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Original Article

The impact of mental toughness training program on psychological well–being and resilience in cancer patients: A Randomized Controlled Trial

Negin Hemmati[1], Kourosh Zarea [*2] Samira Beiranvand[3], Saeed Ghanbari[4], Mehran Hosseinzadeh[5]

[1]Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[2]Nursing Care Research Center in Chronic Diseases, Nursing and Midwifery School, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
[3]Nursing Care Research Center in Chronic Diseases, Nursing and Midwifery School, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[4]Department of Biostatistics and Epidemiology, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
[5]Hematology, Oncology Department of Internal Medicine, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

Abstract

Purpose: This study aims to investigate the effects of a mental toughness education program on the psychological well–being and resilience of cancer patients.

Method: This randomized clinical trial recruited 32 adults with cancer from Baqayi Hospital 2 in Ahvaz. The participants were divided into two groups: an intervention group and a control group. The intervention group received the psychological resilience–based educational intervention. Data were collected using four questionnaires, including the Ryff Psychological Well–Being Scale, the Connor–Davidson Resilience Scale, and the Clough Mental Toughness Scale. Data analysis was performed using SPSS software version 25.

Results: The average age of the participants in this study was 46.47 ± 10.21 years. The mean mental toughness scores before the intervention were 120.5 and 110.81 in the intervention and control groups, respectively. After the intervention, the mean scores increased to 164 and 111.88, respectively, and this difference was statistically significant (P<0.001). The overall mean resilience scores before and after the intervention in the intervention group were 49.56 and 108.63, respectively, with a statistically significant difference (P<0.001). The overall psychological well–being score decreased immediately after the intervention but increased one month later. However, this change was not statistically significant.

Conclusion: Based on the results of this study, psychological resilience education has a positive impact on resilience, psychological well–being, and certain dimensions of social well–being in patients with cancer. Therefore, interventions focused on developing psychological resilience, with an emphasis on increasing resilience and psychological well–being, can lead to positive outcomes in patients with cancer.

Keywords: Mental toughness, psychological resilience, cancer, psychological well–being, resilience.

Introduction

According to World Health Organization (WHO) statistics, cancer is the first or second leading cause of death in people under the age of 70 globally and accounted for 10 million deaths in 2020, of which 58.3% occurred in Asia[(1)]. In Iran, cancer has been reported as the third leading cause of death after heart disease and accidents, and statistics show that in 2020, 131191 new cases of various cancers were recorded, and 79136 people died as a result[(2)]. In addition, the number of such patients in Iran is growing due to the aging population

Corresponding Author: Kourosh Zarea, Nursing Care Research Center in Chronic Diseases, 2nd floor, Nursing and Midwifery School, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
Email: kouorsh1685@gmail.com, zarea_k@ajums.ac.ir.
Phone: +986133738333

and increasing incidence of cancer, as well as recent advances in treatment and care[3].

From diagnosis to treatment and beyond, cancer patients face many physical and emotional ups and downs[4]. Advances in medical treatments have led to improved survival rates in cancer, and the importance of addressing the psychological well–being of patients has been recognized. This disease is unparalleled in terms of the sense of helplessness and deep fear it creates in a person [5]. Psychological distress and reduced resilience can harm the overall quality of life of individuals with cancer[6]. More recently, the approach of positive psychology, which emphasizes human talents and abilities rather than abnormalities and disorders, has gained attention among psychologists. The ultimate goal of this approach is to identify the structures and methods that lead to human well–being and happiness. Therefore, the most important constructs in researching this approach are those factors that contribute to an individual's greater adaptability to life's demands and threats. Among these constructs, resilience occupies a prominent place[7,8].

Resilience is considered a personality trait that improves individuals' ability to manage and adapt to problems[9]. There is evidence that resilience can increase people's ability to cope with difficulties [7]. Individuals with high resilience can cope with life's challenges better than those with low resilience [10]. Resilience can be a flexible approach to managing unpleasant (negative) emotional experiences[9]. Resilience is an active and constructive response of individuals to their environment. Resilience is a form of self–repair with positive emotional, affective, and cognitive outcomes. It is also one of the most important psychological abilities related to cancer[8]. Garcia et al. have shown that highly resilient people retain their psychological well–being and can adapt psychologically to stress and adversity[11]. Another study found a significant and positive correlation between resilience and psychological well–being[12].

