

The Influence of Progressive Muscle Relaxation (PMR) On The Improvement Of Body Composition, Depression Status And Quality of Life of Breast Cancer Patients During Chemotherapy In Dr. Mohammad Hoesin Hospital (RSMH) Palembang

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ABSTRACT

The breast cancer progression and chemotherapy side effects not only cause problems in mental status, but also the patient's physical status. This is related to a deteriorating quality of life and a worse prognosis. Physical exercise can improve physical status, mental status, and quality of life.

Experimental pre- and post intervention research with a control group was conducted on breast cancer patients to determine the effect of progressive muscle relaxation on the improvement of body composition, depression status, and quality of life for breast cancer patients during chemotherapy at RSMH on February 2019 - February 2020.

Progressive muscle relaxation (PMR) can improve body composition ($p = 0.000$), reduce the degree of depression ($p = 0.000$), improve global health status ($p = 0.013$), physical functioning ($p = 0.002$), emotional functioning ($p = 0.009$), social functioning ($p = 0.015$), body image ($p = 0.000$), sexual function ($p = 0.05$), future perspective ($p = 0.006$), and decreased fatigue ($p = 0.00$), nausea and vomiting ($p = 0.002$), pain ($p = 0.000$), insomnia ($p = 0.002$), appetite loss ($p = 0.000$), breast symptoms ($p = 0.000$), arm symptoms ($p = 0.000$), hair loss ($p = 0.000$), and therapy side effects ($p = 0.000$).

Keywords: progressive muscle relaxation, depression, body composition, quality of life

Introduction

Breast cancer is the most common cancer in women and it is the leading cause of cancer death in 2018 (627.000 cases).¹ The progression of breast cancer and its treatment can cause problems in the patient's psychological, physical function and quality of life. Psychiatric disturbances such as depression and anxiety occur in 50% of patients.² Impaired physical function can include changes in body composition; increase in fat mass, decrease in body lean mass/skeletal muscle mass which decreases muscle strength.³ These psychiatric and physical problems can collectively decrease the patient's quality of life and are associated with a worse prognosis.⁴

Song stated that Jacobsen's progressive muscle relaxation during chemotherapy in breast cancer patients can improve the mental status and reduce side effects after breast cancer treatment through its benefits in improving mental status, reducing muscle tension, lowering heart rate and respiratory rate, and reducing negative emotions, which ultimately improves the patient's mental and physical status.⁵ In addition, Lim stated that PMR can help reduce symptoms of insomnia, irritability, other psychological disorders before surgery, and also reduce anxiety and depression during chemotherapy in breast cancer patients.⁶ If the patient's level of anxiety and depression decreases, it is assumed that the quality of life will also improve

Method

Experimental pre- and post intervention research with a control group was conducted on breast cancer patients to determine the effect of progressive muscle relaxation on the improvement of body composition, depression status, and quality of life for breast cancer patients during chemotherapy at Dr. Mohammad Hoesin Hospital Palembang on February 2019 - February 2020. Data were collected from 36 breast cancer patients (stage I-III) who were randomly selected based on consecutive sampling method. The collected data were processed and analyzed by univariate analysis and continued with multivariate analysis to determine the effect of PMR on improvements of body composition, depression status, and quality of life of patients. Data was analyzed using the SPSS v.22.

Result and Discussion

General Characteristics

The general characteristics of this research are shown in **table 1**. With statistical analysis, the results showed that there were no differences in age, education, marital status, cancer stage, and body mass index between the PMR and non-PMR groups. This means that the characteristics of the two groups are homogeneous.

Table 1. General characteristics (n = 36)

Variabel	PMR (n= 18)	Non-PMR (n = 18)	P Value
Age, n (%)			
• ≤ 39 years old	3 (16.7)	10 (55.6)	0.055 ^a
• > 39 years old	15 (83.3)	8 (44.4)	
Educational status. n (%)			
• Primary school	3 (16.7)	1 (5.6)	0.362 ^b
• Junior high school	6 (33.3)	3 (16.7)	
• Senior high school	7 (38.9)	10 (55.6)	
• Scholar	2 (11.1)	4 (22.2)	
Marital status. n (%)			
• Married	17 (94.4)	17 (94.4)	1.000 ^a
• Single	1 (5.6)	1 (5.6)	
Cancer stage. n (%)			
• I	0 (0.0)	0 (0.0)	1.000 ^a
• II	5 (27.8)	4 (22.2)	
• III	13 (72.2)	14 (77.8)	
Body mass index. n (%)			
• <i>Underweight</i>	0 (0.0)	0 (0.0)	0.486 ^a
• <i>Normoweight</i>	18 (100.0)	16 (88.9)	
• <i>Overweight</i>	0 (0.0)	2 (11.1)	

^aFisher Exact Test, p = 0.05, ^bPearson Chi Square, p = 0.05

Body Composition

Body composition was measured using the bio impedance analysis (BIA) method with the Karada Scan HBF-375 body composition monitor before chemotherapy, the 6th week of

chemotherapy, and after chemotherapy. In **Table 2** it can be seen that there is a difference in increase of the mean of body composition; this means that PMR can significantly improves body composition.

