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Efficacy of progressive muscle relaxation training in reducing anxiety in patients with acute schizophrenia

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Aim and objectives. The objective of this study was to examine the efficacy of progressive muscle relaxation training on anxiety in patients with acute schizophrenia.

Background. Many empirical studies have found progressive muscle relaxation training beneficial in reducing the psychological effects of anxiety. Progressive muscle relaxation training is also effective in reducing the distress symptoms associated with the symptomatology of schizophrenia.

Design. An experimental randomised controlled trial using repeated measures.

Method. The study was designed to examine the effects of progressive muscle relaxation training on patients diagnosed with schizophrenia. Study participants were acute psychiatric inpatients in Taiwan. Eighteen patients were block randomised and then assigned to an experimental or control group. The experimental group received progressive muscle relaxation training and the control group received a placebo intervention. Results from the Beck anxiety inventory were compared between groups as a pretest before intervention, on day 11 of intervention and one week post-test after the intervention was completed. Changes in finger temperature were measured throughout the experiment.

Results. The degree of anxiety improvement was significantly higher in the progressive muscle relaxation training group than in the control group after progressive muscle relaxation training intervention ($p < 0{\cdot}0001$) and at follow-up ($p = 0{\cdot}0446$; the mean BAI score fell from 16·4 pretest to −5·8 post-test. After adjusting for the change in patient finger temperature, the mean change in temperature was significantly different between the two patient groups. The average body temperature increased significantly after applying the progressive muscle relaxation training to patients with schizophrenia.

Conclusion. This study demonstrated that progressive muscle relaxation training can effectively alleviate anxiety in patients with schizophrenia.

Relevance to clinical practice. Progressive muscle relaxation training is potentially an effective nursing intervention in the reduction of anxiety in patients diagnosed with schizophrenia, depending on the quality of their mental status at the time of intervention. Progressive muscle relaxation training is a useful intervention as it is proven to reduce anxiety levels across a spectrum of psychiatric disorders.

Key words: anxiety, progressive muscle relaxation training, randomised controlled trial, schizophrenia

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Introduction

Schizophrenia is a serious psychiatric illness generally attributed to long-term treatment, with acute exacerbations not uncommon throughout the illnesses trajectory. An analysis of Taiwan National Health Insurance data from 1996–2001 identifies that the cumulative prevalence of schizophrenia in Taiwan was 0·64% (Chien *et al.* 2004). Sixty percent of patients living with schizophrenia are reported to have concomitant anxiety. For this group of patients loss of life function can be more severe than for those patients without anxiety. There is also a lower degree of life satisfaction in patients with increased anxiety levels (Braga *et al.* 2005). In previous studies, progressive muscle relaxation techniques have been shown to alleviate the symptoms of anxiety in patients with obsessive compulsive disorder (OCD) and chronic schizophrenia (Hawkins *et al.* 1980, Pharr & Coursey 1989, Sloman 1995, Cheung *et al.* 2003). There are very few studies, however, conducted on patients with acute schizophrenia. The lack of research using progressive muscle relaxation training (PMRT) to reduce anxiety levels motivated the authors to examine, via an experimental method, the efficacy of PMRT in alleviating anxiety in patients with acute schizophrenia.

Literature review

The clinical presentation and differentiation of symptoms in patients with schizophrenia are often quite variable: the psychiatric symptomatology often resulting in a loss of daily life functioning or interfering with the person's behaviour and mood. Of the symptoms commonly seen in acute schizophrenia, the negative symptoms include loss of or reduced normal functioning, such as emotional blunting, a limited capacity for thought and speech, lack of motivation, lack of interest and sociability and an inability to concentrate. The positive symptoms include delusions, hallucinations, speech and behavioural disturbances and can often include unpredictable and bizarre behaviour (Falloon & Talbot 1981, Grunebaum *et al.* 2001, Hubl *et al.* 2004). The most common emotional response in patients affected by hallucinations is anxiety (Allen *et al.* 2005). One study by Lysaker *et al.* (2005) suggested that two-thirds of individuals with schizophrenia may experience anxiety levels, at least one standard deviation above the population anxiety mean. When anxiety due to delusions or hallucinations is excluded, the concomitancy rate is approximately 16·7% (Tibbo *et al.* 2003, Huppert & Smith 2005, Ziedonis *et al.* 2005). In patients with schizophrenia, anxiety results in reduced ability to concentrate, lack of motivation, sleep disturbances, social withdrawal, suspiciousness and sensitive thoughts, emotional instability, inability to fulfil character roles and a reduced quality of life (Birchwood 1992, Yung & McGorry 1996). Some of these above symptoms correlate strongly with the diagnostic symptomatology of schizophrenia and anxiety most probably exacerbates such symptoms.

