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THE EFFECT OF PROGRESSIVE MUSCLE RELAXATION TRAINING ON ANXIETY AND QUALITY OF LIFE AFTER STOMA SURGERY IN COLORECTAL CANCER PATIENTS

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SUMMARY

The aim of the study was to evaluate the effects of the use of progressive muscle relaxation training (PMRT) on anxiety and quality of life in colorectal cancer patients after stoma surgery. A randomised controlled trial was used with repeated measures assessment over 10 weeks post-stoma surgery. Fifty-nine patients participated in the study and were randomised to a control group receiving routine care ($n = 30$) and an experimental group receiving routine care and PMRT through two teaching sessions and practice at home for the first 10 weeks. The State-Trait Anxiety Inventory and two Quality of Life Scales were used to collect the data of interest in three occasions, namely during hospitalisation, at week 5 and at week 10 post-surgery. The use of PMRT significantly decreased state anxiety and improved generic quality of life in the experimental group ($P < 0.05$), especially in the domains of physical health, psychological health, social concerns and environment. Social relationships decreased in both groups. In relation to the disease-specific quality of life measure, differences were observed only in the 10-week assessment, with the experimental group reporting better quality of life at 10 weeks, but not over time as compared to the control group. The use of PMRT should be incorporated in the long-term care of colorectal cancer patients, as it can improve their psychological health and quality of life. This may be a cost-effective intervention that needs minimal training and could easily be offered to those patients that they would like to use it as part of the specialist care provided to stoma patients. Copyright © 2002 John Wiley & Sons, Ltd.

INTRODUCTION

The experience of having cancer is a threat, not only to life and physical function, but also to psychological well-being. Recent research found that at least 33% of cancer patients develop anxiety as a result of their diagnosis and treatment (Parle *et al*., 1996). Anxiety in turn may impair the quality of the patient's lives as it may cause psychological and physical suffering, it interferes with day to day functioning, delays return to work, and affects personal relationships and decision-making (Maguire, 1997). As advances in cancer treatments, such as stoma surgery in colorectal cancer patients, help patients to survive their cancer longer and return to a normal and productive life, issues of quality of life (QOL) become of paramount importance. Although its meaning is still debatable, a good QOL is commonly expressed in terms of satisfaction with life, contentment, happiness, fulfilment and the ability to cope (Calman, 1984). QOL is a broad concept, which could be affected in a complex way by the person's physical health and psychological state, level of independence, social relationships and the relationship with the environment (WHO, 1993). It is generally accepted that QOL is both a

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multidimensional and context-related concept because human experiences are dynamic and complex (King *et al*., 1997).

Stoma surgery is one of the major treatment modalities for colorectal cancer. It is an intrusive operation with a serious impact on daily life and the patient's coping capabilities. The patient has to cope with a serious operation, loss of an important body function, distortion of body image, and change in physical functioning and personal care (Bekkers *et al*., 1995). These physical consequences have important implications for patient's emotional welfare, social relations and activities, and QOL. In a prospective study examining the psychosocial morbidity in the first 3 months following stoma surgery, 23% of the patients had deteriorated in relation to their anxiety or depression levels before surgery (Thomas *et al*., 1984). White and Unwin (1998) in a much later study and despite the advances in stoma surgery and care, similarly reported that between 18 and 25% of the patients in their study had experienced clinically significant psychological symptoms in the first 4 months following stoma surgery; these symptoms remained the same 1 year after surgery. Wade (1990) also reported similar results in another prospective study of 265 subjects, showing that anxiety was significantly more prevalent 10 weeks after surgery, especially among those patients who did not have access to a stoma care nurse. Anxiety and depression were found more likely to be sustained 1 year later in those patients who had these symptoms at 10 weeks (Wade, 1990).

Sprangers *et al*. (1995) reviewed 17 studies carried out between 1969 and 1992 comparing QOL in stoma and non-stoma patients in terms of physical, psychological, social and sexual functioning. The results showed that both stoma and non-stoma patients had been troubled by frequent or irregular bowel movements, however, these problems were more prevalent in stoma patients. Such problems may prevent patients from leaving home, subsequently leading to isolation and a decrease in QOL (Porrett and Joels, 1996). In these 17 studies, stoma patients also reported higher levels of psychological distress (including depression, loneliness, suicidal thoughts, feelings of stigma, and low self-esteem) than the non-stoma patients and more social restrictions and sexual dysfunction. Bekkers *et al*. (1995) also examined 22 studies carried out between 1982 and 1992 regarding psychosocial adaptation of stoma patients and concluded that 57% of stoma patients had a decrease in libido, 23% had emotional problems and 45% had a decrease in social contacts. Nevertheless, these findings are affected by the high degree of heterogeneity in the samples of the studies reviewed and the QOL domains assessed. A more recent study examining QOL in temporary stoma patients found that stoma surgery had a great influence on their daily life, and social restrictions were correlated with the number of stoma care problems reported (Gooszen *et al*., 2000).

