I^2 \leq 50\%$, less heterogeneity was considered and analyzed using a fixed-effects model. Meta-analysis was used to map the network structure using mvmeta and network Meta commands in Stata14.0 software. Inconsistency testing should be performed when a closed loop is present, with direct and indirect comparisons judged by node split values, and considered significant if $P < 0.05$. In

this study, the outcome indicators did not form a closed loop, so the inconsistency test was not required. The area under the curve (surface under the cumulative ranking, SUCRA) was used to compare the effects of different stigma intervention methods. The larger the SUCRA, the better the intervention effect. Publication bias was assessed using Begg's test and Egger's test, and the presence of publication bias was suggested if $P < 0.05$. In cases where publication bias was detected, non-parametric clipping methods were employed to analyze and adjust for its effects.

2.7. Evidence quality evaluation

The CINeMA application, utilizing a modified GRADE framework (<https://cinema.ispm.unibe.ch/>), evaluated the quality of evidence. This evaluation encompassed six specific aspects: study bias (pertaining to the quality of study methods), reporting bias (related to the comprehensiveness of inclusion criteria), indirectness (evaluating the relevance and transitivity of research questions), imprecision (assessing the accuracy of combined results from different studies), heterogeneity, and inconsistency (focusing on discrepancies between direct and indirect evidence). Given that all included studies were RCTs, the initial evidence quality of the results was considered high by default. The severity of the aforementioned six aspects was then categorized as non-serious (resulting in no downgrade), serious (one-level downgrade), or very serious (two-level downgrade). In cases where two or more limitations were internally related, an overall downgrade was considered, as opposed to a unilateral cumulative downgrade. Ultimately, the quality level of the evidence was determined and categorized into high, medium, low, and very low.

3. Results

3.1. Literature search process and results

Initially, 3085 related documents were examined, and 20 articles were finally included after reading the literature topics, abstracts and full texts according to the inclusion/exclusion criteria. The literature selection process and results are shown in Figure 1.

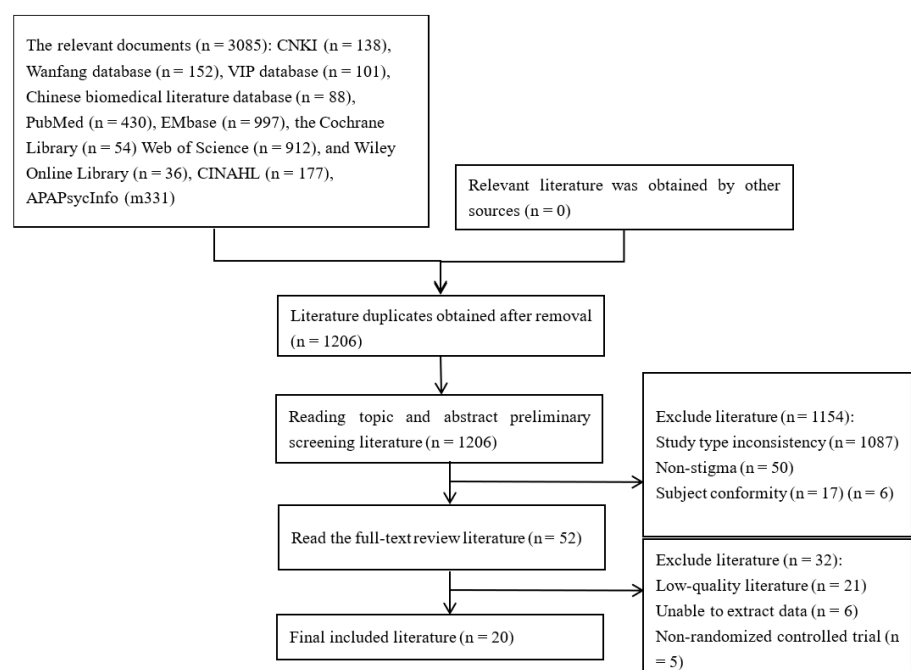


Figure 1. Literature screening process and results.

3.2. Basic characteristics of the included studies

A total of 20 articles were included, all being RCTs with a total of 2583 patients involving 11 intervention methods (**Table 1**).

Table 1. Basic features of the included research literature.