The concept of psychological well–being, an approach to mental health proposed by positive psychology in recent years, emphasizes positive attributes and the development of individual capacities, and is indicative of mental health [13]. Psychological well–being refers to a person's overall mental health and emotional resilience. This encompasses a range of positive psychological experiences, emotions, and attitudes that contribute to a person's overall life satisfaction and ability to cope effectively with challenges. Mental well–being encompasses more than the absence of mental illness; it focuses on promoting positive mental states and optimal functioning. It is a multidimensional concept that encompasses different aspects of one's inner life and subjective experience[14].

Engaging in mental toughness exercises is one of the most effective interventions for coping with illness–related stressors [15]. Mental Toughness is a personality trait closely related to qualities such as character, resilience, grit, and perseverance, which determine one's ability to perform consistently under stress and pressure[16].

Based on Kobasa's (1979) research on hardiness, the 4Cs model of mental toughness was originally proposed by Peter Clough et al. [17,18]. Mental toughness can make cancer patients more flexible and resilient to disease and difficult treatment conditions, helping them respond more adaptively [19]. This attribute can be developed through targeted interventions, such as psychological toughness training programs. They can be introduced as a new approach to enhance the psychological well–being and resilience of adults with cancer[16].

This characteristic also affects other psychological variables and may lead to improvements in the psychological state of people with cancer, which is considered one of the most stressful situations [15]. In this respect, training in psychological toughness can even become a strategy for prevention. It can also empower patients to cope with the emotional challenges of cancer treatment. This can increase their sense of self–efficacy and control [20].

Several studies have examined the effectiveness of interventions such as mindfulness, acceptance and commitment therapy, and dialectical behaviour therapy on psychological well–being and resilience. The current research has a strong background, as mental toughness has been studied in many previous studies, including its predictive role in the psychological state of patients [13,20,21]. Simultaneously, the current research investigates the effectiveness of mental toughness training on the psychological well–being and resilience of adults with cancer, which has not been done before. Despite the potential benefits of such interventions for cancer patients, there is a paucity of research in this area. To address this gap, this study will examine the effectiveness of an educational intervention based on mental toughness on the psychological well–being and resilience of patients with cancer.

Methods

Trial Design

This study was a prospective, randomized, controlled trial registered in the Clinical Trials Database (registration number: IRCT20230109057080N). conducted in an urban hospital in southwest Iran in 2023.

Setting

This trial was conducted between February 20, 2023, and October 22, 2023, at the Shahid Baghayi Oncology Hospital in Ahvaz, Iran. It is the largest specialized centre in Ahvaz dedicated to treating cancer patients. The hospital is affiliated with Jundishapur University of Medical Sciences in Ahvaz and is the only training and research centre in the field of oncology.

Participants

The research population consisted of all adult men and women with cancer who had been referred to this center and had a registered medical record. The research sample included individuals from the research population, selected using the following inclusion criteria: age ≥ 18 years, cancer diagnosis, hospitalization in the oncology department, residency in the city of Ahvaz, basic literacy skills (reading and writing), no attendance in similar training sessions, and no history of neurological and psychiatric disorders or the use of psychotropic medications. Notably, patients who presented as outpatients were excluded from this study. Patients were excluded if they did not wish to continue participating in the study, started receiving daily chemotherapy, moved to another city to continue treatment, died, or did not attend any of the educational sessions (Figure 1).

Participants were assured of the confidentiality of their participation and that their information would not be disclosed or used for purposes other than this study. The rationale for conducting the study and its objectives were justified, and the participants provided written informed consent to participate in the study. The subjects were reassured of their right to opt out at any time during the study.