One of the techniques that could potentially help to reduce anxiety and interrupt obsessive negative thoughts, consequently promoting QOL and enhancing coping ability is the progressive muscle relaxation training (PMRT) (Parle *et al*., 1996; Walker *et al*., 1999; Snyder, 1992). The beneficial effect of relaxation training was supported in a meta-analysis of 48 studies evaluating relaxation in patient populations, with evidence of treatment effects in relation to hypertension, headaches and insomnia, but also to a lower effect in anxiety and chronic pain (Hyman *et al*., 1989). However, generalisation from the studies in the meta-analysis was affected because of insufficient control and limited sample sizes. Likewise, the attrition rate was not mentioned and this increases the difficulty in estimating the appropriate sample size for replication studies. More recently, the effects of PMRT and guided imagery was further evaluated in terms of mood and QOL change in a randomised controlled trial in 96 women during primary chemotherapy (Walker *et al*., 1999). The results showed that QOL was significantly better in the experimental group and psychological symptoms were fewer. Furthermore, relaxation techniques (guided imaging) were found to decrease pain and improve quality of sleep in proctological patients with anorectal surgery, potentially decreasing their anxiety (Renzi *et al*., 2000).

Thus, the aim of this study was to determine the effectiveness of PMRT in reducing the anxiety and improving the QOL of colorectal cancer patients after stoma surgery.

Hypotheses

1. The state-anxiety levels of patients who have received PMRT in addition to the standard treatment after stoma surgery over 10 weeks

will be lower than those receiving standard care alone.
2. The QOL ratings (Colostomy-related and generic) of patients who have received PMRT in addition to the standard treatment after stoma surgery over 10 weeks will be higher than those receiving standard care alone.

METHODS

A randomised controlled trial was used. The sample was recruited from the Department of Surgery in two Hong Kong regional public hospitals. One of the hospitals selected was a University hospital and major referral centre whereas the other one was a regional centre. Also, they were selected as they covered patients in two different geographical areas in Hong Kong. In this way it was thought the sample would be more representative of the patients with stoma. The sample size was calculated using the formula for estimating sample size for repeated measures analysis of variance (Cohen, 1992). As the previous literature is in favour of PMRT, one-tailed test was used and the significance level was set at 0.05 with the power set at 80%. The effect size was estimated from a pilot study of four subjects per group. In the pilot study, the eta^2 for anxiety was 0.53 and for the generic instrument of QOL was 0.62 representing a large effect size. With the estimation of an average of 37% attrition in longitudinal studies over 10 weeks (Baider *et al*., 1994; Bindemann *et al*., 1991), the required sample size would be at least 32 in each group.

Inclusion criteria

All patients who had undergone either temporary or permanent stoma surgery for cancer treatment in the selected regional hospitals, adults and of either gender were invited to participate.

Exclusion criteria

In order to avoid occurrence of valsalva response (closing of the glottis accompanied by increased intrathoracic pressure), hypoglycaemia, or loss-of reality contact reactions, subjects with either uncontrolled heart disease, diabetes, or those who were disorientated, had a documented psychiatric illness or metastases in the central nervous system were excluded (Snyder, 1992). Further, those who were illiterate or unable to understand Cantonese, had hearing difficulty or declined to participate were also excluded from the study.

Intervention

PMRT, which was carried out for a 20-min period, required subjects to tense and relax different muscle groups in combination with deep breathing (Snyder, 1992). Using the procedures recommended by Bernstein and Borkovec (1973), 10 major muscle groups were included. Training of the abdominal muscles was excluded in order to reduce the incidence of increased intra-abdominal pressure, which could lead to an increased risk of developing peristomal hernia after surgery (Hampton, 1992). Also, subjects were taught to use the controlled breathing pattern and how to decrease the tensing time in order to prevent the occurrence of the valsalva response during progressive relaxation (Herman, 1989).

Before the intervention, two teaching sessions, which included one briefing and one training session during the postoperative period, were given to subjects in the experimental group in order to produce the desirable effect of relaxation. Face-to-face verbal instructions were used in the briefing and training sessions. To simplify administration of the practice sessions and to ensure programme standardisation, the sequences of PMRT were recorded on an audiocassette tape and given to patients. This tape contained instructions for systematic tensing and relaxation of muscle groups and suggestions for general relaxation using the therapist's familiar voice from the last session with each patient. The following muscle groups were targeted: right hand and arm, left hand and arm, forehead, jaw and neck, back and shoulder, thighs and buttocks, right calf, left calf, right foot and left foot. Following the same sequence of the tape-instruction, a written training manual of PMRT with pictures was provided to subjects in order to provide visual illustrations supplementing the therapist's demonstration. At the end of the teaching session, the therapist discussed relaxation training with the patients to confirm that they had

mastered the technique. Subjects were recommended to practice at home for at least 2–3 times per week for the 1-week period of their participation in the study, and to record the frequency of home practice in a log sheet provided. The log sheet was printed in a calendar format. Subjects were instructed to put a mark on the particular date in the log sheet if they had practised PMRT. A previous study suggested that follow-up telephone calls might help to maintain compliance of practice (Eller, 1999), thus subjects were contacted by phone every 2 weeks to monitor the progress of practising PMRT after discharge. Phone contacts were initiated by the therapist/research nurse of the study.

