

Original Research Article

Effect of Relaxation Therapy on Fatigue and Quality of Life among Patients Undergoing Chemotherapy

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Abstract: Background: Despite the beneficial effects of chemotherapy, it can also cause distressing symptoms, which can impede physical functioning, emotional state and impact on quality of life for patients with cancer. Fatigue is one of the most common and persistent symptoms of cancer, and can significantly impact a person's ability to function and participate in activities of daily living. Relaxation based interventions have been growing in recognition as supportive non-pharmacological interventions as they are relatively easy to perform, inexpensive, and can be learned by the patient for self-use. Relaxation techniques can help patients to relax physically, promote rest, enhance coping and facilitate psychological adaptation to chemotherapy. The impact of a structured relaxation-based component of a nurse-led symptom-management program on fatigue and global quality of life among patients receiving chemotherapy was investigated in the present study. **Methods:** A quasi-experimental pre-test-post-test control-group design was implemented, which is a quantitative approach. This study involved 200 patients receiving chemotherapy: experimental group (100 patients) and control group (100 patients). The experimental group were given the nurse-led structured symptom-management programme, which incorporated relaxation-based symptom-management strategies, and the control group were given routine institutional care. The Brief Fatigue Inventory was used to measure fatigue and the EORTC QLQ-C30 was used to measure the global quality of life. Within-group comparisons and between-group comparisons were made by comparing pre-test and post-test scores. Paired and independent statistical tests and analysis of covariance were used to assess the effect of the intervention. **Results:** The mean age of the experimental group was 53.07 ± 10.23 years and the control group 51.59 ± 9.51 years. In the experimental group, fatigue at the pre-test was 6.05 ± 1.50 and at the post-test was what was reported in this study, while the control group was 5.77 ± 1.40 at the pre-test and 5.60 ± 1.46 at the post-test. For between-group comparison, fatigue was statistically significant ($p < 0.001$) with a reported t value of 16.899 and Cohen's d of 2.390. Global quality of life increased from 57.39 ± 12.89 to 67.15 ± 13.41 in the experimental group, whereas the control group increased from 52.77 ± 12.28 to 55.88 ± 12.65 . Reported between group comparison was statistically significant at $p < 0.001$, $t = 15.434$, Cohen's $d = 2.183$. The statistically significant ANCOVA group effects were for fatigue and global quality of life with $F = 282.035$ and $F = 230.072$, respectively, at $p < 0.001$. **Conclusion:** This study results suggest that the intervention (structured relaxation and symptom management strategies) was significantly associated with patients' chemotherapy-related fatigue and global quality of life. The results showed that relaxation-based nursing interventions have the potential to be included in supportive cancer care. Since relaxation was part of a multicomponent programme in this source study, additional RCTs are needed to assess the independent effects of relaxation therapy. **Keywords:** Relaxation therapy; chemotherapy; cancer; cancer-related fatigue; quality of life; nursing intervention; supportive oncology care; Brief Fatigue Inventory; EORTC QLQ-C30.

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1. INTRODUCTION

Chemotherapy is still a vital part of treating a significant number of cancerous conditions and cancer is still a huge health problem [1], [2]. While the treatment of many cancers has now improved with chemotherapy, patients often have symptoms that are associated with the treatment and affect their physical, psychological and social functioning. Of these symptoms, cancer-related fatigue is one of the most common and debilitating symptoms. Fatigue can happen before, during and after chemotherapy and can affect mobility, self-care, work and other responsibilities, sleep, social life and emotions. Cancer-related fatigue is not the same as normal fatigue and can occur when someone feels tired even with enough rest and can be physical, cognitive and emotional [3], [4]. Patients might report a sense of fatigue, weakness, diminished drive to do things, poor ability to focus and being unable to do things as well as they used to. Physiological changes, toxicity effects from chemotherapy, anaemia, sleep disturbance, psychological distress, nutritional problems and decreased physical activity can all play a role in fatigue. Fatigue's impact goes beyond the symptom itself [6]. Fatigue may impact patients' ability to be highly engaged in treatment and self-care, and can have a detrimental effect on their health and quality of life. The quality of life is therefore an important aspect of the outcome measured in oncology as a patient-centred outcome. It is a reflection of how the patient experiences physical, emotional, social and functional wellbeing and allows for information to be gained that is not just measurable from a biomedical point of view [6]. One type of supportive intervention that is non-pharmacological is relaxation therapy. Relaxation techniques are used to decrease physiological arousal and muscle tension and may involve progressive muscle relaxation, controlled breathing, guided relaxation, meditation, and other mind-body relaxation techniques [7]. These methods can be applied in cancer care as they are easily implementable and can be integrated into a routine nursing support [8], [9]. Progressive muscle relaxation training plus routine nursing was associated with improvement in CRF; the certainty of evidence was very low, while quality of life was very low (2024 systematic review and meta-analysis, 12 RCTs, 1,047 patients). A previous systematic-review study also found that relaxation and mindfulness techniques can alleviate fatigue in people with cancer. The findings indicate that relaxation therapy is worthy of assessment as a supportive therapy and provide evidence for the need to design studies specifically assessing the contribution of relaxation therapy [10], [11]. The present manuscript is based on the thesis supplied, which assessed a nurse-led symptom-management programme with patients receiving chemotherapy. Relaxation was added to the