Table 2. Effectiveness of progressive muscle relaxation on body composition

Time	Body composition (Mean \pm SD)	Calculated F value	<i>p value</i>
PMR Group			
Before chemotherapy	23.99 \pm 2.35	17.606	0.000
6 th week of chemotherapy	24.23 \pm 2.34		
After chemotherapy	24.92 \pm 1.76		
Non-PMR Group			
Before chemotherapy	24.13 \pm 2.61	13.549	0.001
6 th week of chemotherapy	23.60 \pm 2.58		
After chemotherapy	23.48 \pm 2.57		

Friedman Test. $p < 0.05$ with F table = 5.991

Feroli et al (2018) stated that physical exercise is one of the main supportive therapies to increase muscle mass and strength, and reduce fat mass and body weight in breast cancer patients undergoing chemotherapy.⁷ Mary J et al (2011) showed changes in the increase of body weight and body fat mass in post chemotherapy breast cancer patients, known as sarcopenic obesity, which is an increase in fat mass and a decrease in lean body mass.⁸

Depression Status

Depression status was measured using the Hospital Anxiety and Depression Scale-Depression (HADS-D) before chemotherapy, 6th weeks of chemotherapy and after chemotherapy. In **Table 3**, it can be seen that there is a difference in decrease of the mean of depression status; this means that PMR can significantly reduce depression status.

Song et al (2013) stated that PMR during chemotherapy in breast cancer patients can improve the depression status.⁵ PMR can reduce the degree of anxiety and depression by helping the body achieve a state of deep relaxation and reduce muscle tension which in theory "neuromuscular hypertension", muscle tension is the source of negative emotional triggers such as

anxiety and depression.⁹ Physical exercise can reduce depression because physical exercise can reduce symptoms of insomnia and improve the sleep quality.⁷

Quality of Life

In this study, to measure the quality of life of breast cancer patients, a questionnaire from the European Organization of Research and Treatment of Cancer (EORTC) was used; Quality of Life Questionnaire (QLQ) C30 and Br-23. In **Table 4** it can be seen that there is increase in global health status, physical functioning, emotional functioning and social functioning, as well as a decrease in symptoms of fatigue, nausea and vomiting, pain, insomnia and loss of appetite significantly.

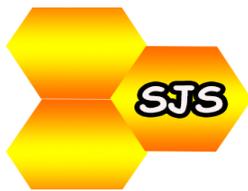
Table 3. Effectiveness of progressive muscle relaxation on depression status

Time	Depression status (Mean ± SD)	Calculated F	<i>p value</i>
PMR Group			
Before chemotherapy	6.89 ± 3.27	-	0.000
6 th week of chemotherapy	6.11 ± 2.65		
After chemotherapy	5.17 ± 2.33		
Non-PMR Group			
Before chemotherapy	6.28 ± 2.99	-	0.000
6 th week of chemotherapy	7.44 ± 2.91		
After chemotherapy	8.39 ± 2.81		

Repeated Measure ANOVA, p < 0.05

Table 4. Effectiveness of progressive muscle relaxation on quality of life QLQ C-30

	Time			Trend	Calculated F	<i>p value</i>
	Before chemotherapy	6 th week of chemotherapy	After chemotherapy			
PMR Group						
Global health status Functional scale	71.29 ± 14.64	76.42 ± 12.54	78.44 ± 21.48	Increase	8.741	0.013
• Physical functioning	75.92 ± 17.13	81.78 ± 14.15	85.06 ± 11.94	Increase	12.035	0.002
• Role functioning	76.85 ± 17.28	81.48 ± 15.01	84.25 ± 13.38	Increase	3.257	0.196



