RESEARCH ARTICLE

Impact of Applied Progressive Deep Muscle Relaxation Training on the Level of Depression, Anxiety and Stress among Prostate Cancer Patients: A Quasi-Experimental Study

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Abstract

Background: The aim of this study was to determine the impact of applied progressive muscle relaxation training on the levels of depression, anxiety and stress among prostate cancer patients. Materials and Methods: A quasi-experimental study was conducted at the University Malaya Medical Centre (UMMC) and Universiti Kebangsaan Malaysia Medical Centre (UKMMC) over six months. Prostate cancer patients from UMMC received the intervention and patients from UKMMC were taken as controls. The level of depression, anxiety and stress were measured using Depression, Anxiety Stress Scales - 21 (DASS-21). Results: A total of 77 patients from the UMMC and 78 patients from the UKMMC participated. At the end of the study, 90.9% and 87.2% of patients from the UMMC and UKMMC groups completed the study respectively. There were significant improvements in anxiety ($p<0.001$, partial $\eta^2=0.198$) and stress ($p<0.001$, partial $\eta^2=0.103$) at the end of the study in those receiving muscle training. However, there was no improvement in depression ($p=0.956$). Conclusions: The improvement in anxiety and stress showed the potential of APMRT in the management of prostate cancer patients. Future studies should be carried out over a longer duration to provide stronger evidence for the introduction of relaxation therapy among prostate cancer patients as a coping strategy to improve their anxiety and stress.

Keywords: Applied progressive deep muscle relaxation training - depression - anxiety - stress - prostate cancer

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Introduction

Prostate cancer is the second most common cancer and the second leading cause of cancer death in man (American Cancer Society, 2011; Cancer Research UK, 2010). The incidence of prostate cancer is rising steadily (Nelen, 2007; American Cancer Society, 2011) and there are about one in six men diagnosed during their lifetime (American Cancer Society, 2011 with the median age of 67 years at diagnosis (Altekruse et al., 2011).

Receiving a diagnosis or treatment for prostate cancer is a significant distressing occasion for most men (Sharpley et al., 2008). In addition to the emotional impact of diagnosis, treatment that follows leads to an increase in anxiety, depression and sadness, consequently affects their quality of life (Bloch et al., 2007). Consultation-liaison psychiatrists and physician need to be aware of psychological sequelae for both prostate cancer and treatment-related side effects (Kunkel et al., 2000).

Prostate cancer patients face several barriers to receive an appropriate psychiatric intervention and tend to underestimate the psychological co-morbidity. It may remain untreated even after identification with sexual associations carry greater social stigma that mostly affect prostate cancer patients (Kunkel et al., 2000). Urinary incontinence, sexual dysfunction and fatigue are major emotional and physical stressors among prostate cancer patients. Even active surveillance for early-stage prostate cancer has no side effects, prostate cancer patients must cope psychological issues for long term cancer survivorship (Kunkel et al., 2000). Prostate cancer reported worse levels of social and emotional functional as well as more symptoms life such as insomnia, constipation and diarrhea compared to the general population (Zenger et al., 2010). The relationship intimacy with the partner is important for psychological adjustment for early stage prostate cancer survivors and their partner (Manne et al., 2010).

Progressive Muscle Relaxation (PMR) is a technique to create a state of deep relaxation involves alternate tensing and relaxing the muscles (Payne, 2000). It was developed by Edmund Jacobson (Jacobson, 1938; Sadock and Sadock, 2003) based on the theory of psychobiological state called neuromuscular hypertension as the basis for a variety of negative emotional states and psychosomatic diseases (Jacobson, 1938) and based on a theory that

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the body's muscle tension was from anxiety-provoking thoughts and events (Nickel et al., 2005).

The purpose of this study was to assess the impact of Applied Progressive Muscle Relaxation Training (APMRT) on the levels of depression, anxiety and stress among prostate cancer patients. We hypothesized that depression, anxiety and stress scores of the intervention group will be significantly reduce compared to the control group's scores after applying progressive muscle relaxation therapy.