Intervention

Training was conducted using a package of mental toughness training programs. It was based on the

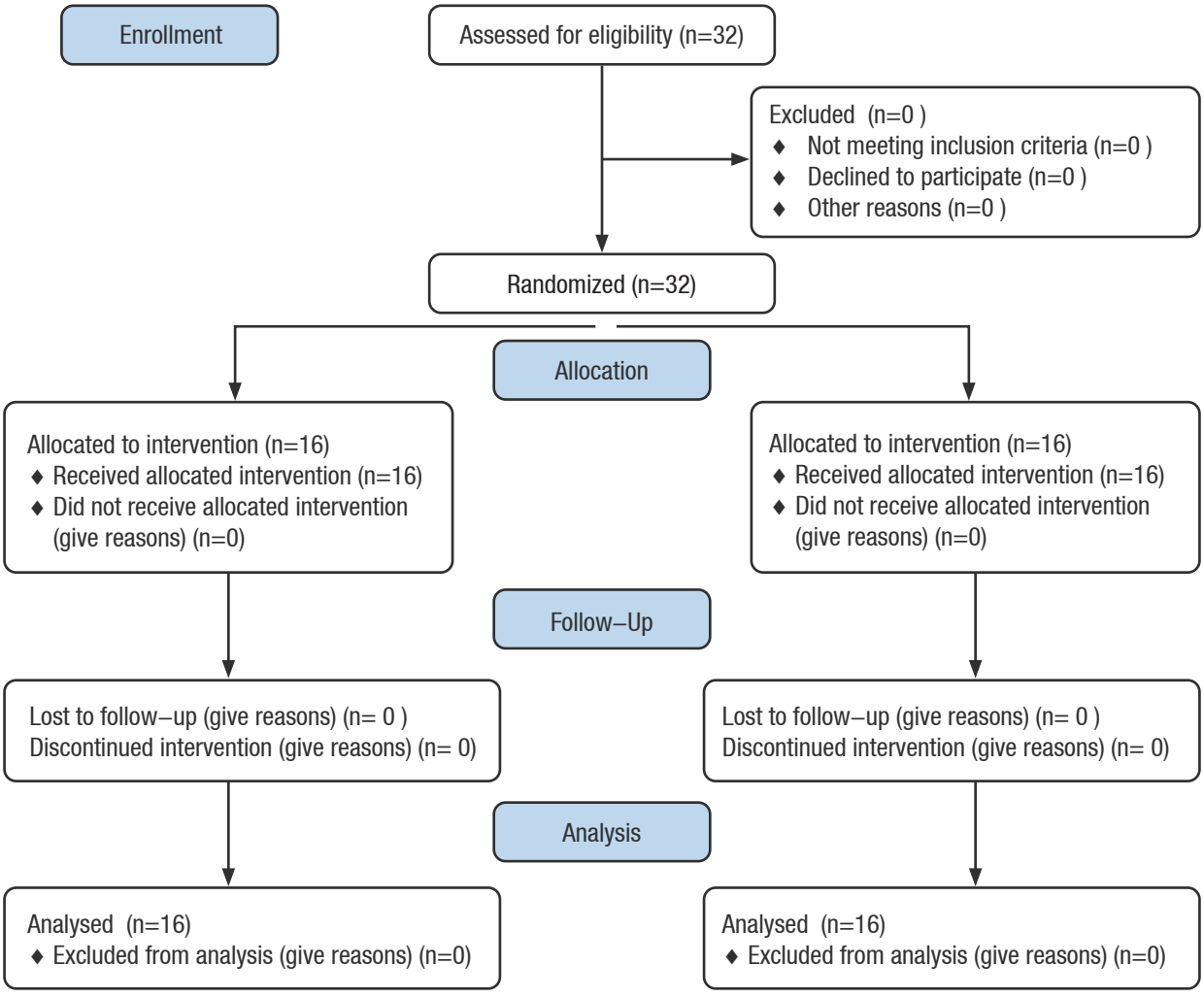


Figure 1: CONSORT Flow Diagram

educational content of Razavian et al. 's study entitled "Effectiveness of mental toughness on distress tolerance and mental vitality in parents of children with leukaemia."[15]. The materials were prepared with defined training objectives and content, and were delivered in nine 60–minute training sessions. The training method was group therapy, which was conducted by the principal investigator, assisted by a clinical psychologist based at Shahid Beqayi Hospital. The patients in the intervention group were invited to a special room in the hospital to receive training.