intervention components in addition to educational, behavioural, nutritional, hydration, activity and energy-conservation components. Therefore, the results shown below are not evidence for an isolated relaxation-only intervention, but rather for this study intervention [12].

2. Background and Related Research Studies

Supportive measures are often necessary for patients receiving chemotherapy, as well as a pharmacologic therapy [13], [14]. Nurses are in regular contact with patients during the chemotherapy course and are therefore able to assess symptoms, educate and provide supportive interventions. Techniques for relaxation can be learned during nursing encounters and patients may then practise these techniques independently. The idea of using relaxation therapy in chemotherapy treatment is founded on the concept of how this therapy may affect physical and mental reactions to chemotherapy. Relaxation can help to alleviate muscle tension, facilitate breathing, provide rest and assist a patient to deal with distress during treatment. Relaxation benefits can also help to improve sleep and subjective burden of fatigue. There can be multiple dimensions to the relationship between relaxation and quality of life. Patients with less symptom burden might be able to engage more in daily activities and better coping and lower treatment-related distress might lead to better perceived well-being. But there are a host of factors that affect the quality of life including the stage of the disease, the type of cancer, the chemotherapy, social support, and financial condition and psychological well-being. Thus, relaxation therapy should not be considered a primary treatment for cancer but rather as a complement to treatment [15]. Sarı *et al.* (2024) conducted a prospective randomized controlled study to assess the effect of progressive muscle relaxation exercises on sleep quality in the patients undergoing chemotherapy. A total of 69 patients were included in the study, 34 in the intervention group and 35 in the control group. The intervention was carried out in the hospital chemotherapy unit. Patients that were given progressive muscle relaxation had a substantial improvement in their sleep quality compared to those that were not given the treatment. The results suggest that relaxation based nursing interventions will be useful as part of supportive cancer care to minimize sleep disruption caused by the cancer treatment, which is strongly linked to cancer treatment fatigue and poor quality of life.

Bahcecioglu Turan *et al.* (2024) conducted a randomized controlled study to examine the effect of progressive muscle relaxation exercise on patients with lung cancer who are on chemotherapy. The

study evaluated treatment-related dyspnea, pain and sleep quality. The researchers said that progressive muscle relaxation helped to decrease the severity of dyspnea, decreased pain and improved sleep quality. This is important for chemotherapy-related fatigue, as minimizing physical discomfort and promoting sleep quality and functional well-being during cancer treatment could be beneficial.

Kahreah *et al.* (2024) examined how the Jacobson progressive muscle relaxation technique affects the quality of sleep in patients with cancer who are receiving chemotherapy. The study was a randomized clinical trial with 90 patients assigned to a progressive muscle relaxation intervention group and a control group receiving routine care. The intervention group engaged in twice daily, 20-minute practice of progressive muscle relaxation for 4 weeks. The Pittsburgh Sleep Quality Index scores did demonstrate significant improvement in the intervention group, but not in the control group. The results corroborate the feasibility of the structured relaxation practice in chemotherapy and indicate that relaxation has the potential of improving sleep issues associated with chemotherapy, which may lead to greater treatment-related fatigue and enhanced quality of life.

In the randomized controlled trial, conducted by Guo *et al.* (2024), they investigated the effects of dynamic and static relaxation therapy for breast cancer patients who were receiving chemotherapy, and they had 114 participants. Patients were randomly assigned to routine nursing, static Benson relaxation, or a dynamic yoga and static Benson relaxation intervention. Patients were randomly assigned to routine nursing, static Benson relaxation, or a combined intervention of dynamic yoga and static Benson relaxation. The intervention was carried out over 8 weeks and cancer related fatigue was evaluated by the Revised Piper Fatigue Scale. Compared with the control group, both relaxation intervention groups showed statistically significant results with regard to fatigue and sleep scores. The combined dynamic-static intervention led to larger decreases in several fatigue domains than did static Benson relaxation alone. In particular, the authors of this study connect the dots with regard to the relationship between relaxation therapy and chemotherapy-induced fatigue.