Standard care

The standard treatment was broadly divided into general and specific care. The general care was provided by the surgeon and ward nurses, whereas stoma care nurses delivered specific care. The general care included the written and verbal information on preoperative physical preparation, postoperative physical and would care until patients' discharge, and surgical outpatient follow-up appointment about 4–6 week after discharge. The specific care included the preoperative stoma-siting and counselling in relation to the stoma surgery, postoperative teaching and written information regarding stoma care and selection of pouching appliances, and outpatient follow-up appointment with the stoma nurse at 4–6 week intervals in the outpatients stoma care clinics.

Instruments

The Chinese version of the State-Trait Anxiety Inventory (C-STAI). Anxiety was measured using the State-Trait-Anxiety Inventory (STAI) (Spielberger *et al.*, 1970). The STAI consists of 40 short affirmative statements divided into two distinct constructs: a transitory emotional state at a particular moment in time (state-anxiety) and a relatively stable predisposition to be anxious. The items within the STAI reflect experiential, cognitive, and behavioural aspects of anxiety. The total score of each construct ranges form 20 to 80 where a higher score reflects higher level of anxiety. The Chinese version of the STAI, showing high internal consistency, was used in the present study (Tsoi *et al.*, 1986; Shek, 1993). The scale's internal consistency with the present sample was 0.76 for the trait-anxiety measure and ranged from 0.78 to 0.90 for the state-anxiety over the three assessment points.

Quality of Life instruments. It is debatable whether a single or multiple instruments should be used in QOL research. While a single instrument approach allows easier data collection and is less time consuming in administration (Stenstrup, 1996), multiple instruments enable researchers to generate more reliable, comparable, valid and sensitive measurements (Padilla and Frank-Stromborg, 1997). Multiple instruments approach also allows for a broader conceptualisation of QOL (Dean, 1997). Hence, the present study employed multiple instruments for the assessment of QOL.

Quality of Life index for Colostomy (QOL-Colostomy). This disease-specific QOL instrument comprises of 23-items, each with a 10 cm linear visual analogue scale, specifically designed for colostomy patients, measuring seven domains: physical and psychological well-being, body image (colostomy) and social concerns, diagnosis/treatment response (surgical), nutritional response, and overall QOL (Padilla and Grant, 1985). Words denoting extremes such as 'not at all' or 'very much so' as response anchors were at each end of the scale. The patient was asked to mark an 'X' on the line at the place that represents how he or she perceives a specific item. The mark was then transposed to a number from 0 to 10 using a standard scaled centimetre ruler, with 0 indicating the poorest quality of life and 10 the best quality of life. The total score of the 23-items scale ranged from 0 to 230 with higher scores reflecting better QOL. The internal consistency (Cronbach alpha) reported to range from 0.71 to 0.90, with only the factor on diagnosis and treatment response (nutritional) having an alpha coefficient of 0.48 (Padilla and Grant, 1985). The scale was translated into Chinese by two bilingual nurses. Semantic equivalence was maintained using back translation techniques by another two bilingual nurses in the manner recommended by Brislin (1986) and resolving discrepancies. The content validity was assessed by sending the Chinese version of the QOL-Colostomy Scale to a panel of experts composed of six enterostomal therapists. Using the quantification of content validity approach,

the researchers established the content validity index (CVI), which was derived from the rating of the content relevance of the items on an instrument (Lynn, 1986). The CVI of each item ranged from 0.83 to 1.00 and the CVI of the entire instrument was 0.93, establishing its content validity. Its internal consistency with the present sample ranged from 0.76 to 0.83 over the three assessment points.

Hong Kong Chinese version of the World Health Organisation Quality of Life Measure-Abbreviated Version (WHOQOL-BREF-HK). This was a health-related culture-specific generic QOL instrument consisting of 28 items. This version, showing high reliability and validity, comprised of four domains including physical health, psychological functioning, social relationships and environment domains (Leung *et al*., 1997). Subjects were asked to rate their own feeling or perception on a five-point scale ranging from 'very good' to 'very poor' or 'very much' to 'not at all' in relation to each of the different items within the last 2 weeks. The total score of all 28 items could range from 28 to 140 with higher scores reflecting better QOL. Its internal consistency with the present sample ranged from 0.92 to 0.93 over the three assessment points.

Medical-social-demographic data. Demographic data was also collected from the patient's records, including gender, age, educational level, marital status, religious practice, previous experience with relaxation training, type of stoma (colostomy, ileostomy or both), stoma status (temporary or permanent), frequency of home practice of PMRT (for the experimental group only), need for chemotherapy or radiotherapy after the surgery, and participation in psychosocial activities (asking directly the patients). Psychosocial activities referred to regular gatherings, health talks, counselling, referral services and recreational activities. The frequency of home practice of PMRT was taken from the log sheet.