Included in the study	Disease name	sample capacity	age	intervention study	Shame evaluation tool
		Control group/ intervention group	Control group/ intervention group	Control group/ intervention group	
Leng [22], 2020	mammary cancer	35/44	70.03 ± 3.26/69.23 ± 3.12	RC/NN	Social Impact Scale
Sun [23], 2019	cervical carcinoma	40/40	51.97 ± 9.51/52.5 ± 9.26	RC/SFA	Social Impact Scale
Yin [24], 2019	mammary cancer	56/57	36.25 ± 4.6/35.34 ± 5.07	RC/PMT	Social Impact Scale
Chen [25], 2020	mammary cancer	45/45	30.20 ± 3.39/33.15 ± 3.42	RC/PFT	Social Impact Scale
Zhang [26], 2020	cervical carcinoma	45/45	53.41 ± 4.25/54.19 ± 4.63	RC/IAT	Social Impact Scale
Zhang [27], 2019	mammary cancer	250/250	57.00 ± 20.40/56.00 ± 20.80	RC/NN	Social Impact Scale
Yuan [28], 2020	carcinoma of urinary bladder	23/24	69.8 ± 8.1/72.3 ± 7.8	RC/SPI	Social Impact Scale
Li [29], 2020	carcinoma of urinary bladder	50/56	61.50 ± 10.70/62.10 ± 9.40	RC/NN	Social Impact Scale
Li [30], 2019	rectal carcinoma	44/45	50.77 ± 10.60/48.82 ± 10.77	RC/MBSR	Social Impact Scale
Li [31], 2021	mammary cancer	32/32	51.56 ± 12.75/50.78 ± 11.22	RC/NN	Social Impact Scale
Wang [32], 2020	Gynecological cancer	30/30	49.03 ± 9.31/48.63 ± 8.81	RC/SPI	Social Impact Scale
Wang [33], 2018	carcinoma of urinary bladder	50/50	53.70 ± 12.80/NA	RC/EPP	Social Impact Scale
Wang [34], 2020	rectal carcinoma	28/28	53.21 ± 10.64/52.34 ± 10.16	RC/PDCA	Social Impact Scale
Zhao [35], 2018	cervical carcinoma	40/40	48.80 ± 6.10/48.70 ± 6.20	RC/SPI	Social Impact Scale
Wang [36], 2021	rectal carcinoma	89/89	55.79 ± 8.16/57.82 ± 9.33	RC/MBSR	Social Impact Scale
Xu [37], 2021	carcinoma of vulva	41/41	62.40 ± 3.80/62.20 ± 3.20	RC/MBSR	Chronic disease stigma scale
Wang [38], 2021	carcinoma of endometrium	40/40	55.32 ± 3.41/54.71 ± 3.09	RC/CBT	Social Impact Scale
Cheng [39], 2023	mammary cancer	56/56	46.75 ± 6.26/46.32 ± 6.17	RC/ACT	Social Impact Scale
Cao [40], 2019	mammary cancer	245/244	62.50 ± 11.70/62.90 ± 11.50	RC/NN	Social Impact Scale

Continuation Table:

Included in the study	Disease name	sample capacity	age	intervention study	Shame evaluation tool
		Control group/ intervention group	Control group/ intervention group	Control group/ intervention group	
Kang [41], 2018	rectal carcinoma	45/44	62.5 ± 11.70/63.10 ± 11.40	RC/NN	Social Impact Scale

Notes: RC = Routine Care, NN = Narrative Nursing, MBSR = Mindfulness-Based Stress Reduction, SPI = Structural Psychological Intervention, SFA = Solution Focused Approach, PMT = Protection Motivation Theory, PFT = Psychological Family Therapy, IAT = Interactive and goal Attainment Theory, EPP = Expert Patient Program, PDCA = Plan-Do-Check-Act, CBT = Cognitive Behavioral Therapy, ACT = Acceptance and Commitment Therapy.

3.3. Methodological quality evaluation of the included studies

The quality evaluation of the 20 included studies resulted in a B grade rating. In terms of random sequence generation, eight studies were found to have a low risk of bias, and four others not specifically mentioned) [22,24,29,30]. Additionally, one study specified the time of admission, while two studies described the ward in detail [22,24,30]. However, two other studies merely mentioned randomization without providing further details [29,34]. Notably, none of the studies reported on group concealment or blinding procedures, despite the completeness of the outcome data being ensured. Furthermore, no other sources of bias were reported in these studies. For a comprehensive overview of these evaluations, please refer to **Table 2**.

