THE EFFECTIVENESS OF A 15 MINUTE WEEKLY MASSAGE IN REDUCING PHYSICAL AND PSYCHOLOGICAL STRESS IN NURSES

Ms Nerolie Bost RN, MN, Dip. M.Ther, Project Officer, Griffith University Research Centre for Clinical Practice Innovation, Gold Coast, Queensland, Australia

Professor Marianne Wallis RN, PhD, Chair, Clinical Nursing Research, Griffith University Research Centre for Clinical Practice Innovation and Gold Coast Health Service District, Queensland, Australia

M.Wallis@griffith.edu.au

ABSTRACT

Objective:

To investigate the effectiveness of massage therapy in reducing physiological and psychological indicators of stress in nurses employed in an acute care hospital.

Design:

Randomised controlled trial.

Setting:

Acute care hospital in Queensland.

Subjects:

Sixty nurses were recruited to the five week study and randomly assigned to two groups.

Intervention:

A 15 minute back massage once a week. The control group did not receive any therapy.

Main outcome measures:

Demographic information, a life events questionnaire and a brief medical history of all participants was completed at enrolment. Physiological stress was measured at weeks one, three and five by urinary cortisol and blood pressure readings. Psychological stress levels were measured at weeks one and five with the State-Trait Anxiety Inventory (STAI).

Results:

Differences in the change in urinary cortisol and blood pressure between the two groups did not reach statistical significance. However, STAI scores decreased over the five weeks for those participants who received a weekly massage. The STAI scores of the control group increased over the five week period. These differences between the groups were statistically significant.

Conclusion:

The results of this study suggest that massage therapy is a beneficial tool for the health of nurses as it may reduce psychological stress levels. It is recommended that further large studies be conducted to measure the symptoms of stress rather than the physiological signs of stress in nurses.

INTRODUCTION

The ageing of the nursing workforce, decreasing numbers of nurses per head of population, increasing hospital admissions and increasing patient acuity are some of the factors which place pressure on nurses as they struggle to provide quality nursing care (Australian Institute of Health and Welfare (AIHW) 2004, 2003, 1997). During the last 30 years there has been increased recognition of the impact of work-related stress on health care employees with evidence suggesting that they suffer more ill effects of stress than other workers (Commonwealth Department of Health and Aged Care 2000; Muncer et al 2001).

Numerous studies have indicated that nurses experience high levels of workplace stress related to individual, social, environmental, occupational and organisational factors (McGrath et al 2003; Bennett et al 2001; Escot et al 2001). There are multiple health related consequences of chronic stress including physical symptoms such as digestive disturbance, hypertension, headache and sleeping difficulties and psychological effects such as anxiety (Corwin 1996). In addition, there is evidence to suggest that nurses suffer higher rates of mortality, psychiatric admisssions and physical illness than workers outside the health care environment (Kirkcaldy and Martin 2000). Stress induced anxiety can lead to poor performance and increased nursing errors and studies have identified job stress as a major cause of nurses leaving the health care workforce (Smith et al 2001; Bratt et al 2000).

There are many theories about the causes and effects of stress (Lazarus 1999; Selye 1993). Cognitive processes, perceptions of events and emotive coping styles are frequently cited as influencing the effects of stress on the individual (Searle et al 2001; Lazarus 1999). A common problem with studies attempting to measure the stress response is the imprecise definition of stress. Anxiety scales such as the State-Trait Anxiety Inventory (STAI) have frequently been used to assess the psychological stress response in study participants (Heinrichs et al 2003; Spielberger 1983). Anxiety and stress elicit similar physical symptoms from the activation of the sympathetic nervous system. The physiological changes of stress can be demonstrated by measuring the long term physiological outcomes of sympathetic stimulation, such as, elevation of blood pressure, heart rate and cortisol secretion (Clow 2001).

The challenge for managers is to find interventions that support nurses individually and organisationally and reduce levels of stress. Massage therapy is one intervention that has received attention in recent years as a potential stress management tool. However, the studies reporting on the effectiveness of massage have often been conducted on small sample sizes, many have used non healthy subjects and research design has not been rigorous. A number of studies of massage in the workplace have been reported (Hernandez-Reif et al 2000; Katz et al 1999; Cady and Jones 1997). These studies have not all been conducted rigorously, the reports have not included effect size information and the sample sizes have been small. In order for managers to be confident about the usefulness of massage therapy as a tool to decrease work related stress for nurses, further evidence is required.

AIM

The purpose of this study was to determine the effect of massage therapy on the stress levels of nurses working in a hospital environment. This was achieved by comparing physiological and psychological indicators of stress in a control group of nurses who did not participate in the massage therapy with those of an experimental group, who did participate in the massage therapy.

METHOD

A randomised controlled trial was conducted in one 200 bed campus of a 650 bed regional hospital in South East Queensland. Approximately 350 full-time and part-time nurses were employed on the campus. The study was supported by funding from the local Hospital Foundation and received approval from the Human Research Ethics Committees of both the health district and a local university.

Intervention

The intervention was conducted in a single room situated in the surgical wing which was lit with natural light. The room was relatively quiet, private and located within easy walking distance for the participants from all clinical areas. Room temperature was comfortable and maintained by air conditioning. Each participant randomised into the intervention group was given a full back massage using grape seed oil as a skin lubricant. The massage was based on the Swedish massage technique of Per Henrik Ling (Fritz 2000). The control group did not receive any active intervention and were requested to continue with their work, meal breaks and personal lifestyle as usual.

Sample

Sixty nurses, including enrolled nurses, registered nurses and nurse managers, volunteered for the study. The participants were then randomly assigned to either treatment or control groups using a random envelope and number system. As effect size has not been accurately reported in previous studies it was not possible to estimate the sample size that would provide an adequate power to the data analysis.