Procedures

The study was approved by the Ethics and Research Committees of the Faculty of Medicine, Chinese University of Hong Kong, and the respective hospitals. A list of stoma patients was obtained from the stoma nurse specialists in the two study hospitals. Data were gathered at three points postoperatively: within 1 week (T1), on week 5 (T2), and week 10 (T3) postoperatively. The Trait-Anxiety scale was used only at T1. These assessment points were selected because a number of studies showed that the critical period of developing psychological morbidity after stoma surgery was predominantly during the first 10 weeks (Thomas *et al*., 1984; Wade, 1990). Subjects were recruited on postoperative day 4–6 when ambulating had begun as by that time patients had less physical discomfort. The research nurse visited those subjects who fitted the inclusion criteria and invited them to participate in the study. Those who were willing to participate signed a consent form. T1 tests were administered in the patient's bedside during a quiet time in the ward maintaining privacy by the same research nurse in both hospitals. The same research nurse also visited all subjects at home on week 5 and 10 and administered the same instruments to both groups. The research nurse in addition to collecting all data from both hospitals also monitored the procedures, minimising in this way variability in the data collection methods.

After baseline measurement, subjects were randomly assigned into either the control or experimental group by simple random sampling. Randomisation was carried out by using the envelope method. Each patient had to select an envelope out of a box of 64 identical envelopes marked inside with a card stating allocation to experimental (32 envelopes) or control group (32 envelopes). The control group received standard care alone. The experimental group, in addition to the standard care, was given two teaching sessions of PMRT, together with an audiocassette tape and the written PMRT manual before discharge.

Data analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to summarise the data. Chi-square tests were used to identify any differences between the control and experimental groups in relation to demographic characteristics. The independent samples *t*-test was used to compare differences in the mean scores of the control and experimental group with respect to age and the scores on

state-anxiety, trait-anxiety, QOL-Colostomy, and WHO–QOL ratings on the pre-test assessment. Repeated measures analysis of variance (R-ANOVA) was employed to compare the mean scores of state-anxiety, QOL-Colostomy and WHO–QOL ratings over time. The data was tested for normality before using parametric tests. There was minimal missing data, as questionnaires were administered by the research nurses with face-to-face interviews. Only a couple of questionnaires had missing data in the sexual functioning-related items, and in this case missing data was replaced by the sample's mean score for the particular item.

RESULTS

Subjects' characteristics

Sixty-three subjects meeting the inclusion criteria were enrolled in the study out of 71 patients originally screened for participation, as 8 (11.27%) were ineligible to participate in the study because they had at least one of the exclusion criteria. However, two subjects dropped out after T1 because of postoperative complications or physical deterioration. One subject declined further participation after baseline assessment for personal reasons. One subject dropped out after T2 because of a need for a second operation for closure of colostomy. Thus there was a low attrition rate of 6.4% throughout the study. The resultant sample consisted of 59 subjects providing complete data sets for all three assessments. Thirty of them were randomly assigned to the control group and 29 were assigned to the experimental group.

Demographic and medical characteristics. All patients were from Chinese origin. As can be seen in Table 1, there was a higher percentage of male subjects. The mean age of the control and experimental groups were 56.4 (S.D. = 13.53) and 60.1 (S.D. = 10.91) years old, respectively ($P > 0.05$). Primary education was also the educational level of the majority with significant differences, despite of the randomisation, between the experimental and control groups ($P < 0.05$). There were also differences between the two groups in terms of their marital status but not in relation to their religion. Fifty-four (92%) of the subjects did not participate in any psychosocial activities. In addition, none of the subjects had any previous experience with relaxation training. Twenty-five (42%) of the subjects had permanent ostomies while 34 (58%) had temporary ostomies. A higher percentage of ileostomy patients were found in the experimental group. With respect to the need for radiotherapy or chemotherapy, 29 (49%) of the subjects did not receive any radiotherapy or chemotherapy. The remaining 30 subjects (51%) either received radiotherapy, chemotherapy or both radiotherapy and chemotherapy. A comparison of medical variables between the control and experimental subjects did not reveal any statistically significant differences with regards to the subject's stoma status, types of stoma and the need for radiotherapy or chemotherapy (Table 1).

Baseline assessment

T-tests did not reveal any statistically significant differences between the experimental and control group in their baseline assessment in relation to state anxiety, Quality of Life-Colostomy Scale and the WHO Quality of Life Scale (all $p > 0.05$). Also, trait anxiety was comparable in the experimental and control group with mean (S.D.) = 40.86 (3.11) vs 39.70 (5.03), respectively.

Effect of PMRT on State-Anxiety. Mean scores for the State-Anxiety in the control group on T1, T2 and T3 were 51.03 (S.D. = 10.96), 44.26 (S.D. = 5.97) and 42.83 (S.D. = 4.24), respectively. Mean scores in the experimental group were 54.65 (S.D. = 2.57) at T1, 40.79 (S.D. = 2.28) at T2, and 31.27 (S.D. = 3.11) at T3 (Figure 1). R-ANOVA indicated that there was a significant difference in the state-anxiety over 10 weeks between the two groups [$F(1, 57) = 8.99$, $p < 0.01$] with the experimental group reporting a significantly lower state-anxiety level compared to the control group. In addition, a significant time effect was observed, with the scores decreasing over 10 weeks for subjects in both groups [$F(2, 56) = 210.24$, $p < 0.001$].