Materials and Methods

A quasi-experimental study was conducted at University Malaya Medical Centre (UMMC) and Universiti Kebangsaan Malaysia Medical Centre (UKMMC) over period of six months. UMMC and UKMMC are tertiary hospitals under the Ministry of Higher Education, Malaysia. Patients from UMMC and UKMMC were selected as the intervention and comparison group respectively.

The inclusion criteria were patients diagnosed with prostate cancer aged 50 years and above. Patients with any cancers other than prostate cancer and with psychiatric diagnosis; current use of any psychiatric medication; having prior training or current use of relaxation therapy; presence of physical limitations for learning Progressive Muscle Relaxation Training (eg: bed-bound) and patients without consent were excluded.

The sample size was calculated using PS sample size calculation (Duport and Plummer, 1990). Based on study by Bastani et al. (2006), with a mean difference of 13.39 points between intervention and comparison groups, standard deviation of 5 points, significant level of 5 percent with a power of 0.80 (Cohen, 1992), a minimum sample of 56 for each group required. By adjusting for attrition of 20 percent, the minimum sample size required for each group was 68 for each group. Patients from both centers were recruited from August 2010 to June 2011 using universal sampling until the required sample size achieved.

Study procedure

The intervention was the Applied Progressive Muscle Relaxation Training (APMRT) Program. It was a one hour therapy that consisted of six modules. A total of three session's one-hour therapy was conducted by the principal investigator and occupational therapist over six weeks. In brief, the APMRT program involved discussion of depression, anxiety and stress in prostate cancer, rational, description and demonstration of the therapy. In addition to that, abdominal breathing technique was taught to enhance relaxation through demonstration by the principal investigator. Patients were encouraged practicing the therapy on their own daily over the six month period assisted by compact disc consists of the text and scripts of APMRT provided to them.

The first module of the training was related to an introductory group discussion of depression, anxiety and stress in prostate cancer, as well as a rational and general description of the purpose of the relaxation. Each patient was provided a written training manual of APMRT and APMRT picture guide as in order to provide visual illustrations supplementing the therapist's demonstration.

The second module was related to how to do breathing technique in order to enhance more relaxes before proceeding to the relaxation therapy. The breathing technique took almost ten minutes to get proper abdominal breathing properly (breathe in for five seconds and breathe out for seven seconds). It was to get more oxygen to muscle and tissues and improving the body's internal rhythm. The patients were encouraged to say to themselves the word, relaxation (with inhalation) and stress or anger (with exhalation). It was to bring in the feeling that the patients want with inhalation and release those the patients don't want by exhalation.

The third module was related to relax with the help of a shortened version of progressive relaxation (tense for five seconds and relax for ten seconds) in the sixteen large muscle groups of the hands, arms, face, shoulders, back, chest, stomach, breathing, hips, legs, and feet. This module took around twenty to thirty minutes to complete. The patients in turn demonstrated the relaxation technique by using compact disc (CD) instruction with the instructor's voice (the CD provided by the Department of Psychological Medicine, Faculty of Medicine, University of Malaya).

The fourth module was related to "end of the relaxation therapy" and took around ten minutes. The fifth module was related to repeat again the second, third and fourth modules. It included the breathing technique, the APMRT and the end of the relaxation therapy. All these modules took around one hour to complete. The final (sixth) module was related on the discussion of the relaxation training with the patients to confirm that they had mastered the technique.

During the relaxation training, the patients were seated in a quiet room and were asked to follow the different exercises demonstrated by the investigator. Each patient was covered with a comfortable blanket and the room lights were then dimmed. The patients were advised to practice the applied relaxation twice daily at home throughout the study period. They were encouraged to keep daily home relaxation practice records (log book) during the study. The patients were refrained from smoking, strenuous physical exercise, eating and consuming caffeine for at least one hour prior to testing.