• Emotional functioning	74.07 ± 16.64	77.77 ± 14.58	84.76 ± 13.13	Increase	9.375	0.009
• Cognitive functioning	81.48 ± 19.71	82.40 ± 18.50	83.32 ± 17.16	Increase	0.500	0.779
• Social functioning	76.85 ± 12.96	80.55 ± 13.09	86.10 ± 15.40	Increase	8.390	0.015
<u>Symptoms scale</u>						
• Fatigue	17.28 ± 14.37	9.26 ± 9.53	5.55 ± 8.73	Decrease	21.814	0.000
• Nausea and vomiting	20.37 ± 21.05	16.66 ± 14.00	11.09 ± 12.77	Decrease	13.000	0.002
• Pain	35.18 ± 15.00	16.66 ± 11.43	8.32 ± 8.56	Decrease	30.721	0.000
• Dyspnoea	14.81 ± 17.04	9.26 ± 15.36	6.48 ± 12.95	Decrease	5.429	0.066
• Insomnia	16.67 ± 20.61	5.56 ± 12.78	3.70 ± 10.78	Decrease	12.286	0.002
• Appetite loss	27.78 ± 20.61	14.81 ± 17.04	9.26 ± 15.36	Decrease	16.545	0.000
• Constipation	7.41 ± 21.56	3.70 ± 15.71	0.00 ± 0.00	Decrease	3.000	0.223
• Diarrhoea	1.85 ± 7.86	0.00 ± 0.00	0.00 ± 0.00	Decrease	2.000	0.368
• Financial difficulties	22.22 ± 25.56	20.37 ± 23.26	25.92 ± 26.94	Increase	0.333	0.846

Non-PMR Group

<u>Global health status</u>	77.77 ± 12.13	76.88 ± 11.97	74.53 ± 11.24	Decrease	4.108	0.128
<u>Functional scale</u>						
• Physical functioning	89.63 ± 12.98	87.96 ± 14.06	87.03 ± 13.99	Decrease	3.852	0.146
• Role functioning	88.89 ± 12.79	86.11 ± 14.29	84.26 ± 14.55	Decrease	5.375	0.068
• Emotional functioning	80.09 ± 11.83	76.85 ± 15.27	75.92 ± 9.43	Decrease	3.872	0.144
• Cognitive functioning	91.67 ± 14.29	91.20 ± 14.71	89.35 ± 15.61	Decrease	2.000	0.368
• Social functioning	86.11 ± 13.10	73.17 ± 15.23	64.81 ± 13.87	Decrease	29.158	0.000
<u>Symptoms scale</u>						
• Fatigue	8.64 ± 11.78	19.13 ± 11.93	26.54 ± 15.78	Increase	26.724	0.000
• Nausea and vomiting	6.48 ± 11.63	19.44 ± 14.29	19.44 ± 16.42	Increase	18.045	0.000
• Pain	20.37 ± 15.64	26.85 ± 18.20	30.55 ± 16.42	Increase	10.167	0.006
• Dyspnoea	5.56 ± 12.78	5.56 ± 12.78	5.56 ± 12.78	Similar	0.000	1.000
• Insomnia	12.96 ± 16.72	24.07 ± 15.36	32.41 ± 16.64	Increase	11.105	0.004
• Appetite loss	20.37 ± 23.26	20.36 ± 20.25	12.96 ± 20.25	Decrease	3.556	0.169
• Constipation	5.55 ± 12.78	3.70 ± 10.78	1.85 ± 7.86	Decrease	3.000	0.223
• Diarrhoea	0.00 ± 0.00	1.85 ± 7.86	9.26 ± 19.15	Increase	6.500	0.039

- Financial difficulties 27.78 ± 26.19 27.78 ± 20.61 25.92 ± 21.56 Decrease 0.500 0.779

Friedman Test, p < 0.05 ; with F table = 5.991

In **Table 5**, it can be seen that there is an increase in body image, sexual functioning and future perspectives, as well as a decrease in breast symptoms, arm symptoms, hair loss and therapy side effects significantly.