Table 2. Methodological quality evaluation of the included studies.

Included in the study	Random sequences were generated	distribution hide	blind method		Integrity of the data results	Selective reporting study	other bias	grade quality
			Subjects or interventionists	Result evaluator				
Leng [22], 2020	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Sun [23], 2019	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level
Yin [24], 2019	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Chen [25], 2020	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Zhang [26], 2020	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level
Zhang [27], 2019	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Yuan [28], 2020	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Li [29], 2020	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Li [30], 2019	unclear	unclear	unclear	unclear	low risk	low risk	low risk	B level
Li [31], 2021	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Wang [32], 2020	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level

Continuation Table:

Included in the study	Random sequences were generated	distribution hide	blind method		Integrity of the data results	Selective reporting study	other bias	grade quality
			Subjects or interventionists	Result evaluator				
Wang [33], 2018	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Wang [34], 2020	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Zhao [35], 2018	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level
Wang [36], 2021	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level
Xu [37], 2021	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level
Wang [38], 2021	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Cheng [39], 2023	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level
Cao [40], 2019	unclear	unclear	unclear	unclear	low risk	low risk	unclear	B level
Kang [41], 2018	low risk	unclear	unclear	unclear	low risk	low risk	unclear	B level

3.4. Traditional meta-analysis and heterogeneity analysis of different interventions

Compared with routine care, the effects of the 10 intervention methods varied significantly in cancer patients, with the exception of SPI ($P < 0.05$). The heterogeneity tests for NN, MBSR, and SPI revealed I^2 values exceeding 50% and P values less than 0.1, therefore, a random effects model was employed. See **Table 3** for details.

Table 3. Results of traditional meta-analysis and heterogeneity tests for different interventions.

intervention study	bring into Study the number	sample capacity		Heterogeneity test		Effect model	Meta analytic result		
		control group	Intervention group	I^2	P		SMD	95%CI	P
NN	Six items	657	570	92%	< 0.001	random	-10.04	[-18.01, -2.08]	0.01
MBSR	Four items	204	205	96%	< 0.001	random	-8.72	[-11.76, -5.67]	< 0.0001
SPI	Two items	63	64	95%	< 0.001	random	-2.29	[-8.38, 3.79]	0.46
SFA	One item	40	40				-9.18	[-10.70, -7.66]	< 0.00001
PMT	One item	56	57				-6.89	[-7.88, -5.91]	< 0.00001
PFT	One item	45	45				-8.04	[-9.31, -6.77]	< 0.00001
IAT	One item	45	45				-3.07	[-3.69, -2.46]	< 0.00001
EPP	One item	50	50				-31.93	[-36.46, -27.40]	< 0.00001
PDCA	One item	28	28				-2.07	[-2.72, -1.41]	< 0.00001
CBT	One item	40	40				-39.69	[-46.01, -33.37]	< 0.00001
ACT	One item	56	56				-5.31	[-6.11, -4.51]	< 0.00001

3.5. Network meta-analysis

3.5.1. Network structure diagram

The network structure diagram illustrates the effect of various psychological intervention methods on stigma among cancer patients, as depicted in **Figure 2**. Each dot within the diagram signifies a distinct psychological intervention method, with the dot's size corresponding to the sample size; a larger dot represents a larger number of studies. Similarly, the thickness of the lines connecting these dots reflects the number of studies that contribute to the comparison between two methods. A solid line between two points indicates the existence of direct comparative evidence between those two methods. Conversely, unconnected points can be indirectly compared based on the overarching network relationship. Studies indicate that NN and MBSR studies boast the largest number of participants, with a substantial sample size, and it is noteworthy that all these comparisons are indirect in nature.