To supplement the presentations and to provide a more effective program, the investigator used posters and pamphlet. The pamphlets consist of the topics relevant to prostate cancer, general information on depression, anxiety and stress in prostate cancer. The pamphlets were given to the patient for them to read at home. The discussion involved question and answer sessions were also carried out during the interview. The patients freely asked any information about prostate cancer and psychological problem which were not clear. The discussion was facilitated by the investigator. However, any questions that involved prostate cancer treatment, they were advised to discuss with the urologist or oncologist who are the expert. The investigator initiated telephone calls to encourage and monitor the patient's compliance and clarify arising related problem.

The comparison group was not given any intervention. They were only given information about depression, anxiety and stress and minimal health education on how to reduce the depression, anxiety and stress level in their daily life.

At baseline, self-administered questionnaire was used to collect information on socio-demographic characteristics, current status and the level of depression, anxiety and stress. Life in prostate cancer was estimated from the date of confirmation by the pathology result for prostate cancer to the date of interview. Prostatic Specific Antigen (PSA) was used to monitor the prostate cancer progression (Katz and Katz, 2008). Gleason score is a score based on the architectural appearance of the prostate gland (Epstein, 2006) where the higher the score the poorer the prognosis (Bracarda et al., 2005). The metastases status was determined by a combination of clinical examinations, blood tests and radiological investigations (Mackie and Rai, 2008).

The depression, anxiety and stress levels were assessed using self-reported Depression Anxiety Stress Scale - 21 (DASS-21). Patient's medical records were reviewed to countercheck the patients' past medical history. At four months, both intervention and comparison groups were required to complete the DASS-21 (post-test 1). The same DASS-21questionnaire filled again by all patients at sixth month (post-test 2).

Assessment

Self-administered Depression Anxiety Stress Scale (DASS-21) was used to measure psychological depression, anxiety and stress (Lovibond and Lovibond, 1995) in both clinical (Gloster et al., 2008) and non-clinical samples (Henry and Crawford, 2005). It comprises twenty-one items that are divided into three subscales measure depression, anxiety and stress. There are seven items for depression (DASS-Depression), seven items for anxiety (DASS-Anxiety) and seven items for stress (DASS-Stress). The depression scale assesses the dysphoria, hopelessness, devaluation of life, self-deprecation, adhedonia, inertia and lack of interest. The anxiety scale assesses the autonomic arousal, skeletal muscle effects, situational anxiety and subjective experience of anxious affects and the stress scale assesses the difficulty in relaxing, nervous arousal and being easily upset or agitates, irritable or over-react and impatient (Lovibond and Lovibond, 1995).

The original DASS-Depression, DASS-Anxiety and DASS-Stress subscales have cronbach's alpha ranging from 0.76-0.84, while the internal consistency ranging from 0.83-0.91 (Lovibond and Lovibond, 1995). The DASS assessment has been translated in various languages (Bados et al., 2005; Apóstolo et al., 2006; Akin and Çetin, 2007; Musa et al., 2007). The translated Malay version of DASS-21 demonstrated good concurrent and criterion-related validity. DASS-21 of Malay version has cronbach's alpha of 0.84, 0.74 and 0.79 respectively (Musa et al., 2009).

In this study, DASS-21 of English and Malay versions were used. The patients were asked to use the 4-point severity scales (0=Did not apply to me at all, 1=Applied to me to some degree or some of the time, 2=Applied to me a considerable degree, or good part of the time, and 3=Applied to me very much or most of the time) to rate the extent to which they have experienced each state over the past four weeks (Lovibond and Lovibond, 1995). The score of depression, anxiety and stress calculated by summing the score for the relevant items and multiply by two to get the final scores for the relevant items and converting these into percentile scores. The higher scores indicated greater depression, anxiety and stress levels.

Ethical considerations

Ethical approval obtained from the UMMC Ethics Committee (MEC Reference number: 781.10) and UKMMC Ethics Committee (Project code: FF-277-2011). The trial registered at the Iranian Registry of Clinical Trial (IRCT201103176085N1). The patients were given verbal and written explanation to clearly understand the principles and procedures of the study. Informed consent obtained from all participants.