Implementation of the Intervention

Experimental Group: To deliver the training program, the intervention group participants were divided into two subgroups of eight, and the material was presented in nine training sessions of 60 minutes each for each subgroup (two 60–minute sessions per week). In other words, each training session was repeated for each subgroup. A total of 18 training sessions were conducted for the entire intervention group. The initial meetings aimed to introduce the structure and objectives of the training program and build a therapeutic relationship. Sessions 2 to 8 included educational content on managing stress and anxiety to prepare for treatment, accepting and managing challenges, improving commitment to build mental toughness, controlling emotions, feelings, and life in the situation, believing in and using abilities in society and in disease–related situations, and interpersonal trust. In the ninth session, a summary and review of the educational materials were conducted, and participants who engaged in self–evaluation of the course discussed their learning experiences and expressed their future goals. The delivery of the required content in the intervention group included lectures, group debates, Q&A, slides, and sharing experiences in the presence of the researcher and clinical psychologist. The effectiveness of the mental toughness training was assessed by completing the questionnaires immediately after the intervention (5th week) and again, after four weeks (9th week).

Control Group: At the first measurement, all patients were informed of the purpose of the study and provided with the researcher's contact details. Patients assigned to the control group could call the researcher if they wished to withdraw. The control group did not receive any training on the subject during the trial. They received routine care regularly in the oncology department. The oncology department has an oncology nurse educator. All patients who are starting treatment (chemotherapy and radiotherapy) will be referred by their physician to an oncology nurse educator. As part of routine care, she provides information about the side effects of medication and diet, psychological support, and answers to patients' questions as they arise. For ethical reasons, training sessions were offered to the control group at the end of the study. Similar to the intervention group, the control group was assessed immediately following routine care and again at 4 weeks.

Measurements

At the beginning of the study, immediately after the intervention (week 5), and 4 weeks after that (9 weeks), the following measures were used: Demographic Information Form (including age, sex, level of education, marital status, economic status, type of cancer, occupation), Mental Toughness Questionnaire (MTQ–48) [17], Psychological Well–Being Scale (PWB) [22] and Connor–Davidson Resilience Scale (CD RISC)[23].

Outcomes

Primary Outcomes

1) Mental Toughness Questionnaire (MTQ–48): This questionnaire was the Iranian version of Peter Clough's standardized Mental Toughness Questionnaire (MTQ–48). It consists of 48 items divided into six general subscales: Challenge (8 items), Commitment (11 items), Control (14 items, including Emotional Control (7 items) and Life Control (7 items)), and Confidence (15 items, including Confidence in Abilities (9 items) and Interpersonal Confidence (6 items)). The items were scored on a Likert scale ranging from strongly disagree [1] to strongly agree [6]. Some items (items 6, 14, 11, 22, 29, 35, 42, 47, 21, 26, 27, 37, 9, 15, 33, 41, 10, 18, 32, 36, 28, 46) were reverse scored, with higher scores indicating greater psychological resilience [15,17].

Secondary Outcomes

2) Ryff's Psychological Well–Being (PWB) Scale–54[22]: This Scale was also psychoanalyzed in Iran [24]. It contains 54 items in six dimensions: self–acceptance, positive relationships, autonomy, environmental mastery, purpose in life, and personal growth. Each dimension contained nine questions and was based on a six–point Likert scale ranging from strongly disagree [1] to strongly agree[6]. Phrases: 3–5–7–8–10–12–13–14–16–18–20–22–24–25–26–27–30–31–32–39–40–41–43–44–46–49–50–54 are scored in reverse. The score range for this scale is 54–324. The higher the score on this questionnaire, the higher the level of psychological well–being, and vice versa. A score between 54 and 108 indicates a low level of psychological well–being, a score between 108 and 216 indicates an average level, and a score above 216 indicates a high level[22,24].

3) Connor and Davidson's Resilience Scale (CD–RISC): The validity and reliability of this scale have been confirmed in Iran[25]. It contains 25 questions (related to five factors: perception of individual competence, trust in individual instincts, tolerance of negative emotions, positive acceptance of change and secure relationships, control, and spiritual influences) on a five–point Likert scale: always true [5], often true [4], sometimes true [3], rarely true [2], and completely false [1]. The minimum possible score was 25, and the maximum was 125. A higher score indicates greater resilience. Scores between 25 and 41 indicate low resilience, and scores between 41 and 83 indicate average resilience. A score above 83 indicates high resilience[23,25].

Sample Size

The sample size was determined using the MedCalc software, with a power of 90% and a level of error of 5%, and was based on the following formula: $n = \frac{(z_{1-\alpha/2}+z_{1-\beta})^2+(SD_1^2+SD_2^2)}{(\mu_1-\mu_2)\hat{}2}$ taking into account the mean and standard deviation obtained in a similar study [15], and considering a dropout rate of 20%. The decision was that there should be a total of 32 patients in the study (16 in each group).