To investigate the effectiveness of PMR training in cancer patients, Wang *et al.* (2024) conducted a systematic review and meta-analysis of randomized controlled trials. This was not a major trial but it was combination of 12 randomized trials with 1,047 patients and thus gave important supportive evidence for the subject of the present

research. Progressive muscle relaxation and routine nursing had a significant positive effect on cancer-related fatigue compared to routine nursing alone, with a standardized mean difference of -1.06 (95% CI -1.49 to -0.62 , $P < 0.00001$). However, the pooled effect on overall quality of life was not statistically significant (SMD 0.27 , 95% CI -0.62 to 1.15 , $P = 0.55$), and the authors judged the certainty of evidence for an improvement in quality of life as being very low. This is relevant, as relaxation therapy had a more stable effect on fatigue and other symptoms than on overall quality of life.

3. Problem Statement

Symptom Management Theory was the basis of the source thesis. The framework considers symptom experience, symptom-management strategies and outcomes as interconnected elements of patient care. In this current manuscript, relaxation is understood as a significant symptom management approach that is aimed at modifying the patient's perception of fatigue and general quality of life. The first step of the intervention is to evaluate the patient's baseline condition and symptom burden. Reducing stress is then introduced using relaxing management strategies taught by a nurse and practiced by a nurse with the student. Patients are encouraged to incorporate relaxation techniques as a means of coping with their symptoms. The outcomes that are expected are a reduction in fatigue and improvement in the perception of quality of life. This study focused on the issue of chemotherapy-induced fatigue and compromised quality of life in patients with cancer undergoing chemotherapy and explored the effectiveness of a nurse-led structured intervention including relaxation training to improve these factors.

4. Aim and Objectives of the Study

The purpose of the study was to assess the impact of a structured relaxation nursing intervention on patients' fatigue and quality of life during chemotherapy. The purpose of the study was to evaluate the level of fatigue prior to and after intervention, evaluate the global quality of life prior to and after intervention, compare the difference in fatigue before and after intervention between the experimental and control groups, compare the difference in global quality of life before and after intervention between the experimental and control groups, and determine if difference in fatigue or global quality of life persisted after the intervention when baseline values were taken into account. The study assumed that there would be a significant decrease in fatigue for those that received the intervention versus those who received routine care. It was also hypothesized that patients who received the intervention would show a significant

improvement in their quality of life, overall, compared to patients who received routine care.

5. Materials and Methods

5.1 Research Design

A pre-test – post test control group design with quantitative approach was employed. Two chemotherapy patients groups were examined prior to and following intervention. The experimental

group were given the structured nurse-led programme with relaxation strategies and the control group were given their normal institutional care. The design allowed for the examination of changes in each group and differences between groups as given in fig 1. The interpretation of the results was based on the quasi-experimental design and thus the results are interpreted as association with the intervention, but not as proof of causality.



Fig.1. Conceptual Framework

5.2 Study Sample

The number of patients in the study was 200 who were treated with chemotherapy. The number of participants in the experimental group was 100 and the control group was 100 participants.

Table 1. Distribution of Participants

Group	Frequency	Percentage
Experimental	100	50.0
Control	100	50.0
Total	200	100.0

The equal group distribution set a baseline for the comparison of the pre-test and post-test results.

5.3 Age Characteristics

The mean age of the experimental group was 53.07 ± 10.23 years and the control group was 51.59 ± 9.51 years. The overall mean age was 52.33 ± 9.88 years.

Table 2. Age Characteristics

Age characteristic	Experimental	Control	Overall
Mean age	53.07	51.59	52.33
Standard deviation	10.23	9.51	9.88

5.4 Gender Distribution

The number of females and males in the experimental and control groups were 67 and 33, respectively,

while 62 females and 38 males were in the control group.

Table 3. Gender Distribution

Gender	Experimental n (%)	Control n (%)	Total n (%)
Female	67 (67.0)	62 (62.0)	129 (64.5)
Male	33 (33.0)	38 (38.0)	71 (35.5)
Total	100 (100.0)	100 (100.0)	200 (100.0)

5.5 Educational Characteristics

The study included participants from various educational levels such as primary, secondary, higher

secondary, graduate and postgraduate education students.