Statistical analysis

The analysis was conducted using the Statistical Package for Social Sciences (SPSS) Version 20.0 (SPSS Inc, Chicago, IL). For descriptive analysis, the frequency distribution, measure of central tendencies and measure of distribution produced. The normality of continuous data checked via Kolmogorov-Smirnov testing and plotting the histogram with normal curve. The significant level preset at $\alpha<0.05$. The normally distributed continuous data presented in the form of mean values with the corresponding standard deviations. Median values and their corresponding 25^{th} and 75^{th} inter-quartile range values presented for the non-normally distributed continuous data. The categorical data presented in the form of absolute number and corresponding percentage.

The scores of depression, anxiety and stress were entered as continuous variables. The raw data for the depression, anxiety and stress score were not normally distributed (skewed to the right). Transformation was carried out by formula Log10 (x+1). The end products of the analyses were then retransformed back to the normal value by formula antilog10-1.

Repeated measures ANOVA procedure was used in the analysis to compare the mean response over time between intervention and comparison groups. The rationale for the repeated measures ANOVA is to regard time and also as a factor addition to treatment. We examined both for main effect (changes for whole sample over time) and for differentiate between treatment conditions. Per-protocol analysis was applied by omitting the patients who dropped out from the study.

Results

A total of 77 patients from the UMMC and 78 patients from the UKMMC participated. At the end of the study, 90.9 percent and 87.2 percent of patients from the UMMC and UKMMC groups completed the study respectively (Figure 1).

The demographic characteristics and the cancer status

of the participants are shown in Table 1. Both groups were comparable in all characteristics at baseline (p>0.05).

Majority of the respondents were more than 70 years olds with more Chinese, married and had secondary education. More than 85 percent of them had other comorbidities besides prostate cancer and around 40 percent had metastases status. The median (IQR) life in cancer in both groups was 2.73 (3.85) years, the median (IQR) level of latest PSA level was 2.53 (6.87) ng/mL and the mean (SD) Gleason score was 6.60 (1.64). There was 27.1 percent with a family history of prostate cancer and all the patients had adenocarcinoma. The impact of APMRT on participants' depression, anxiety and stress levels are shown in Table 2.

Overall, there were significant changes over time

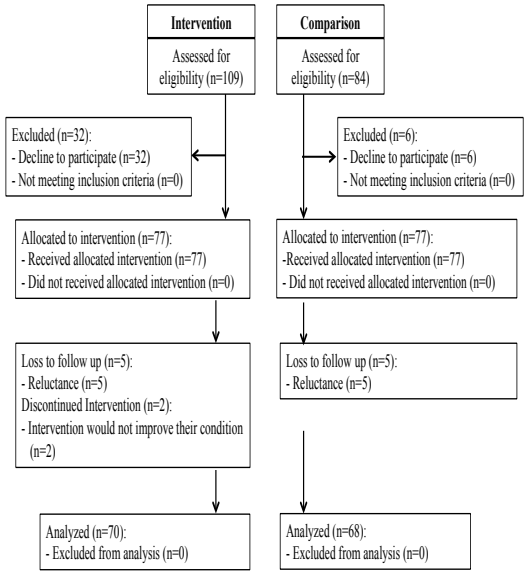

Figure 1. The Flow Diagram of the Progress at Different Phases of Intervention and Comparison Groups

Table 1. The Socio-demographic and Cancer Status among Intervention and Comparison Groups