Randomization

A simple randomization procedure (drawing of lots) was used to allocate participants within each group. This involved writing the names of all selected patients on pieces of paper, placing them into a container, and then drawing a name from the container. The first 16 people were assigned to the intervention group (under training by the mental toughness training program package), and the rest were assigned to the control group (under training by routine care). This gave everyone an equal chance of being in the intervention group. An academic researcher from outside the trial performed the randomization. Neither the patient nor the investigator was aware of the randomization process.

Blinding

The allocation of the experimental and control groups was blinded to the researchers and patients. However, the researchers and patients in the experimental group could not be blinded during the intervention. This was due to their active participation in training.

Ethical Consideration:

The present study was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (AJUMS) with code: IR. AJUMS. REC.1401.504, ensuring that ethical considerations were met.

Data Analysis:

The data were analysed using SPSS software, version 25, and both descriptive (mean, standard deviation, frequency, percentage, etc.) and inferential (chi–square, paired t–test, independent t–test, Mann–Whitney U test, and repeated measures test) statistical analyses were performed. The significance level was set at P≤0.05.

Findings

The final analysis was performed on data collected from 32 adult cancer patients to meet the objectives of this study. The mean age of the participants was 46.47±10.21 years. More than 60% of the participants were women, and 81.3% were married. The results showed that the distribution of the mentioned variables was the same in both groups (P>0.05), and the randomization was performed correctly (Table 1).

The average score obtained in mental toughness before holding nine training sessions was 120.5 and 110.81 in the two intervention and control groups, respectively. This average increased to 164 and 111.88 after the intervention in the two groups. The third time was 155 and 109.81, respectively. The increase in the total mean score for mental toughness before and after the intervention was significant in the intervention group (P<0.001) (Table 2).

The overall mean resilience score in the experimental group before the intervention was 49.56, which increased to 108.63 post–intervention. This difference was statistically significant (P<0.001). According to the results in Table 4, resilience had the highest value at the second time point, and it decreased at the third time point compared to the second time point, but the process was constant in the control group. However, the resilience level in the intervention group was lower than that in the control group at the first and second time points, and this difference was statistically significant (P<0.001) (Table 3).

Table 4 presents the mean scores for overall psychological well–being and its dimensions. The overall psychological well–being score decreased immediately after the intervention but increased after one month. However, this difference was not statistically significant (Table 4).

Discussion

The present study aimed to investigate the effectiveness of mental toughness training on psychological well–being and resilience in adults with cancer at Baghayi 2 Hospital in Ahvaz, Iran. Based on the results, the cancer patients in the intervention group showed an improvement in

Variable		Intervention (N=16)		Control (N=16)		Test statistics (P–value)
		number	Percentage	Number	Percentage	
sex	man	5	31.3	8	50	1.16 (0.473)
	woman	11	68.8	8	50	
Marital status	married	13	81.3	14	87.5	1.03 (0.595)
	single	2	12.5	2	12.5	
	widowed	1	6.3	0	0	
Patient's education	elementary	3	18.8	7	43.8	7.14 (0.067)
	middle School degree	1	6.3	4	25	
	diploma	8	50	2	12.5	
	Bachelor's degree	4	25	3	18.8	
Occupation	Unemployed	12	75	11	68.8	0.155 (0.694)
	employed	4	25	5	31.3	
Economic situation	Poor	7	43.8	11	68.8	2.04 (0.361)
	Average	7	43.8	4	25.0	
	Good	2	12.5	1	6.3	
Type of cancer	Digestion	3	18.8	4	25.0	8.78 (0.361)
	breast	2	12.5	3	18.8	
	Leucemie	7	43.8	2	12.5	
	bone marrow	0	0	1	6.3	
	Uterus	1	6.3	2	12.5	
	lung	1	6.3	2	12.5	
	Liver	0	0	1	6.3	
	Pancreas	0	0	1	6.3	
	Lymphoma	2	12.5	0	0	
	other cities	6	37.5	8	50	

Table 1: Distribution of demographic variables in the two intervention and control groups

resilience, both in the overall score and in all dimensions, after the intervention. In terms of psychological well–being, there were noticeable and significant differences between the intervention and control groups immediately after the educational intervention on the dimensions of "dominance over the environment," "autonomy," "positive relationships with others," and "self–acceptance." However, the overall changes were not significant.