Table 5. Effectiveness of progressive muscle relaxation on quality of life Br-23

	Time			Trend	<i>p</i> value
	Before chemotherapy	6 th week of chemotherapy	After chemotherapy		
PMR Group					
<u>Functional scales</u>					
• <i>Body Image</i>	71.19 ± 15.69	77.77 ± 11.78	81.98 ± 11.13	Increase	0.000^a
• Sexual functional	49.07 ± 29.96	53.69 ± 29.46	54.68 ± 29.46	Increase	0.050^a
• Sexual enjoyment	42.59 ± 25.06	46.29 ± 25.92	49.98 ± 30.78	Increase	0.331 ^a
• Future perspective	61.11 ± 23.57	66.66 ± 22.87	79.61 ± 16.74	Increase	0.006^a
<u>Symptom scales</u>					
• Breast symptoms	21.78 ± 21.01	8.33 ± 11.43	5.55 ± 8.08	Decrease	0.000^a
• Arm symptoms	12.96 ± 10.95	6.81 ± 8.62	3.09 ± 6.38	Decrease	0.000^a
• Hair loss	0.000 ± 0.000	31.48 ± 7.86	7.41 ± 14.26	Decrease	0.000^a
• Therapy side effect	0.000 ± 0.000	11.90 ± 10.36	5.63 ± 6.29	Decrease	0.000^a
Non-PMR Group					
<u>Functional scales</u>					
• <i>Body Image</i>	80.09 ± 12.50	71.76 ± 14.04	68.98 ± 15.86	Decrease	0.000^a
• Sexual functional	71.29 ± 36.52	61.11 ± 33.82	56.48 ± 35.30	Decrease	0.000^a
• Sexual enjoyment	64.81 ± 43.49	55.55 ± 37.92	49.99 ± 38.35	Decrease	0.009^a
• Future perspective	79.63 ± 25.92	61.11 ± 17.15	57.40 ± 15.36	Decrease	0.000^a
<u>Symptom scales</u>					
• Breast symptoms	11.57 ± 13.14	13.91 ± 11.09	13.94 ± 12.14	Increase	0.002^a
• Arm symptoms	9.88 ± 14.20	14.81 ± 14.76	16.66 ± 17.57	Increase	0.004^a
• Hair loss	0.000 ± 0.000	42.59 ± 15.36	43.33 ± 19.80	Increase	0.000^a
• Therapy side effect	0.000 ± 0.000	17.46 ± 10.19	22.22 ± 11.78	Increase	0.000^a

^a ANCOVA. p < 0.05

Quality of life and PMR

A randomized controlled trial study by Andreas Charalambous et al (2016) proved the effectiveness of PMR in reducing symptoms of breast cancer patients undergoing chemotherapy.¹⁰ In a study of 52 breast cancer patients, structured PMR for 1 month could improve quality of life (global health, physical functioning, role functioning, emotional functioning, cognitive functioning, and social functioning, body image, sexual functioning, future perspectives and a decrease in symptoms of fatigue, nausea and vomiting, pain, insomnia, appetite loss, diarrhea, and financial difficulties.^{10,11}

Fatigue

Cancer-related fatigue (CRF) is a subjective, persistent, physical, emotional, and cognitive feeling associated with cancer or cancer treatment that interferes with daily activities.^{11,12} Physical exercise is a non-pharmacological intervention that has strong evidence in treating CRF. A large meta-analysis study (70 studies) by Puetz et al (2012) reported that physical exercise significantly reduced CRF by 32% and 38%, respectively, during and after cancer treatment.¹³

Pain

Physical exercise can reduce pain because it is able to induce hypoalgesia involving multiple analgesic systems in both the opioid and non-opioid systems. A systematic review by Tatham et al (2013) found that physical exercise can reduce cancer pain of post-operative breast cancer patients during chemotherapy or radiation.¹⁴

Lymphedema

Andreas Charalambus et al (2016) found that PMR can reduce lymphedema symptoms significantly.¹¹ Physical exercise can be useful for the prevention or treatment of lymphedema because it can increase lymphatic flow and the movements of exercise can make effective muscle contraction pump and increase venous flow in the affected limb/arm area.^{7,15} Physical exercise can also improve lymphatic function by reducing the adhesive of the fibrotic tissue caused by surgery of breast cancer.⁷

Hair loss

Although hair loss does not cause harm nor is it life threatening, it can cause persistent negative emotions such as anxiety, depression and a negative body image perspective, which in turn reduces the quality of life.¹⁶ The mechanisms of hair loss chemotherapy-induced are damage to deoxyribonucleic acid (DNA), hair follicle cell cycle inhibition, and hair follicle cell apoptosis.¹⁷ In a book of yoga and relaxation therapy for hair health by Kristin Russel (2016), PMR is an effective strategy and has been widely practiced to reduce hair loss induced by stress.¹⁸

Body image, Sexual Functional, and Future Perspective

Erica and Don (2015) stated that breast cancer therapies such as surgery and chemotherapy have a negative impact on changes in the patient's sexual health and function, as well as changes in the anatomical structure of the body (weight gain and body fat mass) after therapy, make many problems on patient's body image.^{7,19} These changes also have an impact on future perspective and problems in personal social relationships.²⁰ Sexual dysfunction is related to physical changes of woman's vulvar area, namely vulvar atrophy, vaginal discharge which usually occurs in patients undergoing chemotherapy. A further symptom is pain during intercourse (dyspareunia) and thus decreased normal sexual activity.¹⁹

Conclusion

Progressive muscle relaxation has a significant effect on improving body composition, depression status, and quality of life for breast cancer patients during chemotherapy.