Table 4. Educational Distribution

Education	Experimental n (%)	Control n (%)	Total n (%)
Primary	6 (6.0)	13 (13.0)	19 (9.5)
Secondary	22 (22.0)	20 (20.0)	42 (21.0)
Higher Secondary	30 (30.0)	30 (30.0)	60 (30.0)
Graduate	28 (28.0)	30 (30.0)	58 (29.0)
Postgraduate	14 (14.0)	7 (7.0)	21 (10.5)
Total	100 (100.0)	100 (100.0)	200 (100.0)

5.6 Clinical Characteristics

Patients with breast, cervical, colorectal, head and neck, lung, ovarian and other cancers were included

in the study. The biggest category of diagnosis was breast cancer. Representations were also made at stages II, III and IV and cycles 1-6 of chemotherapy.

Table 5. Cancer Type Distribution

Cancer type	Experimental n (%)	Control n (%)	Total n (%)
Breast	38 (38.0)	27 (27.0)	65 (32.5)
Cervical	14 (14.0)	18 (18.0)	32 (16.0)
Colorectal	11 (11.0)	12 (12.0)	23 (11.5)
Head and neck	10 (10.0)	15 (15.0)	25 (12.5)
Lung	7 (7.0)	9 (9.0)	16 (8.0)
Other	6 (6.0)	9 (9.0)	15 (7.5)
Ovarian	14 (14.0)	10 (10.0)	24 (12.0)
Total	100 (100.0)	100 (100.0)	200 (100.0)

Table 6. Cancer Stage Distribution

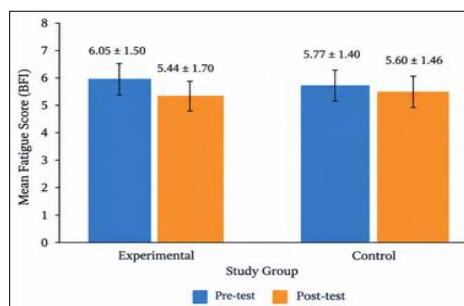
Cancer stage	Experimental n (%)	Control n (%)	Total n (%)
Stage II	24 (24.0)	23 (23.0)	47 (23.5)
Stage III	43 (43.0)	49 (49.0)	92 (46.0)
Stage IV	33 (33.0)	28 (28.0)	61 (30.5)
Total	100 (100.0)	100 (100.0)	200 (100.0)

Table 7. Chemotherapy Cycle Distribution

Chemotherapy cycle	Experimental n (%)	Control n (%)	Total n (%)
Cycle 1	20 (20.0)	15 (15.0)	35 (17.5)
Cycle 2	14 (14.0)	17 (17.0)	31 (15.5)
Cycle 3	20 (20.0)	20 (20.0)	40 (20.0)
Cycle 4	18 (18.0)	15 (15.0)	33 (16.5)
Cycle 5	11 (11.0)	15 (15.0)	26 (13.0)
Cycle 6	17 (17.0)	18 (18.0)	35 (17.5)
Total	100 (100.0)	100 (100.0)	200 (100.0)

The mean period of chemotherapy was 2.91 ± 1.52 months for the experimental group and 3.07 ± 1.51 months for the control group. The mean duration of treatment was 2.99 ± 1.51 months overall. The mean

number of chemotherapy cycles was 3.37 ± 1.73 in the experimental group and 3.52 ± 1.70 in the control group with the mean of 3.44 ± 1.71 chemotherapy cycles.

**Fig 2. Pre-test and post-test fatigue scores among experimental and control groups**

The mean level of fatigue, as assessed by the Brief Fatigue Inventory, pre and post intervention is presented in Fig 2. The mean fatigue for the experimental group decreased from 6.05 ± 1.50 at pre-test to 5.44 ± 1.70 at post-test. The control group, on the other hand, had a lesser decrease of 5.77 ± 1.40 to 5.60 ± 1.46 . The results of this study show that the

experimental group had a greater reduction, suggesting a larger effect of fatigue after the nurse led intervention with relaxation strategies. Between group comparison was statistically significant at $p < 0.001$ with a reported t value of 16.899 and Cohen's d of 2.390. The ANCOVA also gave an F value of 282.035, significant at the $p < 0.001$ level.

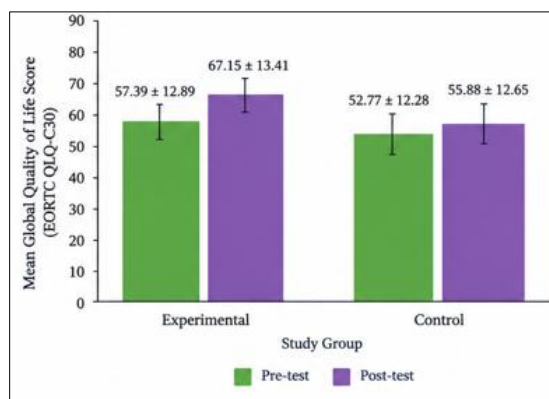


Fig 3. Pre-test and post-test global quality-of-life scores among experimental and control groups