When an individual is anxious, the body activates a set of stress responses. Physiologically, these stress responses result in sympathetic nervous system activation and catecholamine production. The catecholamine increases blood pressure, heart rate, respiratory rate, metabolic rate and blood flow of skeletal muscle, while also resulting in muscle stiffness, increased sensory sensitivity, increased activity of sweat gland and reduced gastrointestinal activity. These sympathetic nervous system responses further activate the body's stress reaction by increasing muscle tension and hence further amplifying the patient's experience of anxiety (Benson *et al.* 1977, Atsberger 1995).

Progressive muscle relaxation is a technique of stress management developed by American physician Edmund Jacobson in the early 1920s. PMRT allows individuals to relax while increasing their awareness of personal stress. In 1984, Bernstein and Given proposed that PMRT could be used to teach patients to practice to systematically relax their muscles (Lehrer 1982, Payne 2000). PMRT is a primary method that is easily learned to achieve relaxation. The literature reviewed demonstrates that PMRT is an effective intervention in reducing emotional distress. For example, the practice of PMRT has been proven to decrease or delay the onset of conditioned symptoms. The regular practice of PMRT also enhances coping ability in a variety of stressful situations (Burish & Tope 1992, Molassiotis 2000). Many empirical studies have found that PMRT has a beneficial effect in the reduction of anxiety (Pender 1985, Holland *et al.* 1991), stress (Sheu *et al.* 2003), depression (Holland *et al.* 1991) as well as enhancing feelings of self-control (Pender 1985, Baider *et al.* 1994).

Studies of PMRT as an intervention in treating anxiety in patients with chronic schizophrenia have been performed as early as 1980. In the Hawkins *et al.* (1980) study, patients received PMRT in 40-minute sessions five times a week. After two weeks, the total mean Hamilton Anxiety Scale score reduced from 60·4–53·1; the mean state anxiety score reduced from 46·3–36·3 and the mean trait anxiety score reduced from 43·5–38·4. Furthermore, in the Hawkins *et al.* (1980) study, the average finger temperature increased by 1·3 °C after PMRT intervention which was significantly different from the pre-PMRT intervention values. The

physiological explanation for an increase in finger temperature is relevant in the context of finger temperature increasing or decreasing in the study reported in this paper. When a patient is anxious, subcutaneous arteriole vasoconstriction reduces the amount of heat lost in the periphery which results in a decreased skin temperature and cold extremities. If the individual is in a passive state, they can be guided to focus their concentration and to reduce their awareness of other stimuli, whilst maintaining a comfortable position. This process of slowing down physiologically results in reduced muscle tension, reduced metabolic rate, an increase in finger temperature, decreased blood pressure, decreased middle cerebral artery blood flow and psychologically produces a feeling of emotional comfort free from anxiety (Atsberger 1995).

In studies applying PMRT in a group setting to patients with OCD, when the PMRT intervention was performed twice a week for 12 weeks, the average self-rating anxiety score reduced from 39·3–27·3; a significant improvement ($p < 0·01$) (Falsstewart *et al.* 1993). When PMRT was applied to night eating syndrome-associated anxiety, after one week of a 20-minute intervention each day, the average state-trait anxiety inventory (STAI) score reduced from 49·6–32·9; another significant improvement ($p < 0·05$) (Pawlow *et al.* 2003). When PMRT was applied to patients with obstructive pulmonary disease at a frequency of one 20-minute session per week, after four weeks of intervention the average STAI score reduced from 45–32; also a significant improvement ($t = 2·4$, $p < 0·01$) (Gift *et al.* 1992). In terms of changes in finger temperature, the average body temperature increase after each PMRT intervention was 2·2 °C, a significant difference when compared with the 1·1 °C increase in the control group ($F = 8·9$, $p < 0·01$) (Brenes 2003) (Table 1).