Effect of PMRT on the disease-specific measure of QOL. Mean scores for the QOL-Colostomy in the control group at T1, T2 and T3 were 97.11 (S.D. = 27.24), 108.07 (S.D. = 14.36) and 110.31 (S.D. = 15.22). For the experimental group, the

Table 1. Demographic and medical characteristics in the experimental and control groups

Variables	Control $N = 30$ f (%)	Experimental $N = 29$ f (%)	X^2	P
Gender				
Male	20 (67)	20 (69)	0.04	>0.10
Female	10 (33)	9 (31)		
Education level				
Informal	6 (20)	14 (48)	6.50	<0.05
Primary	17 (57)	13 (45)		
Secondary	7 (23)	2 (7)		
Martial status				
Married/unmarried but living with partner	18 (60)	28 (97)	11.47	<0.001
Unmarried/living alone/widowed/divorced/separated	10 (34)	1 (3)		
Religious practice				
No religious belief	17 (57)	12 (41)	3.31	>0.05
Buddhism	2 (6.6)	1 (3.5)		
Christian	2 (6.6)	2 (7)		
Catholic	2 (6.6)	1 (3.5)		
Ancestor worship	7 (23)	13 (45)		
Stoma status				
Permanent	14 (47)	11 (38)	0.46	>0.10
Temporary	16 (53)	18 (62)		
Type of stoma				
End-Colostomy	16 (53)	10 (35)	2.13	>0.05
Ileostomy	14 (47)	19 (65)		
Need of radiotherapy/chemotherapy				
No chemotherapy or radiotherapy	14 (46)	15 (52)		
Radiotherapy or chemotherapy	13 (43)	13 (45)	1.02	>0.10
Radiotherapy plus chemotherapy	3 (10)	1 (3)		

mean scores on T1, T2 and T3 were 99.29 (S.D. = 19.56), 108.63 (S.D. = 17.75) and 129.37 (S.D. = 14.06), respectively (Figure 2). Although the experimental group reported a higher rating of QOL-Colostomy scores at T3, there was no significant difference between the control and experimental groups over time [$F(1, 57) = 2.63$, $p = 0.01$]. However, a significant time effect was observed, with the scores increasing over 10 weeks for subjects in both groups [$F(2, 56) = 35.96$, $p > 0.001$]. Based on the observable change in the QOL-Colostomy scores at 10 weeks, *t*-tests were used to assess pre- to post-test mean differences in QOL-Colostomy ratings between groups. In order to protect from error likely to arise from multiple statistical testing, Bonferroni inequality was adopted and the significance was set at 0.025. Results were significant only at T3 ($P < 0.001$). In order to determine the probability that a type II error was committed in a non-significant finding, power analysis was carried out on QOL-Colostomy results. The power was 0.36, indicating a 64% chance of committing a type II error. Further, there were statistically significant differences between the two groups in relation to the domains of physical health ($F = 7.12$, $p < 0.01$), psychological health ($F = 4.21$, $p < 0.05$), social concerns ($F = 4.50$, $p < 0.05$), and general QOL ($F = 9.29$, $p < 0.01$). However, there were no significant differences with respect to body image changes (colostomy) as well as the diagnosis and treatment (both surgical and nutrition) domains between the control and experimental group.

Effect of PMRT on the generic QOL scale. The mean score in the control and experimental groups with regards to WHO–QOL Scale were 77.10

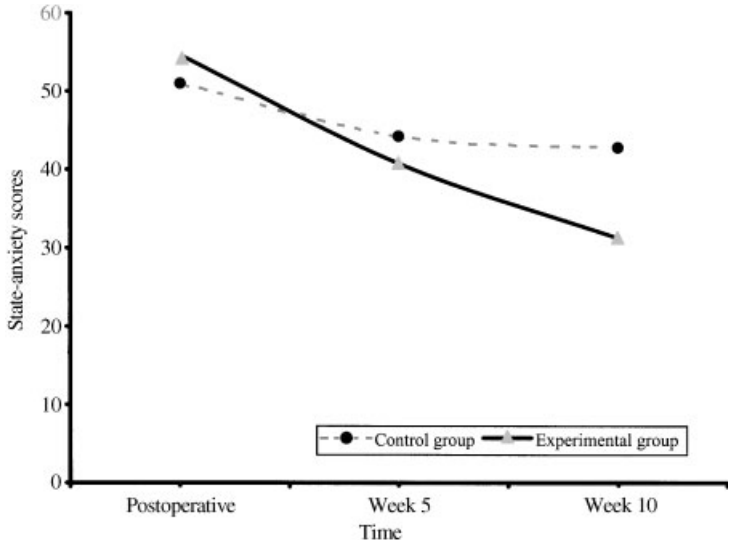

Figure 1. Mean scores of the State-Anxiety Scale in the two groups over 10 weeks.