	Intervention n=77, n(%)	Comparison n=78, (n(%)	p-value
Age: (Mean±SD)	71.2±7.11	73.4±7.42	0.053
Race:			
Malay	26 (33.8)	29 (37.2)	0.750
Chinese	36 (46.8)	37 (47.4)	
Indian	12 (15.6)	11 (14.1)	
Punjabi	3 (3.9)	1 (1.3)	
Marital status:			
Married	69 (89.6)	71 (91.0)	0.573
Not Married	3 (3.9)	1 (1.3)	
Widow/Separate/Divorced	5 (6.5)	6 (7.7)	
Educational status:			
College/University	37 (48.1)	21 (26.9)	0.053
Secondary	36 (46.8)	53 (67.9)	
Primary	4 (5.2)	4 (5.1)	
Co-morbidities:			
Yes	71 (92.2)	66 (84.6)	0.140
No	6 (7.8)	12 (15.4)	
Metastases:			
Yes	34 (44.2)	27 (34.6)	0.224
No	43 (55.8)	51 (65.4)	
Family history of Prostate Cancer:			
Yes	25 (32.5)	17 (21.8)	0.087
No	52 (67.5)	61 (78.2)	
Life in cancer: (Median (IQR))	2.48 (4.45)	2.88 (3.37)	0.191
Gleason score: (Mean±SD)	6.30±1.73	6.73±1.58	0.106
Latest PSA: (Median (IQR))	2.42 (8.31)	2.57 (3.79)	0.166

Table 2. Depression, Anxiety and Stress Scores at Baseline, 4-month and 6-month

	Time	Inter-vention (n=70)	Compa-rison (n=68)	F-stat between-subject (df)	p-value	Partialeffect size (partial η^2)
Depression	Baseline	5.37±2.37	5.14±2.74	0.003	0.956	0.004
(Mean±SD)	4-month	5.25±3.02	5.29±2.59	(1,130)		
	6-month	5.22±2.90	5.29±2.59			
Anxiety	Baseline	6.11±2.68	5.56±3.11	33.652	<0.001*	0.198
(Mean±SD)	4-month	5.49±2.83	5.62±3.04	(1,130)		
	6-month	4.97±2.89	5.62±3.02			
Stress	Baseline	6.94±3.08	6.50±2.77	15.576	<0.001*	0.103
(Mean±SD)	4-month	6.40±3.14	6.61±3.06	(1,130)		
	6-month	5.69±2.62	6.62±3.06			

*statistical significant at α=0.05

in anxiety score (p<0.001) and stress score (p<0.001) between intervention and comparison groups. However, there was no significant change over time for depression score (p=0.956).

For anxiety score in intervention group, there were significant differences between baseline and at 4-month [paired difference: -0.63 (95%CI: -0.85, -0.41)], baseline and at 6-month [paired difference: -1.14 (95%CI: -1.45, -0.83)], and at 4-month and at 6-month [paired difference: -0.51 (95%CI: -0.72, -0.30)]. In the comparison group: there were no significant differences between baseline and at 4-month (p=0.159), baseline and at 6-month (p=0.159) and at 4-month and 6-month (p=0.972). It can be concluded that among intervention group, the score of anxiety decreased from baseline to at 4-month and to at 6-month.

For stress in intervention group, there were significant differences between baseline and at 4-month [paired difference: -0.54 (95%CI: -0.77, -0.31)], baseline and at 6-month [paired difference: -1.25 (95%CI: -1.78, -0.73)]; and 4-month and at 6-month [paired difference: -0.71 (95%CI: -1.08, -0.34)]. In comparison group, there were significant differences between baseline and at 4-month [paired difference: 0.12 (95%CI: 0.01, 0.23)], baseline and at 6-month [paired difference: 0.12 (95%CI: 0.01, 0.23)]. However, there was no significant different between at 4-month to at 6-month (p=0.965). It can be concluded that among intervention group, the score of stress decreased from baseline to at 4-month and to at 6-month. Meanwhile among comparison group, the score of stress increased from baseline to at 4-month and at 6-month.

Discussion

In general, prostate cancer patients did not report higher level of psychological distress compared to general population due to relatively good prognosis (Mehnert et al., 2010). Therefore, early detection of psychiatric morbidity is needed in primary care providers and their determinant can help in psychiatric service planning and treating them under their care (Latifah et al., 2005).

Our results supported the findings of some previous study that investigated the impact of different relaxation technique on anxiety. The improvement found among pregnant women in reducing state-anxiety and trait-anxiety (Bastani et al., 2005), undergraduate physical therapy on reducing cognitive and somatic anxieties (Gill

et al., 2004), and among acute schizophrenia (Chen et al., 2009). Relaxation therapy also improves the state-anxiety over ten weeks among colorectal cancer patients after surgery (Cheung et al., 2003).