Methods

Study design

An experimental randomised controlled trial was designed using repeated measures to examine the effects of PMRT on anxiety for patients with acute schizophrenia. In this study, conducted in 2006, we assigned 18 voluntary participants to either intervention (PMRT) group or control group through block randomisation and compared the differences in anxiety and finger temperature by repeated measurements between the two groups.

Study subjects and setting

Researchers recruited a small representative sample of volunteers with a diagnosis of schizophrenia from the acute psychiatric ward of a medical center in Taiwan, one week after admission. Inclusion criteria were as follows: (i) a Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) diagnosis of schizophrenia; (ii) a Beck Anxiety Inventory (BAI) score of more than 7 prior to recruitment; (iii) the patient was in receipt of inpatient treatment in the acute psychiatric ward; (iv) no history of substance abuse or organic brain disease; and (v) the patient was willing to accept treatment with a limited number of atypical antipsychotics (including Ziprasidone, Risperidone, Zotepine, Olanzepine, Quetiapine and Amisulpride). Patients with the following characteristics were excluded from the study: (i) those patients exhibiting muscular or skeletal problems that might affect training in PMRT; (ii) patients who were not able to concentrate for 25 minutes duration at a time; and (iii) those patients who had received previous relaxation training.

Table 1 Summarises the major significant effects of PMRT

Study	Experimental Design	Diagnosis	Scale	Pretest	Post-test	*p*-value
Hawkins *et al.* 1980	40-minute per session five times a week Duration: two weeks	Chronic schizophrenia	HAS	60·4	53·1	< 0·05
			State anxiety	46·3	36·3	< 0·05
			Trait anxiety	43·5	38·4	< 0·05
Gift *et al.* 1992	20-minute per session one time a week Duration: four weeks	Chronic obstructive pulmonary disease	STAI	45·0	32·0	< 0·01
Falsstewart *et al.* 1993	Two times a week Duration: 12 weeks	Obsessive compulsive disorder	SAS	39·3	27·3	< 0·01
Pawlow *et al.* 2003	20 minutes per session one time a week Duration: four weeks	Night-eating syndrome associated anxiety	STAI	49·6	32·9	< 0·05

HAS, Total Hamilton anxiety states; SAS, Self-Rating Anxiety Scale; STAI, State-trait anxiety inventory; PMRT, progressive muscle relaxation training.

Study tool

On the day prior to commencement of the intervention, the following instruments were administered the Mini-international neuropsychiatric interview (MINI); the scale for the assessment of positive symptoms (SAPS); clinical global impression (CGI) and the BAI. The BAI and the SAPS were again completed at the end of 11 days of PMRT or control intervention and one week after cessation of PMRT or control intervention. Finger temperature was measured prior to and three minutes after each PMRT session.

Beck Anxiety Inventory
The BAI developed by Aaron Beck in 1988 includes 21 questions, each question having four possible scores between 0–3. When the scores are summed, 0–7 points are normal, 8–15 points indicate mild anxiety, 16–25 points indicate moderate anxiety and 26–63 points indicate severe anxiety. When the consistency of this scale with anxiety disorder was evaluated in previous studies, Cronbach's α reached 0·90 or higher (Beck *et al.* 1988, Fydrich *et al.* 1992).

Scale for the assessment of positive symptoms
This scale was developed by Andreasen and Olsen in 1982. The semi-structured questionnaire assesses characteristics of hallucinations, delusions, bizarre behaviours, aggressive and anxious behaviours and impaired active reasoning. Each question is evaluated at six levels, from 'problem non-existent' to 'extremely severe'. The internal consistency of the SAPS scale is more than 0·80 in both English and Chinese versions (Andreasen 1984, Phillips *et al.* 1991, McAdams *et al.* 1996).

Mini-international neuropsychiatric interview
Mini-international neuropsychiatric interview is a structural interview scale that assesses for the most frequently diagnosed psychiatric illness/disorder. It is based upon the Diagnostic & Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV) and the tenth edition of the International Classification of Diseases (ICD-10). The MINI can be used to diagnose a total of 17 psychiatric illnesses. When the original MINI questionnaire was published, it was regarded to be simple, easy to use and accurate. As a whole, the sensitivities are generally higher than 0·70 and the specificities are 0·85 or more (Sheehan *et al.* 1998). The MINI has been validated against several standard diagnostic interviews such as the Structured Clinical Interview for DSM-III-R and the Composite International Diagnostic Interview. The Chinese version of the MINI has been validated in Taiwan and it has acceptable reliability with Cronbach's alpha above 0·70 (Liao *et al.* 2000).