Based on the results of the present study, the resilience of patients with cancer increased after the educational intervention. Consistent with this finding, Ishibashi et al. stated that the adoption of psychological strength approaches in adolescents and young adults leads to an increase in their resilience to cancer[26]. A relationship was found between resilience and mental toughness, and these two factors in patients with cancer can lead to better adaptation and performance in disease conditions. A correlational study reported a positive and strong relationship between psychological stability and resilience[27]. Another study found that psychological toughness is a predictor of resilience among cancer survivors [28]. Wu et al. showed that face–to–face psychoeducational interventions for patients with breast cancer are potentially effective in improving knowledge, resilience, and quality of life during and after chemotherapy[29].

Dimension	Test point	Group	Mean	standard deviation	minimum	maximum	Test statistics	P–value
Challenge	first	intervention	16.88	3.77	11	26	–0.517	0.609
		control	17.56	3.74	12	26		
	Second	intervention	27.31	2.75	21	31	7.027	< 0.001
		control	17.75	4.7	11	29		
	Third	intervention	24.4	3.09	17	29	5.521	< 0.001
		control	17.88	4.08	11	26		
Commitment	first	intervention	26.81	3.29	22	32	1.071	0.293
		control	25.19	5.1	16	35		
	Second	intervention	36.94	4.37	28	44	6.469	< 0.001
		control	25.8	5.66	17	35		
	Third	intervention	33.81	4.78	25	41	5.318	< 0.001
		control	24.31	5.31	16	38		
Emotional control	first	intervention	17.69	3.94	12	26	1.72	0.096
		control	14.63	5.93	8	28		
	Second	intervention	21.63	4	14	26	5.439	< 0.001
		control	14	3.93	9	22		
	Third	intervention	21.31	4.25	12	27	4.431	< 0.001
		control	14.5	4.44	9	25		
Life control	first	intervention	18.25	3.68	12	25	0.962	0.344
		control	16.88	4.38	12	29		
	Second	intervention	26.38	2.73	22	31	5.95	< 0.001
		control	17.19	5.54	11	33		
	Third	intervention	25.13	3.56	19	30	5.6	< 0.001
		control	16.44	5.09	12	33		
Control	first	intervention	35.94	6.64	28	48	1.578	0.125
		control	31.5	9.08	21	50		
	Second	intervention	48	5.15	36	55	6.877	< 0.001
		control	31.19	8.31	22	51		
	Third	intervention	46.44	6.2	36	56	6.227	< 0.001
		control	30.94	7.79	21	51		
Trust in your abilities	first	intervention	23.19	4.09	14	32	2.095	0.045
		control	19.88	4.83	10	30		
	Second	intervention	29.44	3.92	23	39	5.464	< 0.001
		control	20.31	5.41	13	32		
	Third	intervention	28.31	3.22	23	33	5.81	< 0.001
		control	19.69	4.99	13	30		
Interpersonal trust	first	intervention	17.69	3.89	13	27	0.774	0.445
		control	16.69	3.4	8	22		
	Second	intervention	22.31	3.18	14	27	4.395	< 0.001
		control	17.25	3.34	9	22		
	Third	intervention	21.5	2.9	16	26	3.695	0.001
		control	17	3.92	9	23		
Trust	first	intervention	40.88	6.7	27	54	1.726	0.095
		control	36.56	7.41	18	52		
	Second	intervention	51.75	6.21	37	64	5.864	< 0.001
		control	37.56	7.42	22	50		
	Third	intervention	49.81	5/44	41	58	5.733	< 0.001
		control	36.69	7.36	22	53		
Total mental strength score	first	intervention	120.5	18.1	93	156	1.398	0.172
		control	110.81	20.99	83	160		
	Second	intervention	164	15.01	122	189	7.828	< 0.001
		control	111.88	22.01	85	165		
	Third	intervention	155	15.64	120	178	6.97	< 0.001
		control	109.81	20.69	86	167		

Table 2: Comparison of two control and intervention groups in terms of mental toughness and its dimensions at three points in the tests