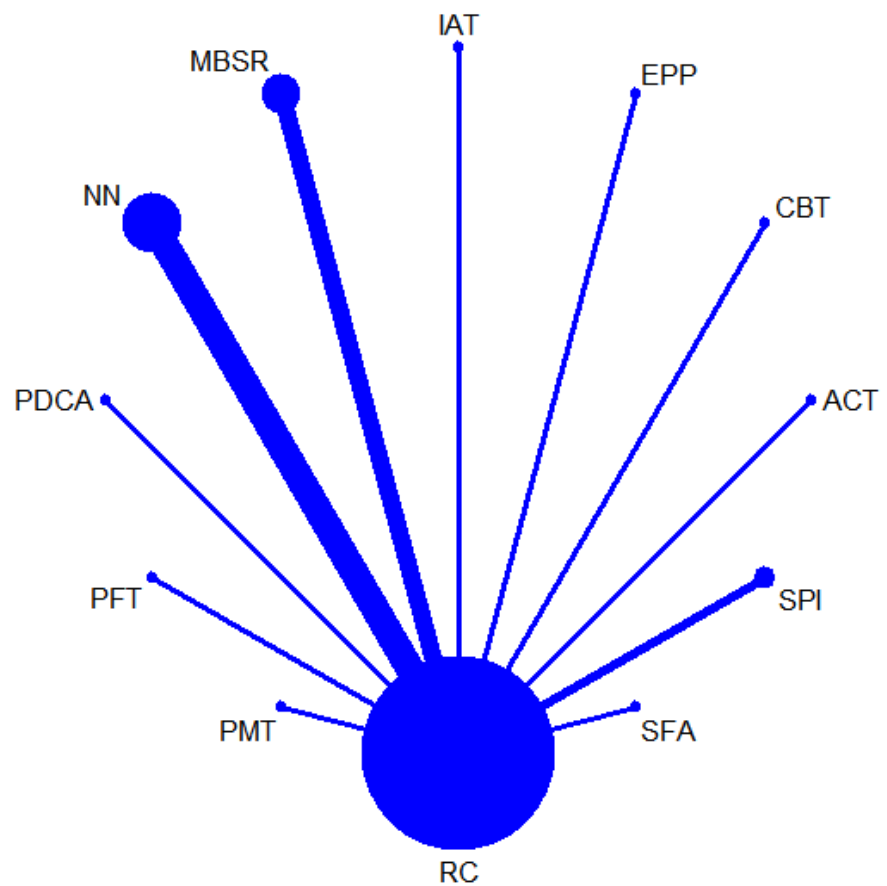


Figure 2. Network diagram of the effects of different intervention methods on stigma in cancer patients.

3.5.2. Network meta-analysis

Compared with routine care, the effects of Narrative Nursing (NN) on stigma intervention in cancer patients were statistically significant [SMD = -1.55 , 95%CI (-2.72 , -0.39), $P < 0.05$], as were those of Mindfulness-Based Stress Reduction (MBSR) [SMD = -1.58 , 95%CI (-3.01 , -0.15), $P < 0.05$], Solution-Focused Approach (SFA) [SMD = -3.72 , 95%CI (-6.63 , -0.81), $P < 0.05$], Expert Patient Program (EPP) [SMD = -2.58 , 95%CI (-5.45 , -0.29), $P < 0.05$], and cognitive behavioral therapy (CBT) [SMD = -4.15 , 95%CI (-7.07 , -1.22), $P < 0.05$].

However, pairwise comparisons among these different intervention measures revealed no statistically significant differences. For detailed information, please refer to **Table 4**.

Table 4. Results of reticular meta-analysis of effect of different interventions on stigma in cancer patients [SMD (95%CI)].