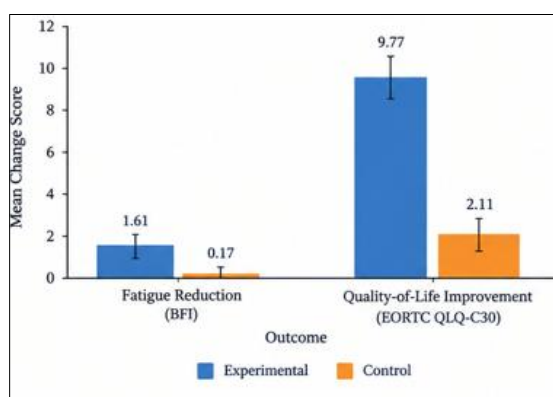


Fig 4. Change in fatigue and global quality of life following the intervention

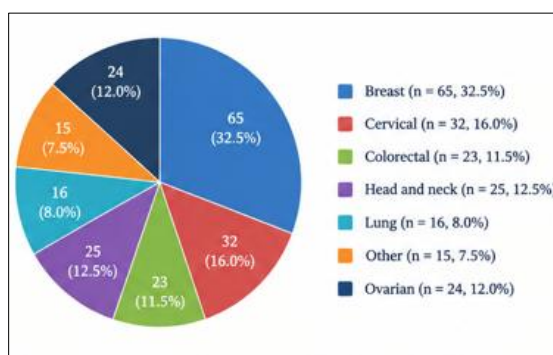


Fig 5. Distribution of participants according to cancer type

Fig 3 shows the changes in quality-of-life scores with the EORTC QLQ-C30 over the world. For the experimental group, there was an increase from the mean pre-test quality of life score of 57.39 ± 12.89 to a mean post-test score of 67.15 ± 13.41 . The control group showed a comparatively smaller increase from 52.77 ± 12.28 to 55.88 ± 12.65 . The

Cohen's d value of the between group comparison was reported as 2.183 and the t value was 15.434 with $p < 0.001$. The baseline level of quality-of-life scores was also statistically significant as the result of the ANCOVA ($F = 230.072$) with a p value < 0.001 , suggesting a difference between the groups after considering the baseline level of quality-of-life scores.

Fig 4 shows that there were reported improvements in fatigue and in global quality of life from pre-test to post-test. This manuscript documented 1.61 points fatigue change in the experimental group and 0.17 points fatigue change in the control group. In the context of the benefit for global quality of life, the scores for the experimental group were 9.77, while the scores for the control group were 2.11. The findings showed that participants in intervention group have a larger magnitude of change in both outcomes. The manuscript has, however, an inconsistency in the fatigue data with the experimental post-test mean being 5.44 ± 1.70 and another statistical output giving a post-test mean of 4.44 ± 1.70 .

The distribution of 200 study participants by type of cancer is shown in Fig 5. The most prevalent type of cancer was breast cancer (65 participants,

32.5 %), with cervical cancer (32 participants, 16.0 %), head and neck cancer (25 participants, 12.5 %), ovarian cancer (24 participants, 12.0 %), colorectal cancer (23 participants, 11.5 %), and lung cancer (16 participants, 8.0 %) following. Other types of cancer constituted 7.5 % (15 participants). The distribution shows that the study population had different types of cancer, with the largest number of participants having breast cancer.

6. Intervention

Structured nurse-led symptom management programme implemented with relaxation component. The intervention consisted of relaxation and psychological-support strategies, education, behavioural guidance, hydration, nutritional support, and activity planning and energy-conservation strategies.

Table 8. Relaxation-Based Intervention Structure

Intervention element	Description
Preparation	Creation of a quiet and comfortable environment for relaxation practice
Breathing	Controlled and slow breathing to promote relaxation
Muscle relaxation	Systematic reduction of unnecessary muscular tension
Guided relaxation	Nurse-guided relaxation practice during intervention sessions
Energy conservation	Planning activities and rest periods according to individual tolerance
Psychological support	Supportive communication and coping guidance
Home practice	Encouragement of regular relaxation practice outside the clinical session
Follow-up	Reinforcement and monitoring during subsequent contacts

The relaxation component was designed to help patients to learn a concrete way to relax and manage treatment discomfort. The nurse showed how to do it; coached the patient through practice and encouraged future use. The outcome observed cannot only be attributed to the relaxation as it was part of the larger programme. Brief Fatigue Inventory was used to measure fatigue. Patients undergoing chemotherapy were assessed for severity and functional impact of fatigue using the BFI. The EORTC QLQ-C30 (European Organization for Research and Treatment of Cancer Quality of Life) was used to measure the quality of life in the global population. These measures were taken at baseline and post intervention, under standard assessment conditions. Patients were identified for the study based on the study criteria. Demographic and clinical data were obtained prior to explanation of the study and completion of consent procedures. Pre-test fatigue and quality of life questionnaires were completed. The nurse-led intervention with structured relaxation was then given to the experimental group, while the control group was given routine nursing care. This was then followed by a post test with the same result measures.