Dimension	Point of test	Group	Mean	Standard deviation	Minimum	Maximum	Test statistics	P–value
Perception of individual competence	first	Intervention	16.31	2.70	10	20	–0.872	0.390
		Control	17.50	4.73	11	27		
	Second	Intervention	34.06	1.84	31	36	8.841	< 0.001
		Control	19.19	6.47	12	37		
	Third	Intervention	28.81	3.58	23	36	8.588	< 0.001
		Control	17.50	3.86	13	27		
Trust in individual instincts to tolerate negative emotions	first	Intervention	14.44	2.80	10	19	–1.524	0.138
		Control	16.38	4.24	11	26		
	Second	Intervention	29.38	2.50	24	33	8.008	< 0.001
		Control	17.50	5.38	12	34		
	Third	Intervention	25.44	3.37	20	32	6.586	< 0.001
		Control	16.63	4.16	10	27		
Positive acceptance of change and secure relationships	first	intervention	9.13	2.00	5	14	–2.820	0.008
		control	11.94	3.45	7	18		
	Second	intervention	22.69	1.54	20	25	10.566	< 0.001
		control	12.94	3.36	8	20		
	Third	intervention	17.75	2.27	15	22	4.942	< 0.001
		control	11.94	4.12	6	21		
Control	first	intervention	5.56	1.26	4	8	–0.198	0.844
		control	5.69	2.18	3	10		
	Second	Intervention	13.56	0.81	12	15	10.280	< 0.001
		control	6.31	2.70	4	12		
	Third	intervention	10.88	1.45	8	14	6.918	< 0.001
		control	6.19	2.29	3	11		
Spiritual effects	first	intervention	4.13	1.15	2	6	–3.716	0.001
		control	6.31	2.06	2	10		
	Second	intervention	8.94	0.85	7	10	3.994	< 0.001
		control	6.56	2.22	3	10		
	Third	intervention	7.00	1.03	6	9	1.600	0.120
		control	6.13	1.93	3	10		
Total resilience score	first	intervention	49.56	5.74	38	63	–2.202	0.35
		control	57.81	13.84	39	86		
	Second	intervention	108.63	5.14	100	116	9.906	< 0.001
		control	62.50	17.90	46	112		
	Third	intervention	89.88	9.29	80	111	8.163	< 0.001
		control	58.38	12.33	43	90		

Table 3: Comparison of two control and intervention groups in the dimension of resilience at three points of the test

In addition, the present study found that the mental toughness–based educational intervention had a noticeable and significant effect on the dimensions of "mastery over the environment, 'autonomy,' positive relationships with others," and "self–acceptance" of psychological well–being immediately after the intervention. However, this significant effect was not observed in the measurements taken one month later,

Dimension	Point of test	Group	Mean	Standard deviation	Minimum	Maximum	Test statistics	P–value
Self–Acceptance	first	intervention	31.25	2.59	27	36	0.192	0.849
		control	31.06	2.91	27	38		
	Second	intervention	35.25	3.36	28	42	2.253	0.032*
		control	32.19	4.28	25	40		
	Third	intervention	33.63	3.58	28	40	1.156	0.257
		control	32.06	4.06	26	40		
Positive relationships with others	first time	intervention	32.19	3.19	26	39	–1.698	0.100
		control	34.31	3.86	28	40		
	Second	intervention	28.94	3.84	22	37	–3.894	0.001*
		control	34.44	4.15	25	42		
	Third	intervention	32.06	4.37	24	39	–1.511	0.141
		control	34.44	4.52	26	41		
Autonomy	first	intervention	32.13	3.72	27	42	0.429	0.671
		control	31.56	3.69	26	38		
	Second	intervention	33.75	2.72	29	38	2.599	0.014*
		control	30.56	4.08	20	39		
	Third	intervention	31.69	3.22	26	37	0.613	0.544
		control	31	3.12	26	39		
Dominance over the environment	first	intervention	33.94	4.57	27	41	–0.348	0.73
		control	34.44	3.48	28	41		
	Second	intervention	29.94	2.89	25	36	–4.364	<0.001*
		control	35	3.63	29	43		
	Third	intervention	30.81	3.33	26	37	–3.49	0.002*
		control	34.94	3.36	28	42		
Purposeful life	first	intervention	32.63	2.42	26	36	2.871	0.007*
		control	29.38	3.83	24	37		
	Second	intervention	32.19	5.24	20	41	1.512	0.141
		control	29.69	4.03	24	37		
	Third	intervention	32.63	5.56	21	45	1.968	0.058
		control	29.06	4.64	21	36		
Personal growth	first	intervention	29.88	2.83	26	39	2.774	0.009*
		control	27.06	2.91	21	34		
	Second	intervention	29	3.93	19	36	1.024	0.314
		control	27.6	3.66	22	35		
	Third	intervention	29.44	3.18	23	37	1.07	0.293
		control	28.31	2.75	23	34		
Total psychological well–being score	first	intervention	192	6.08	179	203	1.419	0.166
		control	187.81	10.12	173	205		
	Second	intervention	189.06	6.66	177	203	–0.09	0.914
		control	189.4	10.28	173	210		
	Third	intervention	190.25	6.52	179	201	0.13	0.898
		control	189.81	11.81	165	213		