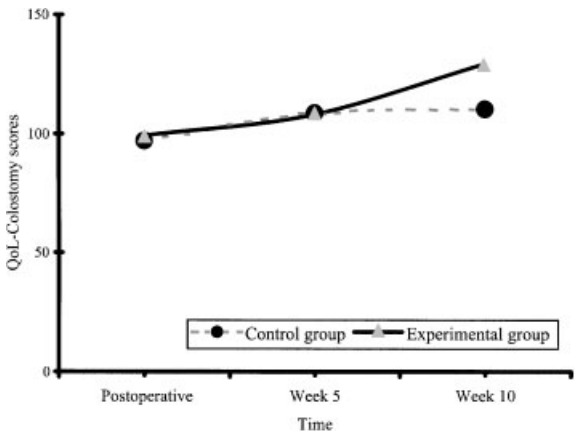

Figure 2. Mean scores of QOL-Colostomy Scale in each group over 10 weeks.

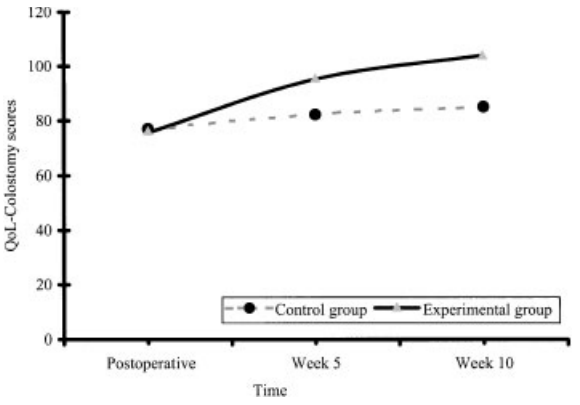

Figure 3. Mean scores of WHO–QOL Scale in each group over 10 weeks.

(S.D. = 18.10) and 75.65 (S.D. = 3.93), respectively, at T1, 82.23 (S.D. = 9.52) and 95.27 (S.D. = 4.18), respectively, at T2, and 85.13 (S.D. = 5.82) and 104.10 (S.D. = 5.41), respectively, at T3 (Figure 3). There was a significant difference between the control and experimental groups [$F(1, 57) = 26.52$, $p < 0.001$]. The experimental group reported significantly higher WHO–QOL ratings than the control group over 10 weeks. Also, a significant time effect was observed, with the scores decreasing over 10 weeks for subjects in both groups [$F(2, 56) = 97.63$, $p < 0.001$]. There were significant differences with regards to all domains of the WHO–QOL Scale with the experimental group reporting significantly higher WHO–QOL ratings. Further, it was noticed that the mean scores for the social relationship domain reduced in both groups over 10 weeks (Table 2).

The frequency of practising PMRT

PMRT was carried out with a frequency that was lower than the 2–3 times per week recommended

Table 2. Differences between the control and experimental group in the WHO–QOL domains

WHO–QOL domains	Time	Control group		Experimental group		$F(1, 57)$
		Mean	S.D.	Mean	S.D.	
Physical health	T1	17.50	3.83	15.72	1.75	37.9***
	T2	20.86	1.75	24.96	1.32	
	T3	22.60	2.14	26.58	1.45	
Psychological	T1	20.80	6.49	19.27	2.53	15.7**
	T2	22.23	2.83	25.62	1.39	
	T3	23.26	2.66	30.27	2.67	
Social relationship	T1	10.16	2.26	11.00	0.70	9.95*
	T2	9.64	1.56	10.55	0.50	
	T3	9.47	1.43	10.37	0.49	
Environmental	T1	24.26	4.82	24.68	1.92	18.24***
	T2	23.36	3.05	26.62	1.74	
	T3	24.23	2.67	29.37	1.44	
General QOL (Questions 1 and 2)	T1	4.36	1.62	4.96	1.74	50.66***
	T2	4.96	0.66	7.51	0.98	
	T3	5.56	0.50	7.48	1.12	

*$p < 0.05$; ** $p < 0.01$; ***$p < 0.001$.

to the subjects. The mean frequencies of practising PMRT were 9.24 (S.D. = 1.12) times in the period from week 1 to 5, and 7.51 (S.D. = 2.26) times from week 6 to 10. The overall mean frequency of practising PMRT within the 10 weeks was 16.75 (S.D. = 2.84) times, with a minimum frequency of 11 and a maximum of 20 times. Thus, the average practice of PMRT was 1.67 times per week. Correlations between frequency of PMRT and the dependent variables suggested that subjects who had practised PMRT more frequently reported lower state anxiety, and higher quality of life (Table 3).

Table 3. Correlations between frequency of practising progressive muscle relaxation training (PMRT), state anxiety and quality of life scores at 5 and 10 weeks

	Frequency of practising PMRT	*P*
State anxiety (week 5)	−0.62	< 0.001
State anxiety (week 10)	−0.49	< 0.001
QOL-Colostomy Scale (week 5)	−0.31	< 0.05
QOL-Colostomy Scale (week 10)	0.08	> 0.05
QOL-Generic Scale (week 5)	0.59	< 0.001
QOL-Generic Scale (week 10)	0.88	< 0.001

QOL = quality of life.