Clinical global impression
Developed by Guy (1976), this tool measures the patient's perceived overall disease status. Disease severity has seven levels, from 'no disease' to 'extremely severe'. Changes in the progression of the disease are divided into seven levels, from 'improved greatly' to 'very bad'. Treatment efficacy is divided into four levels, from 'improved greatly' to 'no improvements'.

PMRT
To ensure program standardisation, the PMRT audiotape employing Jacobson's progressive muscle relaxation protocol included progressive relaxation of groups of muscles and deep breathing for 25 minutes (Jacobson 1938, Snyder 1992). The PMRT tape contained instructions for systematic tensing and relaxation of specific muscle groups, starting with the groups of muscles in the upper body and progressing down to the lower part of the body.

Data collection

Patients were randomly assigned to an experimental or a control group. Baseline and follow up data were collected by the same methods in both groups. Before the intervention, one training session was given to the experimental group and feedback was elicited during this experience to allow patients to experience and share the changes and sensations of relaxation.

Intervention
One session of PMRT was applied to the experimental group per day at a set time each morning for 11 consecutive days. Subjects were led into a sound-proof therapy room and asked to sit in a half recumbent position on a therapy chair with no distractions. Each person was covered with a comfortable sheet and the room lights were then dimmed. The air-conditioned temperature of the room was set at 23 °C (ASHRAE 2004). This setting was found to be a comfortable setting for patients during the pilot study. The temperature is also recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers for *Thermal Environmental Conditions for Human Occupancy*. The volume of the instructions played to the experimental group was set between 40–50 decibels, which was an acceptable sound level.

The research assistant monitored subjects for relaxation according to the criteria set by Jacobson. Subjects were asked to relax and limit their movements for approximately

five minutes while the equipment was calibrated and baseline finger temperature was recorded in each session for each person. During the baseline procedure, finger temperature was continuously recorded for five minutes allowing the subjects to stabilise from previous activities and thus reducing arousal associated with the experimental setting. The first two minutes of baseline were discounted; the remaining three minutes were averaged and obtained as the baseline levels.

Researchers repeatedly measured finger temperature in the two groups and recorded changes in finger temperature during and after the PMRT session for 40 minutes. To avoid interference with experimental effects, subjects were asked to refrain from smoking, strenuous physical exercise, eating and consuming caffeine for at least one hour prior to testing. Procedures for the control group patients were identical to those in the experimental group, except in the control group no PMRT was given. Control group patients received a placebo intervention (they were quietly led to a therapy chair in the same therapy room, at the same set time each morning, with no other interventions given). The study intervention was also provided for control group patients after the whole study ended. In administering the measurement instruments data was collected on the first day prior to the intervention (pretest), 11 days after intervention (post-test) and one week after the finalisation of intervention (follow-up).

Data processing and analysis

Collated study data was summarised by frequency distribution, percentages, means and standard deviations. The chi-squared test, *t*-test and non-parametric test were used to compare differences between experimental and control groups. Afterwards, generalised estimating equations (GEE) and the Mann–Whitney *U*-test were used to analyse experiment efficacy. The Mann–Whitney *U*-test was applied because researchers could not assume a normal distribution given the small sample size, as a non-parametric check, these results were useful to compare with parametric outcomes.

Ethical considerations

This study had approval from the Institutional Review Board of the hospital and patient's voluntary consent. Subjects were given a verbal and written explanation to enable them to clearly understand the principles and procedures of the study. Patients were given opportunities to ask questions and to have their questions answered. Agreement from patients to participate in the study was obtained from ward managers. A series of staff meetings were held prior to the pre-intervention at which details (including information sheets) about the research were disseminated. Patients were provided an information sheet and asked to sign a consent form. No names were recorded and patient details were kept confidential. Patients were informed that they could withdraw from the study at any time and that this would not affect their treatment.