Table 4: Comparison of two control and intervention groups in terms of psychological well–being score and its dimensionsDiscussion

and overall, it can be concluded that the intervention did not have a substantial impact on the psychological well–being of patients with cancer. In contrast to our findings, Chen et al found that the mind map–based life review programme could improve hope, meaning in life, and self–transcendence in cancer patients undergoing chemotherapy[30].

Relevant studies have mainly focused on the relationship between resilience and psychological well–being in cancer patients, reporting a strong and positive relationship between these two variables [31]. Some studies have also investigated the effectiveness of psychological interventions such as mindfulness and positive psychotherapy in cancer patients [32,33]. Naden's study also states that mental toughness is a broader concept than resilience, so it is considered a stronger predictor of psychological well–being. In addition, resilience has many structural similarities and overlaps with the psychological toughness variable [34]. Indeed, the role of factors such as social support[35] should not be overlooked. On the other hand, considering that the values obtained are close to the significance level, it is necessary to repeat the present study on a larger scale with long–term interventions.

In the present study, to further support the results obtained, the variable of resilience was also measured before and after the intervention. It was found that cancer patients in the intervention group experienced better resilience both overall and in all dimensions after the educational intervention. These results are consistent with the findings of Harooni Jamalooei et al.[36], Razavian et al. [15], Van Niekerk et al. [37], and Kiarastami et al. [38], who reported the effectiveness of psychological educational interventions on the resilience of the target populations. No conflicting results based on the ineffectiveness of psychological interventions on psychological resilience were found. The accumulated evidence suggests that psychoeducational interventions in cancer patients have almost always produced changes in the intended psychological outcomes, even if these changes may not be overt or statistically significant [39]. In addition, positive psychological interventions have had a significant impact on the physical health of both healthy and patient populations [40]. Therefore, given the long–term psychological challenges that cancer patients face even after treatment is completed, the implementation of such interventions is recommended. Our results for overall psychological well–being are not in line with Takano et al. (2021), who also found no significant improvements in quality of life among chemotherapy patients. These findings highlight the difficulty of achieving broad, sustained psychosocial benefits and emphasize the need for more intensive and tailored interventions[41].

Limitations of this research include a small sample size, short intervention and follow–up periods, the use of self–report questionnaires, and a lack of relevant studies in this area. Therefore, the generalizability of the results should be approached with caution. Future research should aim to design and conduct studies with larger sample sizes and longer intervention and follow–up periods. Other limitations include the confounding effects of personality and psychological factors on the results and the inability to control for social and cultural support factors.

Conclusion

In general, according to the results obtained in this study, it can be said that mental stability training had a positive effect on resilience, mental stability, and some dimensions of social well–being in cancer patients. Therefore, it can be concluded that interventions focused on developing mental stability by enhancing resilience can lead to positive outcomes in patients' ability to cope with emotional and psychological challenges related to cancer diagnosis, treatment, and survival. Additionally, there is a need for positive psychological interventions based on psychological stability in managing chronic diseases, especially cancer.

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Authors contributions

NH, KZ, SB, MH, and SGh were involved in the design of this research. NH collected the data. SGh analyzed the data. NH, KZ, SB, and SGh were involved in data interpretation. KZ was responsible for writing and finalizing the manuscript. All authors have read and approved the manuscript.

Declaration of Competing Interest

The authors declare no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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