

Effect of Progressive Muscle Relaxation Therapy on Fatigue and Psychological Distress of Cancer Patients during Radiotherapy: A Randomized Controlled Trial

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Abstract

Background: Patients with cancer receiving radiotherapy experiences fatigue and psychological distress. Now a days there has been growing interest towards managing these symptoms with non-pharmacological treatments, But researches related to effect of progressive muscle relaxation therapy on fatigue and psychological distresses related to admitted patients are limited hence the aim of the study to evaluate the effect of progressive muscle relaxation therapy on fatigue and psychological distress in Cancer patients during Radiotherapy. **Aims and Objectives:** Aim of the study to evaluate the effect of progressive muscle relaxation therapy on fatigue and psychological distress in Cancer patients during Radiotherapy. **Materials and Methods:** The study design was single blinded randomized control trial. Total of 50 patients, for both intervention and control group 25 patients were included. The intervention group patients received P.M.R. therapy of 20 min. given for 3 times/week of total period of 3 weeks, whereas the control group received conventional treatment with no added intervention. Fatigue symptom inventory and hospital anxiety and depression scale used as an outcome measures. **Results:** Paired *t*-test used for FSI to compare among intervention and control group and results were showing statistical significant difference ($P < 0.05$), similarly pre and post improvement was observed in both the groups for HADS. Between group comparison showed no superior improvement one over the other. **Conclusion:** Based on the above findings, P.M.R. and conventional treatment were similarly efficacious in decreasing fatigue and psychological distress related to cancer patients who were hospitalized undergoing radiotherapy.

Keywords: Anxiety, depression, fatigue symptom inventory, Jacobson's relaxation, radiation

INTRODUCTION

In 80% of cases, patients receiving radiation as a treatment of cancer experience early fatigue which commonly was appearing along with or subsequently soon after the intervention. In concerning 30% of cases, it can furthest after the end of treatment. In that, up to 40% will suffer from radiotherapy-induced fatigue.^[1] Cancer patients also significantly suffer from psychological distress. Psychological distress is defined as a multifactorial, unpleasant, emotional experience of a psychological (cognitive, behavioral, and emotional), social, and/or spiritual nature that may interfere with the ability to cope effectively with cancer, its physical symptoms, and its treatment. Distress extends along a continuum, ranging from common normal feelings of vulnerability, sadness, and fears, to problems that can become disabling, such as depression, anxiety, panic, social isolation, and existential and spiritual

crisis.^[2] However, based on the different types and sites of cancer, the occurrence of psychological distress such as depression and anxiety accounts for 30%–40%.^[3] Depression has been highly correlated with cancer types, in which oropharyngeal patients seen around 22%–57% of cases and in breast cancer patients ranges from 15% to 46% of cases.^[3]

Nowadays, there has been growing interest toward managing these symptoms with non-pharmacological treatments such as

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exercises, education, and cognitive-behavioral interventions such as progressive muscle relaxation (PMR).^[4-6] PMR emerged based on the concept of psychobiology which is found to be the objective for a numerous adverse sensitive positions and psychosomatic diseases, which is like facilitation of specific group of muscles often progress to relaxation of the mind; this has been put forwarded by the Jacobson as a mechanism of action.^[7]

Several studies have been shown that PMR in combination with other interventions is found to be evident in decreasing fatigue and psychological distress in patients with receiving different interventions in different patient populations with related to different study settings, but studies are related to PMR only were limited in hospitalized patients undergoing radiotherapy and the results were conflicting. Hence, the need of the study is to find the effect of PMR in fatigue and psychological distress of hospitalized cancer patients undergoing radiotherapy.

METHODS

In this study, fifty patients were recruited to participate in a trial comparing PMR therapy and conventional physical therapy sessions from July 2017 to January 2018. Ethical clearance approval was obtained from the institutional ethical committee. The participants were recruited if they satisfied the selection criteria and gave written consent to participate in the study. Patients were included in the study if the age range was 35–75 years, both genders, having breast and head-and-neck cancers, visual analog scale score > 4 for fatigue, hospitalized, and receiving radiotherapy for treatment of cancer. Patients were excluded from the study if they are not willing to participate in the study, terminally ill, having any type of cognitive or communication problems, receiving chemotherapy or have undergone surgery within the past 1 month, and taking any type of medication for fatigue and psychological distress. This was a single-blinded, randomized controlled study comparing PMR therapy and conventional physical therapy with randomization done using computer-generated random numbers and opaque envelopes with group assignments.