There were other studies that show significant difference in many different relaxation techniques in reducing anxiety level such as in dental fear patients (Lahmann et al., 2008b), eating syndrome patients (Pawlow et al., 2003) and among post coronary bypass graft surgery underwent rehabilitation care (Dehdari et al., 2009). Mackereth et al. (2009) found a combination between reflexology and relaxation therapy were significantly reduce in anxiety subscale in General Health Questionnaire (GHQ-28) and in State-Anxiety Inventory Scale among multiple sclerosis patients. The combination between relaxation techniques and guided imagery were found more effective in reducing level of anxiety in dental fear patients (Berggren et al., 2000) and among breast cancer patients using anxiety-subscale of Hospital Anxiety Depression Scale (HADS) (León-Pizarro et al., 2007).

The effectiveness of the relaxation therapy to reduce the level of anxiety could be due to relaxation for the stimulation of parasympathetic activity that cause decreased blood pressure, heart rate, muscle tension, and rate of breathing, as well as feelings of being calm and in control (Payne, 2000). Sharpley et al. (2007) also found that the anxiety level decreased was due to an association with reduction in psychomotor, agitation, weakness and pessimism. Even though there were many relaxation studies had an advantage on anxiety, Yu et al. (2007) did not found any significant reduction in anxiety subscale of HADS among heart failure patients.

On the stress level, the results supported the findings of some previous studies that investigated the impact of different relaxation technique among night eating syndrome patients (Pawlow et al., 2003), undergraduate students (Pawlow and Jones, 2002), pregnant women (Bastani et al., 2005) and healthy young adults (Emery et al., 2008). Yu et al. (2007) found a medium-size effect (partial η^2= 0.7) for alleviating psychologic distress in patients with chronic illness. In meta-analysis literature, an abbreviated progressive muscle relaxation (APRT) is an effective treatment for the reduction of stress with average effect size was moderate (r=0.40) (Charles and Rick, 1993). The reason for the improvement is almost the same with the improvement for the anxiety score where the effect of the relaxation for the stimulation of parasympathetic activity causes a decreased in blood pressure, heart rate, muscle tension, and rate of breathing, as well as feelings of being calm and in control and indirectly can reduce the stress (Payne, 2000).

Although our results on anxiety and stress were statistically significant, the effect sizes obtained were small (19.8% and 10.3%, respectively). This could be due to the short term intervention of six months duration only.

There were no significant different in the improvement of depression score comparing both group. It can be concluded that APMRT has no advantage in the improvement of depression among prostate cancer patients. The results supported the study by Lahmann et al. (2008a) found the relaxation therapy was not effective in reducing depression score among non-specific chest pain of the somatoform heart disorder patients (p=0.973).

Our result contradicted with the findings of the study among gynaecology and breast cancer patients underwent brachytherapy (p=0.03) (Leo´n-Pizarro et al., 2007) and among night eating syndrome (Pawlow et al., 2003). The depression score was significantly decreased by using Hospital Anxiety Depression Scale (HADS) among heart failure patients (Yu et al., 2007) and advanced cancer patients (Sloman, 2002). Yu et al. (2007) also found a medium-size effect in reducing psychological distress (partial η^2=0.7) among heart failure patients.

The quasi-experimental design was conducted as we had difficulty in recruitment and randomize the patients. This study design is inferior to randomized controlled trial as it is difficult to control for important confounders. Universal sampling conducted had a tendency to non-sampling error like selection bias, response bias and non-response bias. Selection bias is the major issue in this sampling. It could be due to patient who are willing to participate were different from patients who did not willing to participate. However, the comparability of baseline characteristics for both intervention and comparison groups assured us that the observed improvement was due to the intervention itself. The good follow up rate of our study also assured us of less bias.

In conclusion, the improvement in anxiety and stress showed the potential of APMRT in the management of prostate cancer patients. Future studies should be carried out over a longer duration to provide stronger evidence for the introduction of relaxation therapy among prostate cancer patients as a coping strategy.

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