NN										
-0.03										
(-1.88, MBSR										
1.82)										
0.55	0.58									
(-1.79, (-1.9, SPI										
2.89)	3.06)									
-2.17	-2.14	-2.72								
(-5.3, (-5.38, (-6.27, SFA										
0.97)	1.11)	0.83)								
0.84	0.87	0.29	3							
(-2.23, (-2.31, (-3.2, (-1.06, PMT										
3.91)	4.05)	3.78)	7.07)							
-0.08	-0.05	-0.63	2.09	-0.92						
(-3.16, (-3.24, (-4.13, (-1.99, (-4.95, PFT										
3.01)	3.15)	2.87)	6.17)	3.11)						
0.8	0.83	0.25	2.97	-0.04	0.88					
(-2.28, (-2.36, (-3.25, (-1.11, (-4.06, (-3.16, IAT										
3.88)	4.02)	3.74)	7.04)	3.98)	4.91)					
-1.03	-1	-1.58	1.14	-1.86	-0.95	-1.82				
(-4.12, (-4.2, (-5.09, (-2.94, (-5.9, (-4.99, (-5.87, EPP										
2.07)	2.21)	1.93)	5.23)	2.17)	3.1)	2.22)				
1.36	1.39	0.8	3.52	0.52	1.44	0.56	2.38			
(-1.74, (-1.81, (-2.7, (-0.56, (-3.52, (-2.61, (-3.48, (-1.67, PDCA										
4.45)	4.59)	4.31)	7.61)	4.55)	5.48)	4.6)	6.43)			
-2.6	-2.57	-3.15	-0.43	-3.43	-2.52	-3.39	-1.57	-3.95		
(-5.74, (-5.82, (-6.71, (-4.55, (-7.51, (-6.6, (-7.48, (-5.66, (-8.05, CBT										
0.55)	0.69)	0.41)	3.7)	0.64)	1.57)	0.69)	2.53)	0.14)		
0.68	0.71	0.13	2.85	-0.15	0.76	-0.12	1.71	-0.67	3.28	
(-2.39, (-2.47, (-3.36, (-1.22, (-4.17, (-3.27, (-4.14, (-2.33, (-4.71, (-0.8, ACT										
3.76)	3.9)	3.62)	6.92)	3.86)	4.79)	3.91)	5.75)	3.36)	7.36)	
-1.55	-1.58	-1	-3.72	-0.72	-1.63	-0.75	-2.58	-0.2	-4.15	
(-2.72, (-3.01, (-3.03, (-6.63, (-3.56, (-4.49, (-3.6, (-5.45, (-3.06, (-7.07, ^{-0.87}										
-0.39)	-0.15)	1.03)	-0.81)	2.13)	1.22)	2.09)	-0.29)	2.67)	-1.22)	(-3.71, 1.97) RC

3.5.3. Results sorting

A higher SUCRA value suggests a more effective intervention method for stigma reduction. The cumulative probability ranking plot indicates that the order of the effectiveness of different psychological interventions for stigma reduction in cancer patients is as follows: CBT (SUCRA = 90.0%) > SFA (SUCRA = 85.6%) > EPP (SUCRA = 69.7%) > MBSR (SUCRA = 54.4%) > NN (SUCRA = 53.7%) > PFT (SUCRA = 53.4%) > SPI (SUCRA = 40.4%) > ACT (SUCRA = 38.2%) > IAT (SUCRA = 36.7%) > PDCA (SUCRA = 26.1%) > RC (SUCRA = 15.4%). See **Figure 3** for details.