DISCUSSION

As indicated by the results, PMRT was successful in reducing the state-anxiety and promoting generic health-related QOL ratings in colorectal cancer patients with a stoma. However, it did not increase the disease-specific QOL scores significantly. This is one of the first studies in the literature demonstrating that relaxation is beneficial in reducing the anxiety in colorectal cancer patients after stoma surgery. As only a few studies have examined the effect of PMRT on quality of life changes in the past (Eller, 1999; Walker *et al.*, 1999), the present study strengthened this aspect in the literature and findings also supported the importance of PMRT in reducing the anxiety and promoting the quality of life of cancer patients after stoma surgery. These findings concur with previous studies of relaxation in other groups of cancer patients (Walker *et al.*, 1999; Baider *et al.*, 1994; Bindemann *et al.*, 1991; Holland *et al.*, 1991).

The level of anxiety in the present sample was higher than those reported in past studies such as patients receiving chemotherapy (Arakawa, 1997) or those newly diagnosed with a malignancy

(Bindemann *et al*., 1991). This finding provides a general agreement with other studies that the anxiety and emotional reactions associated with surgery may be higher when compared to other therapeutic or invasive procedures (Visser, 1988). The anxiety scores in the experimental group decreased 25% over 5 weeks and 43% over 10 weeks, while in the control group scores decreased only 19 and 22%, respectively. These findings suggest that the anxiety level of the control group became relatively stable after 5 weeks. This also leads to stronger argument for the introduction of relaxation techniques in patients after stoma surgery as a coping strategy to reduce stress and anxiety associated with the consequences of cancer treatment. Time effects were also observed in both groups. This is consistent with the study by Walker *et al*. (1999) and expected as generally the anxiety level of subjects is decreasing over time after the surgery.

There was a significant difference between the two groups at T3 with regards to the disease-specific instrument. It might be possible that QOL-Colostomy scores may take 10 weeks or even longer to change. Yet, the significant finding of the QOL-Colostomy Scale at T3 using a *t*-test should be cautiously interpreted. The main reason is that using another statistical test in multiple comparisons may increase the chance of a Type I error as the more statistical tests performed the more likely it is that some will be significant simply by chance (Grimm, 1993). Given the small sample size and the small to medium effect size of PMRT for the QOL-Colostomy Scale, this may be due to the likelihood of small effect sizes in new areas of research inquiry (Cohen, 1992). On the other hand, the QOL-Colostomy Scale is a disease-specific instrument and to a certain extent it measures and reflects the functional well-being of an individual with ostomy. Analysis of the QOL-Colostomy subscales also found that the non-significant findings belonged to the domains of body image (Colostomy) as well as the diagnosis and treatment (both surgical and nutritional aspects). These domains are heavily related to the treatment consequences. For instance, the presence of colostomy is an inevitable outcome of the stoma surgery. The change in body image directly affects the functional ability of the individual. Likewise, PMRT is unlikely to reverse the functional disability caused by the surgery or the disease process itself. From a theoretical perspective, the present study acknowledges that QOL is a state of mind, not a state of health necessarily (Gill and Feinstein, 1994). In the present study, there was a significant increase with regards to the ratings on physical health, psychological health, social concerns, and general QOL domains. These changes are comparable with the findings in the WHO–QOL subscales. Also, the QOL-Colostomy Scale may not provide adequate information regarding the performance status of colostomy patients. This implies that using a single QOL instrument solely as the outcome indicator may not be sensitive enough to detect QOL changes. Using multiple-instruments approach is again sanctioned to enable researchers in generating more reliable, comparable, valid and sensitive measurements (Padilla and Frank-Stromborg, 1997).

Mean scores for the social relationships domain decreased in both groups over 10 weeks. This finding is congruent with previous literature regarding the adverse social impact of people with ostomies (Bekkers *et al*., 1995; Sprangers *et al*., 1995). The social relationships domain examines how much a person feels the commitment, approval and availability of practical assistance from family and friends (Leung *et al*., 1997). It is common that friends and relatives would visit patients more frequently while in hospital and especially if they are diagnosed with a major illness. However, by 5 and 10 weeks, patients have returned home where they cannot depend on hospital staff. In addition, it is after a few weeks from surgery that patients may start experiencing problems associated with the stoma, such as pouch leakage, odour and sexual dysfunction (Sprangers *et al*., 1995). These types of problems would prevent patients from leaving home, resuming previous social activities and other leisure pursuits.

Nevertheless, the experimental group reported significantly higher overall levels of QOL than the control group. These findings are in line with those reported by Walker *et al*. (1999) and Eller (1999) about global QOL changes. Eller (1999) in a study with HIV-infected individuals further divided the subjects into high and low-PMRT users using a median of 28 times as the cut-off point over 6 weeks. High-PMRT users were found to have 16.7% improvement in overall QOL, 2.7% improvement in the physiological domain, and 22.9% improvement in the psychosocial domain. Low-PMRT users had 1.7% improvement in overall QOL and 16% improvement in the psychosocial domain. Using these criteria, the

participants in the present study fall in the group of low-PMRT users. The findings for these low-PMRT subjects showed that there was 20.6% improvement in total QOL, 37% in physical health and 27.1% in the psychological domain (which are comparable to the high-PMRT users in Eller's study). Thus, the question that remains to be answered is how many times of practising PMRT is adequate to achieve the desired effects, as different studies provide different information. Higher frequency of practice has not conclusively been shown to contribute to a better adjustment. Whilst the present finding demonstrates that even low-frequency users can have some beneficial effects, further investigation on frequency of use of PMRT to determine the effects according to usage is imperative.