7. Statistical Analysis

Demographic and clinical data were summarized using descriptive statistics. Continuous variables were reported as means and standard deviations and categorical variables were reported as frequencies and percentages. Within-group changes were compared via paired comparisons and between-group comparisons were performed via independent comparisons. To compare group differences in the adjusted post-test scores, ANCOVA was used, which controlled for the baseline scores. The criterion for statistical significance was $p < 0.05$.

8. Results

8.1 Fatigue

The experimental group showed a decrease in fatigue in the results of the principal thesis. The experimental group had a pre-test mean fatigue score of 6.05 ± 1.50 . A different statistical output from this study, the principal results, report 5.44 ± 1.70 , whereas the other report 4.44 ± 1.70 . A mean change of 1.61 points and a statistically significant between-group comparison ($p < 0.001$) was reported for this study. The control group changed from 5.77 ± 1.40 to 5.60 ± 1.46 , with a reported mean change of 0.17.

Table 9. Fatigue Scores Before and After the Intervention

Group	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Reported mean change
Experimental	6.05 $\pm$ 1.50	5.44 $\pm$ 1.70*	1.61
Control	5.77 $\pm$ 1.40	5.60 $\pm$ 1.46	0.17

This study statistical output has 4.44 $\pm$ 1.70 for the experimental post-test and the principal results have 5.44 $\pm$ 1.70. This study reported a between-group t value of 16.899 with $p < 0.001$ and Cohen's d of 2.390. The ANCOVA analysis reported $F = 282.035$ with $p < 0.001$.

Table 10. Inferential Analysis of Fatigue

Statistical analysis	Reported value	p-value
Experimental paired t-test	25.426	<0.001
Control paired t-test	3.140	0.002
Between-group t-test	16.899	<0.001
Cohen's d	2.390	—
ANCOVA F	282.035	<0.001

The significant difference suggests that the experimental group had a larger decrease in fatigue compared to the control group within the data set reported.

8.2 Global Quality of Life

The intervention led to an improvement of the global quality of life. The experimental group increased from 57.39 $\pm$ 12.89 at pre-test to 67.15 $\pm$ 13.41 at

post-test. This study found an average of 9.77 points improvement. The control group's score rose from 52.77 $\pm$ 12.28 to 55.88 $\pm$ 12.65, which is how they reported an improvement of 2.11 points.

Table 11. Global Quality of Life Scores

Group	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Reported mean change
Experimental	57.39 $\pm$ 12.89	67.15 $\pm$ 13.41	9.77
Control	52.77 $\pm$ 12.28	55.88 $\pm$ 12.65	2.11

The between group comparison yielded $t = 15.434$ and $p < 0.001$. Cohen's d of 2.183 was reported. ANCOVA produced $F = 230.072$ with $p < 0.001$

Table 12. Inferential Analysis of Global Quality of Life

Statistical analysis	Reported value	p-value
Experimental paired t-test	-28.169	<0.001
Control paired t-test	-5.960	<0.001
Between-group t-test	15.434	<0.001
Cohen's d	2.183	—
ANCOVA F	230.072	<0.001

The results indicate a significant difference between the experimental and the control groups in terms of overall quality of life, as measured with a 95% confidence interval.

Table 13. Hypothesis Testing for Fatigue

Hypothesis	Statistical result	Decision
Patients receiving the intervention will have lower fatigue than those receiving routine care	Between-group $p < 0.001$	Supported

The fatigue hypothesis was supported as the experimental group reported a significantly greater decrease in fatigue than the control group.

Table 14. Hypothesis Testing for Quality of Life

Hypothesis	Statistical result	Decision
Patients receiving the intervention will demonstrate improved quality of life compared with routine care	Between-group $p < 0.001$	Supported

The quality-of-life hypothesis was supported as the experimental group had a significantly higher rise in the global scores of quality-of-life.

Table 15. ANCOVA Results

Outcome	F value	p-value
Fatigue	282.035	<0.001
Global quality of life	230.072	<0.001

The ANCOVA results show that there were still statistically significant differences between the experimental group and the control group after controlling for baseline outcome values. This further

supports the conclusion that there were differences between the groups that were not necessarily due to the differences in baseline scores.