Baseline assessment of demographic data, visual analog scale, fatigue outcome scale, and outcome scale of psychological distress was taken before the intervention of both the groups (Group A and Group B). For the intervention group, PMR therapy was performed by the patients together of 20 min, which was given thrice in a week, for the total duration of 3 weeks. For the control group, walking at a moderate intensity was performed by the patients together of 20 min, which was given thrice in week, for the total duration of 3 weeks. Moreover, post-intervention measures of both the groups (Group A and Group B) such as visual analog scale, fatigue outcome scale, and psychological distress scale were undertaken after cessation of the last treatment session.

Interventions

For the PMR therapy group, patients received two sessions of PMR as a practice session. Patients made lie comfortably on the

bed. They were instructed to listen and follow the instruction carefully. While contracting the muscle, the tautness supposed to be held for around 5–7 s at a time. They were instructed to release the tightness when repeating the word relax. While relaxing, the patient keeps concentrated on the feeling of relaxation.

The sequences which were followed were patients started with tensing and relaxing the forehead, then the upper cheeks, lower cheeks, nose, and jaws, followed by the neck and throat, then moved to the right hand and forearm, then the biceps muscle. Once the right side relaxed switched to the left hand and forearm, followed by biceps, then given concentration to the chest, both shoulders, and upper back, followed by the abdominal region. Once relaxation of the upper body had achieved, then moved to the lower body. Started with the right thigh, right calf, right foot muscles, then moved to the left side, the order was followed similarly like the right side.

Once the complete body relaxed, the end of the treatment was performed by telling number reverse order from four to one by the therapist. When told four, patients started moving legs, and when told to three, patients started moving the hands. For the next count, the patient started moving the head and neck. When told one, patients opened their eyes.^[7]

For the conventional physical therapy group, patients were instructed to perform all the daily living, along with made walk with moderate intensity on the corridors of the hospital ward for the total duration of 20–30 min.^[8]

Outcome measures

Fatigue symptom inventory

A 14-item component designed to measure the severity level, occurrence, observed relationship, the conjunction with activity of daily living, and the last point measures the final item that provides descriptive relation of fatigue. To identify patient has fatigue on Fatigue Symptom Inventory minimum score of 3 or above is necessary. The validity and reliability are seen in breast cancer patients, which shown good internal consistency with α coefficient above 0.90 in all the groups and also found weak to modest test–retest reliability; validity was compared with different groups and compared with depression and anxiety.^[9]

Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS), developed by Zigmond and Snaith in 1983,^[10] is a self-reported questionnaire that originally was designed for use with medical patients, even though it has been used widely in cancer patients also. It is a 14-item Likert response scale. There are two subscales: Hospital Anxiety and Depression Scale-depression (HADS-D) and Hospital Anxiety and Depression Scale-Anxiety (HADS-A).^[11] Each item has four possible answers (scored from 0 to 3, with higher scores more suggestive of psychological distress), and patients are asked to tick the answer which they experienced in the previous week.^[12] Interpretation of the results is divided into

0–7 means normal score; 8–10 means borderline score; and 11–21 means abnormal score.^[10] In oncological populations, it has shown to be an adequate means of identifying anxiety and depression symptoms, by producing ranges between 74 and 84 for sensitivity, 78 to 80 for specificity, a high internal consistency (alphas between 83 and 85), high test–retest reliability ($r = 0.75$), adequate convergent validity ($P < 0.05$), and a factorial structure that is similar to the original version.^[10]

RESULTS

SPSS 16.0 package (SPSS Inc., Chicago, IL, USA) for Windows was used to compute the data. The demographic data such as age and gender were analyzed using descriptive statistics. To compare the outcome measures before and after interventions, paired *t*-test was used and to compare the effectiveness of interventions between the groups, “independent sample *t*-test” was used. $P < 0.05$ was statistically significant. The age and gender were similar and equally distributed in the intervention and control groups.