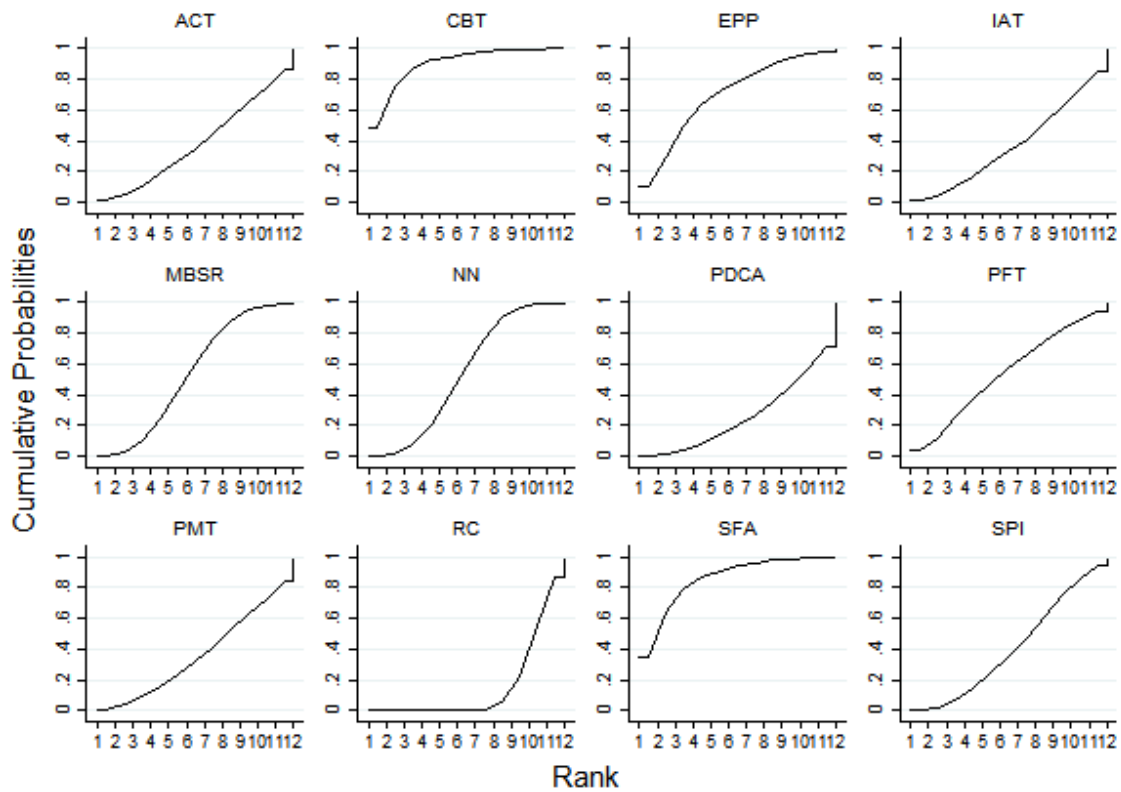


Figure 3. Order probability plot of the effects of different intervention methods on stigma in cancer patients.

3.6. Test of publication bias

The funnel plot shows that the funnel plot is basically symmetrically distributed, and the Egger's test did not find a significant publication deviation ($P > 0.05$). It suggests that there may be no obvious publication deviation, and the overall representativeness of the included literature is good. See **Figure 4**.

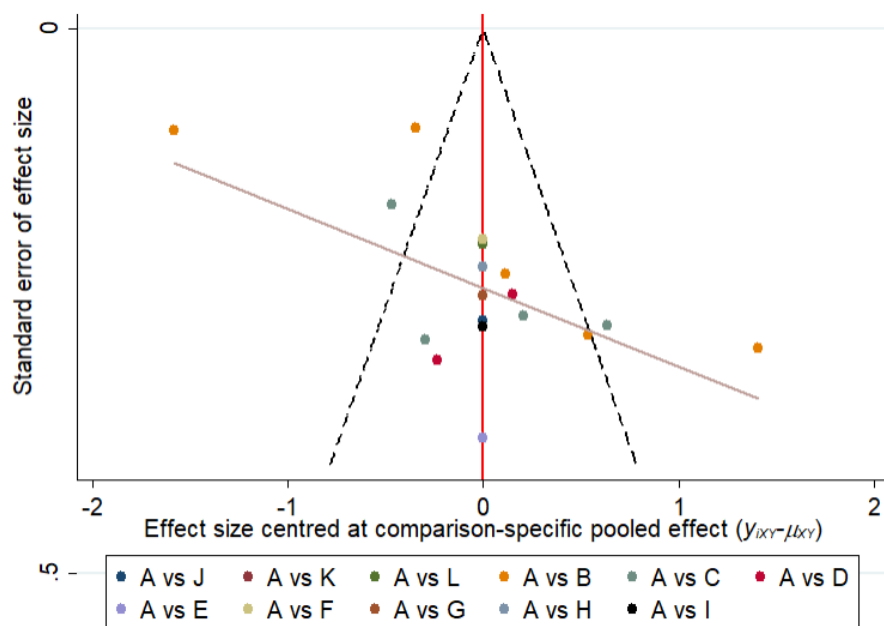


Figure 4. Funnel plot of the effect of different intervention methods on stigma in cancer patients.

(Note: A represents RC; B represents NN; C represents MBSR; D represents SPI; E represents SFA; F represents PMT; G represents PFT; H represents IAT; I represents EPP; J represents PDCA; K represents CBT; L represents ACT).

3.7. Assessment of evidence quality

The CINeMA evaluation revealed varying degrees of bias and quality concerns in the analyzed studies. In terms of risk of bias within studies, a minority of pairwise comparisons were rated as serious, while the majority were considered not serious. With respect to reporting bias, the overwhelming majority of pairwise comparisons were deemed not serious. In the dimension of indirectness, all pairwise comparisons were judged as serious. Regarding imprecision, all pairwise comparisons were also assessed as serious. As for heterogeneity, a small number of pairwise comparisons were considered very serious, while the vast majority were rated as serious. Lastly, in the aspect of inconsistency, all pairwise comparisons were adjudged as serious. Overall, the quality of evidence was determined to be moderate.