Results

Basic analysis of baseline data

The study recruited 18 patients, of which eight experimental patients and six control patients completed the 11-day PMRT program (Fig. 1). Drop out rates were 11% (1/9) in the experimental group. To preserve the effect of the variable being studied and not intensify the differences in other variables, a statistical adjustment to control these covariates was used in the data analysis. Differences between the experimental and control groups in baseline demographic (age and sex), smoking (percent), dose of antipsychotic drug (chlorpromazine equivalents), severity of positive symptoms (SAPS), overall disease severity (CGI), severity of anxiety (BAI) (Table 2) and presence of comorbid psychiatric disorder (Table 3) were not statistically significant. There was also no significant difference between groups in SAPS scores at the end of the intervention and at the follow-up stage.

Changes in anxiety

In the experimental group, the BAI range prior to intervention was 9–21 points and the mean was 16·4 points (SD, 4·4). In the control group, the BAI range was 11–20 points and the mean was 15 points (SD, 3·9). While baseline anxiety assessed by mean total Beck score was moderate (16 points) in experimental patients and mild (15 points) in control patients, anxiety at one week postintervention was normal (seven points) in experimental patients and mild (13 points) in control patients (Fig. 2). After controlling for baseline values of anxiety, GEE was used to evaluate the effect of PMRT on anxiety. From the interactions between group allocation and testing time (Table 4), the difference in the severity of anxiety between the two groups was significant after 11 days of PMRT intervention ($Z = -4{\cdot}1$, $p < 0{\cdot}0001$). When efficacy was assessed one week after the 11 days of intervention, mean anxiety severity was still lower in the experimental group than in the control group (Table 4, $Z = -2{\cdot}0$, $p = 0{\cdot}0446$).

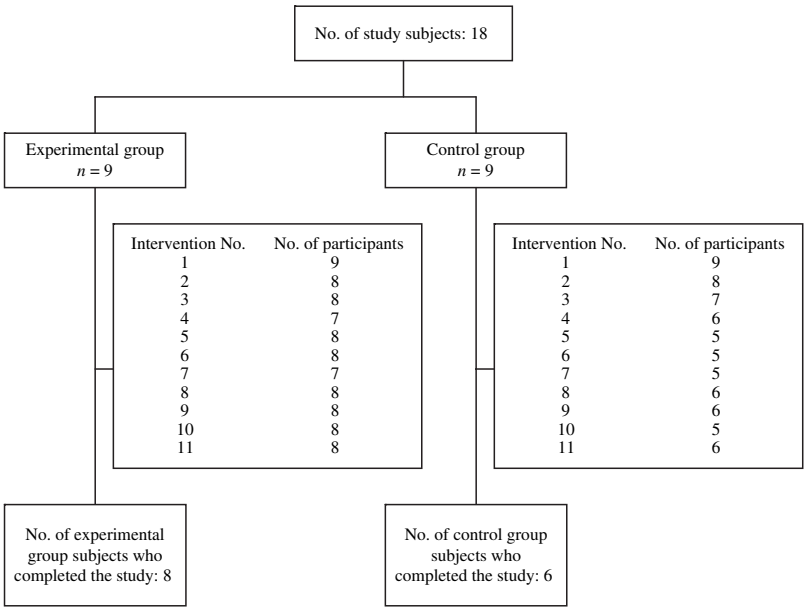

Figure 1 Details of the subjects who participated in the study.

Table 2 Baseline data on patients who completed the study (values given as percentages or mean [standard deviation]) (n = 14)

Category	Experimental group (n = 8)	Control group (n = 6)	Inferential statistics (p-value)
Sex			
Male (%)	1 (13%)	3 (50%)	2·4 (0·18)*
Female (%)	7 (87%)	3 (50%)	
Smoking			
Yes (%)	1 (13%)	1 (17%)	0·1 (0·69)*
No (%)	7 (87%)	5 (83%)	
Mean age, years (SD)	39·1 (16·8)	41·0 (16·4)	22·5† (0·85)
Mean age of disease onset, years (SD)	13·1 (12·8)	12·0 (15·4)	24·0† (1·00)
Anxiety status (BAI)	16·4 (4·4)	15·0 (3·9)	15·0† (0·46)
Antipsychotic dosage equivalent (chlorpromazine, CPZ)	844·6 (585·4)	286·0 (243·8)	9·0† (0·11)
Positive psychiatric symptoms (SAPS)	64·3 (23·1)	55·2 (27·1)	20·0† (0·60)
Disease severity (CGI)	3·8 (0·9)	3·5 (1·4)	16·0† (0·54)

CGI, clinical global impression; SAPS, scale for the assessment of positive symptoms; BAI, Beck Anxiety Inventory.
*Fisher's exact test value from chi-squared test; †Mann–Whitney U-test, U-value.