Fatigue symptom inventory

Paired *t*-test was used to compare the pre- to posttest data of Fatigue Symptom Inventory (FSI) (FSI composite and FSI average). The obtained *P* value in all the groups was <0.05 , and hence, there was a statistically significant difference in pre- and post-intervention in fatigue [Table 1].

Hospital Anxiety and Depression Scale

Paired *t*-test was used to compare the pre- to posttest data of HADS (HADS-D and HADS-A). The obtained *P* value in all the groups was <0.05 , and hence, there was a statistically significant difference in pre- and postintervention in psychological distress [Table 2].

Between-group comparison

Between-group comparison of post-intervention data was performed by independent sample *t*-test. All the components of outcome scales *p* value were >0.05 . It was found to be statistical insignificant which means that there was no statistically significant difference between the groups [Table 3].

DISCUSSION

The current research performed evaluating the effect of PMR therapy-related fatigue and psychological distress in hospitalized patients undergoing radiotherapy. Although in some studies, they have assessed the effect of PMR on pain, comfort level, nausea, sleep quality, and cluster of symptoms.^[13-16] However, there are little research on the effect of PMR on fatigue and psychological distress on hospitalized cancer patients undertaking radiotherapy.

The patients of both intervention as well as the control groups were homogeneously distributed. There was no remarkable difference in gender and age distribution ($P < 0.05$). Acute patients who underwent radiotherapy for their primary head-and-neck and breast cancers were included in the study. Patients for both the groups were hospitalized and underwent

Table 1: Paired *t*-test for pre-post comparison of fatigue symptom inventory

	Mean ± SD		<i>t</i>	<i>P</i>
	Pretest	Posttest		
FSI composite				
Group A	6.87±0.89	3.51±0.79	13.57	0.001*
Group B	6.57±0.99	3.66±0.72	10.67	0.001*
FSI average				
Group A	6.96±0.72	3.40±0.72	16.65	0.001*
Group B	5.98±1.76	3.49±0.82	6.56	0.001*

*Means significance. SD: standard deviation, FSI: fatigue symptom inventory

Table 2: Paired *t*-test for pre-post comparison of Hospital Anxiety and Depression Scale

	Mean ± SD		<i>t</i>	<i>P</i>
	Pretest	Posttest		
HADS depression				
Group A	13.26±2.18	7.74±2.19	7.86	0.001*
Group B	13.47±1.71	7.16±2.06	9.06	0.001*
HADS anxiety				
Group A	14.35±2.67	6.74±2.40	10.84	0.001*
Group B	14.16±2.46	7.11±1.79	9.86	0.001*

*means significance. SD: standard deviation, HADS: hospital Anxiety and Depression Scale

Table 3: Between group comparison of fatigue symptom inventory and Hospital Anxiety and Depression Scale

Variables	Group	Mean ± SD	<i>t</i>	<i>P</i>
FSI composite	Group A	3.16±1.19	-0.62	0.54
	Group B	2.91±1.19		
FSI average	Group A	3.56±1.02	-0.49	0.63
	Group B	2.49±1.16		
HADS depression	Group A	5.52±3.37	0.88	0.39
	Group B	6.32±3.03		
HADS anxiety	Group A	7.61±3.37	-0.56	0.59
	Group B	7.06±3.12		

FSI: Fatigue symptom inventory, HADS: Hospital Anxiety and Depression Scale, SD: standard deviation

a radiation therapy for their conditions. Patients in both the groups did not have any medical conditions which might affect the results.

In the current study, treatment given was three times per week for 3 weeks which was after a practice session. Only two sessions of practice were given prior to intervention. Each treatment session was carried on for 20 min. This can be related to the reason that complete relaxation of all muscle groups takes up to 20 min and some time is also necessary for making the patient to achieve a relaxed position.^[7] In the beginning, some of the patients faced difficulties when doing PMR. In a recent study conducted in Japan, patients faced difficulty while learning PMR.^[17] However, in this study, after learning

once, patients felt easy while doing PMR, and they noticed it to be easy to perform even when they are tired and cannot go for a walk. The immediate effect of PMR was not analyzed rather the intermediate effect was observed after 3 weeks on completion of all sessions.