Several limitations should be considered when interpreting the results of the present study. Ideally, the baseline assessment should be performed preoperatively, however, it was often uncertain to patients whether a stoma surgery or bowel resection would be performed. Both the surgeon and the extensiveness of the tumor determined the choice. Hence, the preoperative assessment was omitted with the baseline assessment being performed shortly after surgery. Further, the study employed a selected sample of stoma patients in Hong Kong. Although it would have been preferable to obtain the sample by random sampling, this option was not feasible in this study because of the limited accessible numbers from the target population in the study hospitals. The heterogeneity of the sample in several areas limited the conclusions of the study, including the type of colorectal cancer, disease stage, socioeconomic status, the number, type and dosage of radiotherapy and chemotherapy agent. Despite the effort made to maintain the homogeneity between control and experimental groups, subject differences still existed in relation to the educational level and marital status, which may influence the home practice and frequency of PMRT. In order to preserve the effect of the variable being studied and not intensify the differences in other variables, a statistical adjustment to control these covariates did not appear to be an optimal method in reporting the data (Pedhazur, 1997). Thus, the generalisability of the findings may have been affected. Furthermore, the potential for investigator bias in a non-blind design cannot be denied. Participants were aware that they were taking part in a randomised controlled trial that involved random assignment into either the control or experimental group, and experimental subjects received more attention which on its own may decrease anxiety and improve QOL and this may affect the validity of the data. The Hawthorne effect may also be high. It can also be argued that the two teaching/practice sessions given before the intervention are actually part of the intervention and their effects in the outcomes of the study need to be considered. Even though these were practice sessions whereby relaxation may not have been achieved due to interruptions between the therapist and the patient and repetition of instructions, the amount of time spent with each patient may have been therapeutic in nature. Further, it is not known whether the relaxation training may have exerted its effects merely as a diversion or as welcomed evidence to patients that their psychosocial needs were being acknowledged. Further, the subjects' compliance with PMRT was purely based on self-reports on the log sheet, therefore, the accuracy of data relied heavily on the subjects' commitment to the study. Also, it was not known whether the participants had practised the entire or only some parts of PMRT during their home practice.

Recommendations and implications for practice

As PMRT has produced encouraging results in this study, it is suggested that PMRT should be offered to patients undergoing stoma surgery as routine care, for instance, it could be started on day 5 postoperatively or once the patient is able to ambulate. Similarly, it has been advocated that PMRT could be incorporated during different phases within the cancer continuum, such as the pre-treatment, treatment and post-treatment phase (Caudell, 1996). Offering the intervention pre-surgically may also assist in decreasing anxiety related with the surgical procedure. The use of PMRT in other patient groups is worth considering such as patients undergoing similar invasive procedures, for example, patients undergoing mastectomy or hysterectomy. Relaxation-based interventions may also affect coping, such as emotional suppression, and this may be an important area of future research. Nevertheless, the incorporation of PMRT in the care provided to cancer patients is still limited, as it is time consuming and labour intensive, thus more feasible alternatives (such as the use of audiotapes

as in the present study) need to be explored. It has long been addressed that systematic studies including relaxation training as an intervention are lacking (Snyder, 1992). Relaxation measures are techniques that patients can control by themselves and can be independently administered by trained therapists such as nurses (Larsson and Starrin, 1992). Therefore, the training of nurses to become competent therapists is perceived as the major task to promote the use of PMRT in clinical practice. This training should also include the acquisition of skills assessing PMRT's contra-indications and the factors likely to militate against a satisfactory response. Particular attention should be focused on how to enable nurses to acquire skills in teaching relaxation to patients, maintain the effect of the intervention and balance the cost-effectiveness in providing PMRT in busy care settings. As there is limited information available on the length and duration of PMRT training sessions and instruction tapes that is adequate to produce the effects of PMRT, further investigation is needed in this area. This is important in order to determine the optimum dose and duration of PMRT for different targeted populations (Eller, 1999).

This study intended not to include the training of abdominal muscle during the postoperative period. However, muscle and tissue layers after the operation should completely heal within 4–6 week after surgery, and the incorporation of the abdominal muscle in PMRT after 8 weeks can improve the muscle tone of the rectus abdominus (Ellison, 1991). Subsequently, it may help to reduce the occurrence of peristomal hernia. It is important for future studies to incorporate the training of abdominal muscles after 8 weeks from stoma surgery because peristomal hernia is a common complication after stoma surgery (Hampton, 1992). To improve the acceptance of PMRT by stoma patients, therapists can introduce PMRT as an intervention to reduce the risk of stoma-related complications such as peristomal hernia in addition to the reduction of the physical and psychological distress.

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