Table 3 Comorbidity of patients who completed the study, based on Mini-International Neuropsychiatric Interview (n = 14)

Comorbidity	Experimental group (n = 8)	Control group (n = 6)	Chi-squared test p-value*
Dysthymia	3 (37%)	1 (17%)	0·7 (0·41)
Major depression	2 (25%)	1 (17%)	0·1 (0·62)
Agoraphobia	1 (13%)	1 (17%)	0·1 (0·69)
Social anxiety	2 (25%)	0 (0%)	1·8 (0·31)
Panic disorder	1 (13%)	0 (0%)	0·8 (0·57)
Generalised anxiety disorder	1 (13%)	0 (0%)	0·8 (0·57)

*Probability values from the chi-squared test are represented in the form of Fisher's exact test value.

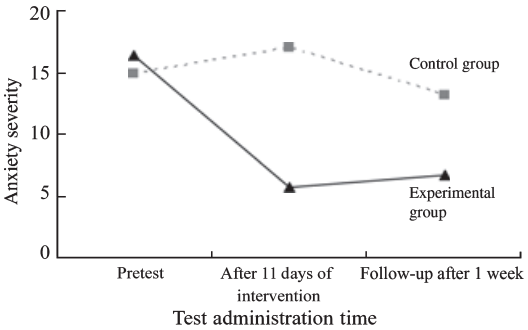

Figure 2 Changes in the severity of anxiety in the experimental and control groups.

Changes in finger temperature

The Mann–Whitney U-test was used to analyse changes in finger temperature in the two groups of patients. After the 11 days of the PMRT, the mean increase in finger temperature (temperature at end of session − temperature prior to commencement of the session) was significantly greater in the experimental group than in the control group, 0·4 and 0·2 °C respectively (Table 5; U = 29·5, $p < 0·05$; Fig. 3). The results demonstrated that after adjusting for change in patient finger

Table 4 Results of GEE analysis examining changes in the severity of anxiety in the experimental and control groups

Parameter	Estimate	Standard error	95% Confidence limits		Z-value	p-value*
			Minimum value	Maximum value		
Intercept	15·0	1·6	12·0	18·0	9·7	< 0·0001
Group (Exp)†	1·4	2·1	−2·8	5·5	0·7	0·5179
Time (2)‡	2·0	3·0	−3·9	7·9	0·7	0·5059
Time (3)‡	−1·8	3·2	−8·1	4·5	−0·6	0·5744
Interactions						
Group (Exp.) × Time (2)§	−12·6	3·1	−18·7	−6·5	−4·1	< 0·0001
Group (Exp.) × Time (3)§	−7·8	3·9	−15·5	−0·2	−2·0	0·0446

GEE, generalised estimating equations.
†Reference group: Control group; ‡Reference group: Time (1); §Reference group: Group (Control) × Time (1).
*$p < 0·01$.

temperature on the first day, the mean change in temperature was statistically different between the two patient groups.

Discussion

Despite the small sample size and the subsequent problems with the generalisation of results, this is the first study that has demonstrated the efficacy of PMRT in reducing anxiety in hospital in patients with acute schizophrenia. The literature highlights that relaxation is beneficial in the reduction of anxiety in patients with chronic schizophrenia. Anxiety is also common in patients experiencing an acute episode of schizophrenia. Patients with schizophrenia often display anxiety symptoms, such as physical complaints, compulsive behaviours and thoughts and report feelings of panic. In this study, the registered subjects ($n = 18$) were patients with schizophrenia who were hospitalised during an acute episode. Of the acute schizophrenic patients available, only 18 volunteers met the inclusion criteria. Of the registered subjects, patients with concomitant anxiety comprised 35·7%. When a test was performed immediately after

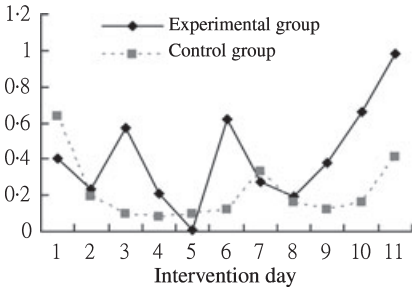

Figure 3 Changes in finger temperature in the experimental and control groups.