References

1. World Health Organization. Early diagnosis and screening of breast cancer. Tersedia pada: <https://www.who.int/cancer/prevention/diagnosis-screening/breast-cancer/en/>. 2018.
2. Ministério da Saúde. Secretaria de Atenção à Saúde. Instituto Nacional de Câncer (Brasil). Estimativa 2012/2013: Incidência de câncer no Brasil. Rio de Janeiro: INCA, 2012.

3. Hojan K, Molinska-Glura M, Milecki P. Physical activity and body composition, body physique, and quality of life in premenopausal breast cancer patients during endocrine therapy – a feasibility study. *Acta Oncologica*. 2013; 52: 319–326
4. Nipp RD, Fuchs G, El-Jawahri A, et al. Sarcopenia is associated with quality of life and depression in patients with advanced cancer. *The Oncologist*. 2018.
5. Song QH, Xu RM, Zhang QH, Ma M, Zhao XP. Relaxation training during chemotherapy for breast cancer improves mental health and lessens adverse events. *Int J ClinExp Med*. 2013;6(10):979-984.
6. Lim CC, Devi MK, Ang E. Anxiety in women with breast cancer undergoing treatment: a systematic review. *Int J Evid Based Healthc*. 2011; 9: 215-35.
7. Ferioli M, Zauli G, Martelli AM, et al. Impact of physical exercise in cancer survivors during and after antineoplastic treatments. *Oncotarget*. 2018 Mar 2; 9(17): 14005–14034.
8. Nissen MJ, Shapiro A, Swenson KK. Changes in weight and body composition in women receiving chemotherapy for breast cancer. *Clinical Breast Cancer* 2011;11(1):52-60.
9. Kim KS, Lee SW, Choe MA, Yi MS, Choi S, Kwon SH. Effects of abdominal breathing training using biofeedback on stress, immune response and quality of life in patients with a mastectomy for breast cancer. *Taehan Kanho Hakhoe Chi* 2005; 35: 1295-1303.
10. Charalambous A, Giannakopoulou M, et al. Guided Imagery And Progressive Muscle Relaxation as a Cluster of Symptoms Management Intervention in Patients Receiving Chemotherapy: A Randomized Control Trial. *PLoS ONE* 11(6):1-18
11. Berger AM, Mooney K, Alvarez Perez A, et al. Cancer-Related Fatigue, Version 2. 2015. *J Natl Compr Canc Netw*. 2015 Aug; 13(8): 1012–1039.
12. Berger AM, Mooney K, Alvarez-Perez A, Breitbart WS, Carpenter KM, Cella D, Cleeland C, Dotan E, Eisenberger MA, Escalante CP, Jacobsen PB, Jankowski C, LeBlanc T, et al. Cancer-related fatigue, version 2. 2015. *J Natl Compr Canc Netw*. 2015;13:1012–39.
13. Puetz TW, Herring MP. Differential effects of exercise on cancer-related fatigue during and following treatment: a meta-analysis. *Am J Prev Med*. 2012;43:e1–24.
14. Tatham B, Smith J, Cheifetz O, Gillespie J, Snowden K, Temesy J, Vandenberg L. The efficacy of exercise therapy in reducing shoulder pain related to breast cancer: a systematic review. *Physiother Can*. 2013;65:321–30.

15. Grande AJ, Silva V, Maddocks M. Exercise for cancer cachexia in adults: executive summary of a cochrane collaboration systematic review. *J Cachexia Sarcopenia Muscle*. 2015;6:208–11.
16. Carelle N, et al. Changing patient perceptions of the side effects of cancer chemotherapy. *Cancer*. 2002;95(1):155–63.
17. You J, Huang M, Guo Lm et al. The effect and mechanism of YH0618 granule on chemotherapy- induced hair loss in patients with breast cancer: study protocol for a randomized, double-blind, multi-center clinical trial. *20 (719)*: 2019.
18. Russel K. Progressive muscle relaxation, In: *Need for relaxation in hair care chapter 8 of Yoga for Hair Growth*. Inner Light Publisher. Hlm: 87-90
19. Bosswell EN, Dizon DS. Breast cancer and sexual function. *Transl Androl Urol*. 2015 Apr; 4(2): 160–168.