4. Discussion

4.1. The cognitive behavioral therapy (CBT) psychological intervention method exhibits the most favorable efficacy for addressing stigma in cancer patients

Stigma constitutes a pervasive negative psychological experience endured by cancer patients. Psychological interventions are pivotal in penetrating the psychological barriers of cancer patients, fostering a profound emotional connection with them. The network meta-analysis underscores CBT as the most promising intervention method. CBT interventions have been shown to enhance psychological well-being, elevate quality of life, and alleviate stigma among cancer patients [42–44]. Research indicates that CBT effectively alleviates negative emotions, rectifies distorted perceptions, refines coping strategies, and fosters a more positive mindset towards

Stigma, as a major psychosocial challenge confronting cancer patient, is increasingly recognized as a pivotal factor influencing the overall well-being of these individuals. This assertion is substantiated by the extensive research conducted by Rose et al. [45] and Hamann et al. [46]. These studies profoundly illuminate how stigma can subtly undermine patients' mental health and exacerbate their psychological burden, thereby emphasizing the imperative need to actively address and eliminate this obstacle within comprehensive cancer treatment protocols. To effectively mitigate the psychological distress stemming from stigma among cancer patients, both academia and clinical practice have jointly acknowledged the significance of implementing targeted interventions. Among these interventions, acceptance-centered psychological strategies exhibit considerable potential, effectively ameliorating patients' psychological symptoms, including anxiety and depression, while markedly diminishing their stigma experience [14,18]. These interventions foster a more resilient psychological shield for patients by fostering their self-acceptance and fostering positive coping mechanisms.

In addition, with the aim of further enhancing the therapeutic efficacy and fostering the holistic rehabilitation of patients, the researchers additionally introduced innovative concepts that incorporate post-traumatic growth intervention strategies and mindfulness-based cognitive therapy (MBCT) within the framework of traditional cognitive behavioral therapy (CBT) [44]. These complementary therapeutic approaches not only emphasize the direct mitigation of stigma and associated psychological manifestations, but also center on fostering the intrinsic resilience of patients, empowering them to discern opportunities for personal growth amidst adversity, and ultimately facilitating the augmentation of psychological resilience and the enhancement of their quality of life.

In conclusion, cognitive behavioral therapy (CBT), serving as a pivotal psychological intervention, has demonstrated a proven track record of effectiveness in alleviating psychological distress among cancer patients, enhancing quality of life, and mitigating stigma. This therapeutic approach equips patients with a potent psychological tool, enabling them to confront the challenges posed by cancer through the modulation of their cognitive patterns and subsequent behavioral adjustments.

4.2. Significant effects of multiple psychological interventions on cancer-related stigma reduction

In delving into the profound impact of psychological interventions on cancer-related stigma among patients, the importance of diversified and personalized intervention strategies cannot be overemphasized. Through validation using traditional meta-statistical analysis methods, we found that, with the exception of a specific intervention (SPI), the remaining ten psychological interventions demonstrated statistically significant differences ($P < 0.05$) in reducing cancer-related stigma compared to routine care. This outcome not only reinforces the effectiveness of psychological interventions but also underscores the significance of selecting appropriate intervention strategies. It underscores the need for clinical practitioners to flexibly select and combine multiple psychological interventions based on patients' individual differences, disease severity, and psychological needs to achieve optimal intervention outcomes.

Our comprehensive network meta-analysis not only confirms the efficacy of cognitive behavioral therapy (CBT) as a classic psychological intervention but also reveals that Narrative Nursing (NN), Mindfulness-Based Stress Reduction (MBSR), Solution-Focused Approach (SFA), and Expert Patient Program (EPP) exhibit remarkable intervention effects. These findings significantly enrich our understanding of the role of psychological interventions in cancer care, providing a broader and deeper range of options for clinical practice.

It is noteworthy that our study did not solely focus on these five specific interventions but also comprehensively assessed the overall effects of multiple psychological interventions. The results showed that almost all evaluated psychological interventions had SUCRA values significantly higher than routine care, highlighting the unique advantages of psychological interventions in reducing cancer-related stigma and enhancing patients' psychological well-being. The elevation of SUCRA values not only quantifies the intervention effects but also underscores the indispensable role of psychological interventions in comprehensive cancer treatment.