Table 5 Differences in patient finger temperature in degrees celsius after intervention, as analysed by the Mann–Whitney *U*-test

Group	Experiment		Control			
Day	Finger temperature difference mean (°C)	SD	Finger temperature difference mean (°C)	SD	U-value	p-value
1	0·4	(0·4)	0·6	(0·6)		
2	0·2	(0·3)	0·2	(0·8)		
3	0·6	(0·6)	0·1	(0·4)		
4	0·2	(1·1)	0·1	(0·3)		
5	0·0	(0·3)	0·1	(0·3)		
6	0·6	(0·9)	0·1	(0·3)		
7	0·3	(0·3)	0·3	(0·5)		
8	0·2	(0·6)	0·2	(0·3)		
9	0·4	(1·1)	0·1	(0·8)		
10	0·7	(0·7)	0·2	(0·5)		
11	1·0	(1·4)	0·4	(0·8)		
Overall session	0·4	(0·8)	0·2	(0·6)	29·5	0·042

In the table, pretest post-test differences were represented in terms of Mann–Whitney *U*-test *U* values and *p* values ($U = 29·5$, $p = 0·042$).

PMRT in the experimental group, the severity of anxiety in patients was effectively reduced and the degree of anxiety improvement was significantly better than in the control group. In acute patients with schizophrenia, PMRT intervention could improve their anxiety experience and severity. As all study patients were provided a quiet and comfortable environment during the experiment, increased finger temperature was observed in both groups. The anxiety levels in the experimental group receiving PMRT improved (as measured by the scales/questionnaires) and their finger temperature increase was significantly higher than the control group.

Our study findings of anxiety severity reduction and mean finger temperature increase are similar to those obtained by Brenes (2003), who applied PMRT to patients with OCD. The mean STAI score fell from 45–32 and average finger temperature increased significantly. They are also similar to the results obtained by Hawkins *et al.* (1980), who applied PMRT to patients with chronic schizophrenia. The mean score of total Hamilton Anxiety Scale decreased from 60·4–53·1 and average finger temperature increased by 1·3 °C.

In our study, although after one week of follow up there was still an improvement compared with baseline measures, anxiety was already showing an increasing trend and between-group differences were only marginally different statistically. Therefore, after patients stop PMRT, its effect on symptoms is limited and anxiety gradually increases. It is recommended that relaxation techniques are continuously performed and practiced to maintain their effect. After completion of training, the relaxation tape can be provided to the patient, reminding them of the importance of continuous treatment to achieve the aim of anxiety reduction. The result of the study has demonstrated that the use of PMRT with patients could be potentially welcomed by patients, as they feel they are more in control of the management of their anxiety.

To prevent factors such as medications and substance abuse from interfering with the results, the inclusion criteria were very restricted, which resulted in only a small number of eligible volunteers, with just 14 of 18 patients completing the study. This study initially recruited 18 patients, of which eight experimental patients and six control patients completed the 11-day PMRT program. The effort made to maintain the homogeneity between control and experimental groups could have affected the generalisability of the findings. Notwithstanding the lack of a large sample to improve reliability scores and statistical power, it can be suggested that other similar studies include a larger sample and a crossover method.

Conclusion

This study has demonstrated that providing PMRT can effectively alleviate anxiety in patients with schizophrenia. Future studies could collect and assess data from other physiological indices to further validate the efficacy of the PMRT. The question that remain to be answered is how often one has to practice PMRT, before it can affect anxiety levels in specific patients. Furthermore, additional research is needed to see if these results can be replicated and how long-lasting the benefits are. Future studies can also examine the effect on patient anxiety of PMRT in psychiatric patients with different diagnoses other than schizophrenia. The combination of other physiological indexes in determining the effectiveness of the PMRT could be included in future studies.

Relevance to clinical practice

Progressive muscle relaxation training is potentially an effective nursing intervention in the reduction of anxiety in patients diagnosed with schizophrenia, depending on the quality of their mental status at the time of intervention. PMRT is a useful intervention as it is proven to reduce anxiety levels across a spectrum of psychiatric disorders.

Contributions

Study design: WCC, KRC; data collection: WCC, HC, RBL, YHC, CHC, KRC, YCC and manuscript preparation: WCC, APO, KRC.

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