PMR used as a verbal command, which did not include any type of music on the background. In this study, planned to assess the effect of PMR alone, there was a chance of biased by the effect of music and also for the same reason, PMR was not combined with other interventions such as guided imagery. In several other studies, they have used PMR alone or in combination with other interventions as guided imagery and hypnosis.^[13,18]

In the current study, PMR was similarly effective as conventional therapy in reducing fatigue among cancer patients receiving radiotherapy. At the starting of the therapy, both the groups were not homogeneous according to their mean fatigue scale, and at the end of 3 weeks, both the group patients had a significant decrease in their mean fatigue scores. ($P < 0.01$), the present study supports the findings of Demiralp M *et al.*^[14] and Pathak P *et al.*^[15] The possible mechanism of reduction of fatigue like, there is a strong correlation between the easing, tautness in the muscle group, and the association with autonomic nervous systems. When there is relaxation of the muscles which will lead to activation of parasympathetic system results in reduction of muscle tone, and hence, there is correlation between central nervous system and peripheral nervous system.^[17]

In the control group (walking program) also, there is a reduction in pre–post mean fatigue score. This result is supporting the findings of previous results.^[8] In this study, PMR was similarly effective as conventional therapy in the reduction of depression and anxiety on cancer patients who were undergoing radiation therapy. The mean anxiety and depression score had statistically significant difference in both the groups ($P < 0.01$).

Walking is a part of aerobic exercise. Aerobic exercise is an effective intervention for cancer-related fatigue (CRF), sleep disruption, depression, anxiety, cardiopulmonary function, and quality of life (QOL) among cancer patients and survivors. Aerobic exercise is beneficial when performed by cancer patients who are undergoing treatment. Mustian KM *et al.*^[8] reported that home-based walking at a moderate intensity (50%–70% of maximum heart rate) performed for 10–45 min per day, 4–6 days per week, for 1 to 6 months, during chemotherapy and radiation treatment for breast cancer reduced CRF, sleep disruption, depression, and anxiety while improving cardiopulmonary function and QOL.^[8] Hence, the intervention group was not given any additional conventional therapy, like to assess the effect individually rather than combining one over others.

PMR works in relation to the principle of neuromuscular hypertension. This is found to be the reason for various

undesirable expressive psychological feelings and musculoskeletal diseases originating from the psychological origin. When performing PMR which will induce relaxation and helps in reducing the anxiety and depression. This is favoring the studies of Yelmaz *et al.*^[16] and Chan *et al.*^[19]

The results from this study showed enhancement in the level of worry of cancer patients, the current study results which matching with study of Yelmaz *et al.*^[16] For assessing the fatigue after giving PMR as a treatment in cancer patients, Demiralp *et al.*^[14] performed one study which concentrated on breast cancer patients who receiving chemotherapy, and the results favored that PMR helps in improvement of tiredness. The result of the current study favors the same.^[14] The effect of PMR on fatigue was favoring the study of Pathak *et al.*^[15] conducted a similar study, with an objective to assess the effect of PMR exercises related to pain as well as fatigue on admitted patients with cancer undergoing radiotherapy, and their results show that PMR together with standard care is effectively helps in decreasing fatigue and pain.^[15]

The usage of the HADS for oncological patients over other outcome scales which assess anxiety and depressive symptoms such as beck depression inventory, beck anxiety inventory, and distress thermometer is that it does not include somatic symptoms which may be explained by the cancer itself and the treatment for it. This may contribute to an overestimation by the other instruments and also it is a brief instrument, which is easy to apply and reliable for clinical practice and cancer-related research activities.^[10]

Based on the results obtained, the current study is accepting the null hypothesis and rejecting the alternative hypothesis.