In summary, the findings of this study provide robust evidence supporting the use of multiple psychological interventions for cancer patients, demonstrating their significant effects in reducing stigma and promoting psychological recovery. This not only offers valuable insights for clinicians and nurses but also points to directions for the development and optimization of future psychological intervention strategies. We anticipate the emergence of more high-quality studies to further explore the potential of psychological interventions in cancer care, ultimately providing more comprehensive and individualized psychological support for cancer patients.

4.3. Limitations and perspectives of this study

The limitations of the present study primarily reside in the restricted scope, stemming from the utilization of solely Chinese and English databases for data retrieval. This confines the exploration to a specific linguistic and cultural context, potentially overlooking insights from other linguistic realms. Furthermore,

inconsistencies in the questionnaire instruments employed in the English-language literature have resulted in the exclusion of certain high-quality studies that did not fulfill the predefined inclusion criteria. This, in turn, potentially narrows the breadth and depth of the investigative landscape, impeding a more comprehensive understanding of the research topic. Future endeavors should aim to expand the search scope to incorporate additional databases and languages, as well as harmonize questionnaire tools across studies to enhance the inclusivity and representativeness of the research findings.

Second, the included original studies had obvious weaknesses in quality, and the overall level of evidence quality was low. Specifically, all the included studies comprised solely Chinese literature classified as grade B, inherently containing methodological deficiencies. Notably, the inadequate application of blinding procedures significantly elevates the risk of rater bias, potentially compromising the accuracy of the study outcomes. Additionally, the limited sample sizes employed in several studies undermine their statistical robustness, thereby casting doubt on the reliability of the derived conclusions. Concurrently, a direct comparison of the included RCTs revealed substantial heterogeneity ($I^2 > 50\%$), ultimately impairing the generalizability of the findings and necessitating a downgrade in the overall quality of evidence.

In light of the aforementioned limitations, researchers ought to accord paramount significance to the rigor and scientific rigor of their research designs when embarking on original studies in the foreseeable future. Specifically, researchers must rigorously adhere to the standards of RCTs, ensuring the precise execution of crucial elements including randomization, blinding, and allocation concealment, thereby fundamentally enhancing the quality of their research endeavors. Only by adhering to these rigorous standards can researchers develop more reliable and efficacious psychological interventions aimed at mitigating the stigma experienced by cancer patients. In addition, future studies should consider including more diverse cancer types and designing and implementing more tailored psychological interventions for patients with different types of cancer. At the same time, researchers should document and analyze the specific content and form of the intervention, as well as the duration of the intervention, in order to better understand which factors have a significant impact on the effectiveness of the intervention. With this more nuanced analysis, we can make more targeted recommendations for clinical practice, which can more effectively reduce the stigma of cancer patients and improve their mental health and quality of life.

5. Conclusions

This study, through systematic and network meta-analysis, confirms the optimal efficacy of cognitive behavioral therapy (CBT) in mitigating cancer-related stigma among patients and reveals that various psychological interventions can effectively facilitate patients' psychological recovery. CBT not only improves patients' psychological outcomes and quality of life but also significantly reduces stigma and other psychological symptoms. Furthermore, interventions such as Narrative Nursing (NN), Mindfulness-Based Stress Reduction (MBSR), Solution-Focused Approach (SFA), and Expert Patient Program (EPP) also demonstrate remarkable intervention effects, offering diverse and personalized options for clinical practice. However, this study is not without limitations, including a restricted research scope, relatively low evidence quality grades, and high heterogeneity. Future research should endeavor to expand the search scope, enhance the quality of evidence, and

explore more innovative psychological intervention strategies to further optimize the psychological support system for cancer patients. By doing so, we aim to provide a more comprehensive and tailored approach to addressing the psychological needs of this vulnerable population.

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Availability of data and materials: The data and materials used in this article are derived from previously published studies and are publicly available through the respective journals or databases where they were originally reported. The references to these studies are comprehensively listed in the bibliography of this article. No new data were generated in the course of this review, and thus, no additional datasets or repositories are associated with this publication. For readers interested in accessing the full text of the studies reviewed, we recommend consulting the relevant databases or contacting the authors of the original articles for further information. We have made every effort to ensure that all sources are properly cited and that the information presented in this review is accurate and up-to-date.

Conflict of interest: The authors declare no conflict of interest.

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