Table 16. Final Results Summary

Outcome	Experimental pre-test	Experimental post-test	Control pre-test	Control post-test	Between-group p-value	Cohen's d	ANCOVA F
Fatigue	6.05 ± 1.50	5.44 ± 1.70*	5.77 ± 1.40	5.60 ± 1.46	<0.001	2.390	282.035
Global quality of life	57.39 ± 12.89	67.15 ± 13.41	52.77 ± 12.28	55.88 ± 12.65	<0.001	2.183	230.072

Unlike the main results in this publication, where the fatigue post test is 5.44 ± 1.70 , this study statistical appendix reports a value of 4.44 ± 1.70 .

9. Discussion

The current study assessed the impact of a nurse-led intervention using relaxation techniques on fatigue and global quality of life of chemotherapy patients. The results showed significant differences between the experiment group and the control group for the two outcomes. There was a reduction in fatigue in the experimental group and an improvement in global quality of life. The results on fatigue are in line with the theoretical arguments for supportive care with relaxation. Fatigue is a complex physical and psychological experience of chemotherapy side effects, and relaxation can help with managing it by reducing physical tension, promoting rest, supporting sleep and enhancing coping. The results of the present thesis were statistically significant with $p < 0.001$ and a reported Cohen's $d = 2.390$. Recent evidence, however, suggests more support for relaxation-based approaches, and uncertainty as well. A systematic review of 12 RCTs in 2024 with 1047 cancer patients showed that progressive muscle relaxation training was better for cancer-related fatigue than routine nursing with SMD -1.06 and $p < 0.00001$ with low certainty of evidence. A previous systematic review of mind-body interventions revealed that relaxation techniques led to significant fatigue reduction. The observed improvement in global quality of life in this study is clinically meaningful as quality of life is a more comprehensive patient-centred outcome measure. The experimental group increased from 57.39 ± 12.89 to 67.15 ± 13.41 , whereas the control group increased from 52.77 ± 12.28 to 55.88 ± 12.65 . The between group difference was statistically significant ($p < 0.001$) and Cohen's d was 2.183. The improvement in QOL should be viewed with some caution as specific to relaxation therapy, however. The meta-analysis of the progressive muscle relaxation (2024) showed no pooled significant effect on the quality of life (SMD 0.27, 95% CI -0.62 to 1.15 ,

$p = 0.55$, and rated as very low certainty of evidence). This study's findings differ from the aforementioned broad evidence base in some ways that could be attributed to differences in intervention design, participant characteristics, cancer type, treatment stage, measurement of the outcomes, or the fact that this study intervention contained several supportive care components in addition to relaxation. Accordingly, the present findings can be seen as supportive of the hypothesis that a structured nursing programme with relaxation strategies was related to a better fatigue and quality of life. They should not be taken to mean that the observed changes were due to relaxation. This is because educational, behavioural, nutritional, hydration, activity, energy-conservation and psychological aspects of the intervention were included too. Nevertheless, nursing implications are numerous. The relaxation techniques are easy to teach and can be integrated as part of a supportive oncology nursing assessment. Nurses can offer a structured setting for practicing, evaluate patient comfort, remind them of proper technique, and counsel patients to use relaxation techniques during times of fatigue, anxiety or discomfort related to treatment. The intervention could also be helpful in promoting patient autonomy. If a patient learns a relaxation technique he or she might use it at home, such as before going to sleep or when resting, or when suffering from distress during the treatment. This property is also desirable as an enabling strategy where healthcare resources are low. The quality-of-life findings also point to the need to consider chemotherapy treatment not just as symptom control. If coping, functioning, and confidence in managing symptoms increase, the patient may feel better, but still have some fatigue. Hence, a full evaluation should be done to address both the symptom-specific and the patient-centred quality-of-life outcome.

10. Clinical Implications

The findings of the study argue for the inclusion of relaxation-based interventions to supportive oncology nursing practice. Nurses could help teach chemotherapies in a relaxing manner and encourage relaxation throughout the treatment. Relaxation can be used in conjunction with the proper clinical management, symptom monitoring and referral for severe and persistent symptoms. The intervention should not be used to replace the use of pharmacotherapy for chemotherapy-induced symptoms, or the assessment of potentially reversible causes of fatigue. If fatigue is recurring or severe, it may be a sign of anaemia, infection, nutritional deficiencies, sleep disorders, toxicity from treatment or other clinical issues and should be investigated. Relaxation should be used as a supplementary supportive approach for the treatment of cancer. The number of samples were relatively large with 200 participants in the experimental group and 200 participants in the control group. It looked at fatigue and quality of life, giving information about symptom burden and patient well-being in general. Several complementary methods of statistical analyses were provided by the use of standardized instruments, between-group testing, paired comparisons and ANCOVA. The findings were applicable to supportive oncology nursing practice since the intervention was implemented as a nursing intervention. The programme also included repeated contact and follow-up which could enhance self-management strategies practice.