CONCLUSION

The present randomized control trial suggests that both PMR technique and conventional treatment can be used for treating radiotherapy-induced fatigue and distress in admitted cancer subjects as a treatment for cancer patients. Thus, these interventions can be included as an inpatient rehabilitation those who undergoing radiotherapy.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Fossa BA, Marsiglia HR, Orecchia R. Radiotherapy-related fatigue. *Crit Rev Oncol Hematol* 2002;41:317-25.
2. Schuurhuizen CS, Braamse AM, Beekman AT, Bomhof-Roordink H, Bosmans JE, Cuijpers P, *et al.* Screening and treatment of psychological distress in patients with metastatic colorectal cancer: Study protocol of the TES trial. *BMC Cancer* 2015;15:302.
3. Massie MJ. Prevalence of depression in patients with cancer. *J Natl Cancer Inst Monogr* 2004;32:57-71.
4. Cramp F, Daniel J. Exercise for the management of cancer-related fatigue in adults. *Cochrane Database Syst Rev* 2008;11:CD006145.

5. Mustian KM, Morrow GR, Carroll JK, Figueroa-Moseley CD, Jean-Pierre P, Williams GC. Integrative non-pharmacological behavioral interventions for the management of cancer-related fatigue. *Oncologist* 2007;12:52-67.
6. Porteno RK, Itri LM. Cancer-related fatigue: Guidelines for Evaluation and Management. *Oncologist* 1994;4:1-10.
7. Conrad A, Roth WT. Muscle relaxation therapy for anxiety disorders: It works but how? *J Anxiety Disord* 2007;21:243-64.
8. Mustian KM, Sprod LK, Janelsins M, Peppone LJ, Mohile S. Exercise recommendations for cancer-related fatigue, cognitive impairment, sleep problems, depression, pain, anxiety, and physical dysfunction: A review. *Oncol Hematol Rev* 2012;8:81-8.
9. Hann DM, Jacobsen PB, Azzarello LM, Martin SC, Curran SL, Fields KK, *et al.* Measurement of fatigue in cancer patients: Development and validation of the fatigue symptom inventory. *Qual Life Res* 1998;7:301-10.
10. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta psychiatry scand.* 1983;67:361-70.
11. Singer S, Kuhnt S, Götze H, Hauss J, Hinz A, Liebmann A, *et al.* Hospital Anxiety And Depression Scale cut-off scores for cancer patients in acute care. *Br J Cancer* 2009;100:908-12.
12. Brown DJ, McMillan DC, Milroy R. The correlation between fatigue, physical function, the systemic inflammatory response, and psychological distress in patients with advanced lung cancer. *Cancer* 2005;103:377-82.
13. Charalambous A, Giannakopoulou M, Bozas E, Marcou Y, Kitsios P, Paikousis L. Guided imagery and progressive muscle relaxation as a cluster of symptoms management intervention in patients receiving chemotherapy: A randomized control trial. *PLoS One* 2016;11:1-18.
14. Demiralp M, Oflaz F, Komurcu S. Effects of relaxation training on sleep quality and fatigue in patients with breast cancer undergoing adjuvant chemotherapy. *J Clin Nurs* 2010;19:1073-83.
15. Pathak P, Mahal R, Kohli A, Nimbran V. Progressive muscle relaxation: An adjuvant therapy for reducing pain and fatigue among hospitalized cancer patients receiving radiotherapy. *Int J Adv Nurs Stud* 2013;2:58-65.
16. Yelmaz SG, Arslan S. Effects of progressive relaxation exercises on anxiety and comfort of Turkish breast cancer patients receiving chemotherapy. *Asian Pac J Cancer Prev* 2015;16:217-20.
17. Kwekkeboom KL, Wanta B, Bumpus M. Individual difference variables and the effects of progressive muscle relaxation and analgesic imagery interventions on cancer pain. *J Pain Symptom Manage* 2008;36:604-15.
18. Chen SF, Wang HH, Yang HY, Chung UL. Effect of relaxation with guided imagery on the physical and psychological symptoms of breast cancer patients undergoing chemotherapy. *Iran Red Crescent Med J* 2015;17:1-8.
19. Chan CW, Richardson A, Richardson J. Managing symptoms in patients with advanced lung cancer during radiotherapy: Results of a psych educational randomized controlled trial. *J Pain Symptom Manage* 2011;41:347-57.