11. Limitations

However, the sole drawback is that relaxation was not examined as a stand-alone treatment. The source thesis analyzed the evaluation of a multi-component nurse led symptom-management programme including relaxation and other supportive strategies. Thus, the changes in fatigue and quality of life observed cannot be directly attributed to relaxation. Also, the quasi-experimental study design restricts causal interpretation. Even with statistical adjustments for selection effects and unmeasured differences between participants, there may be unmeasured differences. Because multiple cancer types and stages, as well as various chemotherapy cycles, were included, the study population is diverse but may contain heterogeneity. The study was also carried out in a specific clinical context, and therefore, the results cannot be generalized to other populations and institutions. However, long-term follow-up was not available to see if improvements were maintained following the end of intervention. There are also inconsistencies in the numbers throughout the source thesis. Specifically, the fatigue post-test value is different for

each of the thesis sections. The principal results are 5.44 ± 1.70 and a statistical appendix report 4.44 ± 1.70 . The latter is the mean change reported, not the former. It is therefore important that these values should be checked with the original data set prior to submission to the journal.

12. Conclusion and Future Scope

The study showed patients receiving chemotherapy who were treated with the nurse-led intervention with structured relaxation strategies experienced a statistically significant improvement in fatigue and global quality of life. The experimental group experienced a greater reduction in fatigue and greater improvement in global quality of life when compared to the control group. Between-group differences were statistically significant ($p < 0.001$) for both outcomes and adjusted group differences were statistically significant with ANCOVA. The results support the use of relaxation strategies as a means of supportive oncology nursing practice. A low resource, non-pharmacological approach, relaxation can be taught and reinforced by nurses during chemotherapy care. The intervention may be useful for patients to deal with treatment-related fatigue and to better adapt to treatment-related physical and psychological demands. The results of the source study, however, should be interpreted scientifically as the result of a nurse-led symptom-management programme with relaxation, since relaxation was not the only intervention being assessed, but only part of a programme containing relaxation. Additional RCTs specifically designed to examine the effect of relaxation therapy over usual care are needed to confirm its independent effect on fatigue and QOL. Randomized controlled design should be used in future studies to assess relaxation therapy as a standalone treatment. The studies should clearly indicate the kind of relaxation, the length of the session, the frequency, the length of the treatment, adherence to the treatment and so on. Progressive muscle relaxation and guided imagery, controlled breathing and combined relaxation programmes may be compared to see if different techniques have different effects. Larger multicentre samples and stratification of participants by cancer type, chemotherapy regimen, disease stage and treatment cycle should be included in future studies. To establish long-term improvements in fatigue and quality of life following the intervention, longer follow-up should be included. Objective and subjective measures of treatment response should also be explored in future studies. Where appropriate, measures of sleep, physical activity, functional status and psychological distress should be used to complement patient-reported fatigue. Guided relaxation recordings could be used with digital applications for relaxation training and to track

adherence during chemotherapy visits. Economic assessments could inform the feasibility of implementing nurse-led relaxation programmes to either decrease health service use or enhance functioning in the context of treatment. Further research is needed to determine if relaxation therapy is specifically effective for individuals who already have a high level of fatigue, anxiety, and/or sleep disturbances. Last, but not least, sufficiently powered randomized controlled trials should also separate the effect of relaxation from the wider effect of nurse-led symptom-management programmes. This separation is critical to figuring out the individual benefit of relaxation therapy in supportive oncology care. Larger multicenter samples should be implemented in future studies and participants should be divided into groups based on cancer type, chemotherapy regimen, stage and treatment cycle. Longer follow-up should be included to assess if fatigue and QoL improves after intervention is completed. Objective and subjective measures of treatment response should also be explored in future studies. Fatigue should be complemented (where appropriate) by measures of sleep, physical activity, functional status and psychological distress as perceived by the patient. One possible use for digital apps is offering guided relaxation recordings and checking adherence between chemotherapy sessions. Economic assessments can help to decide if nurse provided relaxation programmes lower health care consumption or enhance functioning related to treatment. Further studies are needed to determine if relaxation therapy is more effective in patients with higher levels of baseline fatigue, anxiety, and/or sleep disturbance. Lastly, sufficiently powered randomized controlled trials are needed to differentiate effects of relaxation from effects of wider, nurse-led symptom-management programmes. This distinction is crucial to establish the extent to which relaxation therapy has been contributing to supportive cancer care.

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