Two participants had dropped out of the study by the end of week one. Consequently, 28 participants were left to take part in the control group data collection while 30 participants took part in the intervention group. Of the 58 remaining participants, 48 (83%) completed all data required at each time point of week one, three and five of the study. See Figure 1 for details of drop outs.

Figure 1: Sampling, randomisation and drop outs
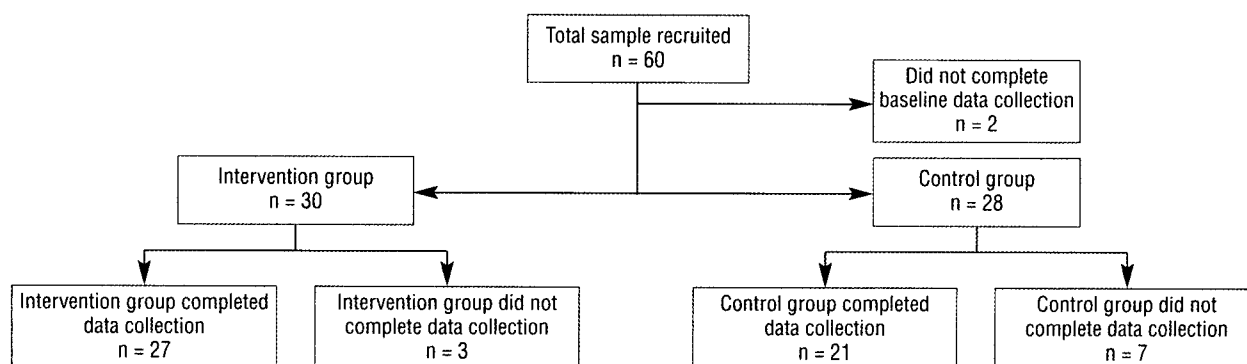
Data collection

As there are contraindications to performing massage therapy on people with certain physical disorders a screening tool was administered to the participants before further data collection began (Fritz 2000). This tool screened for physical disorders and the prescribed use of anxiolytic drugs, glucosteroids, androgens and phenytoin which are effective suppressors of stress-induced cortisol secretion (Gaedeke 1996). No participants were excluded from the study on the basis of this screening.

Participants were given further information, requested to sign a consent form and complete a questionnaire in relation to demographic information. A Life Events questionnaire was completed in the first week of the study. This form measures participants' perceptions of personal life events experienced over the previous four-week period and was used to assess extreme situational stress in the sample that might affect physiological or psychological indicators of stress. It was based on the Social Readjustment Rating Scale and modified by Field (2000).

The outcome measures used in this study were the Spielberger State-Trait Anxiety Inventory (STAI), mean arterial blood pressure and urinary cortisol levels. Data were collected over a consecutive five-week period. The STAI was completed in the first, third and fifth week of the data collection. The STAI is reported to be one of the best and the most extensively used of the standardized anxiety measures and uses responses to four-point Likert scale (Spielberger 1983). Each scale consists of 20 statements that the participant rates to describe how they generally feel (trait) or how they feel at a particular moment in time (state). In studies conducted by Spielberger (1983), test-retest reliability coefficients of 0.73 to 0.86 and 0.86 to 0.92 have been reported for the trait subscale and coefficients of 0.16 to 0.54 and 0.83 to 0.92 for the state subscale.

All participants were requested to supply a first morning urine specimen in the first, third and fifth weeks. These specimens were frozen and transported to the pathology department of a large Brisbane hospital for cortisol assay levels. Cortisol is known as the 'stress hormone' and has been measured in urine in at least two previous studies on the effects of massage therapy to ascertain the physiological response of the body (Field et al 1996; Field et al 1991). In healthy men and women aged between 18 and 55 years, the range for random early morning cortisol is less than 25 nmol/mmol. The researcher measured the participants' blood pressure (MAP = Pdias + 1/3 Psys − Pdias; normal is less than 105) before the weekly massage sessions and measured the control groups' blood pressure weekly. The experience of stress was expected to affect blood pressure due to the activation of the sympathetic nervous system during stress (Pasternac and Talejic 1991).

Data were entered into the Statistical Package for the Social Sciences (SPSS) version 10. Analysis involved descriptive and inferential statistics. A significance level of 0.05 was set for all inferential tests. Due to the small number of participants and the non-normal distribution of some variables there was a risk of committing a Type II error thus non-parametric statistical tests were employed in this study. Univariate descriptive statistics were calculated for the total sample. The Chi-Square Test was used to test for differences between groups when the data were measured at the nominal level. The Mann Whitney U test was used to test differences between groups when the data were measured at the interval level.

RESULTS

Participants represented all clinical areas and nursing levels of the hospital campus. Fifty-one (87.9%) worked shiftwork while seven (12.1%) worked business hours. Table 1 presents the descriptive statistics for data collected at interval level related to age, work history and baseline outcome measures for the total sample.

A medical history from clients is required when undertaking a treatment of massage therapy. Table 2 presents the frequency and percentage of physical conditions suffered by participants in this study. None of the participants was hypertensive or being treated for hypertension at the beginning of the study.

Almost half (47.3%-41.8%) the participants identified that they suffered from headaches, fatigue, tension or stress and muscle or joint pain. Over one third (34.5%)

Table 1: Description of age, work history and baseline measures - total sample

Characteristic	n	Median	IQR
Age	57	42.0	14.0
Length of employment at GCH	58	1.0	1.6
Total clinical experience	58	16.0	19.0
Mean arterial pressure	51	93.3	18.4
State anxiety score	57	38.0	17.5
Trait anxiety score	57	38.0	16.0
Life events questionnaire score	57	8.0	9.0
Urinary cortisol	55	6.0	9.0

Table 2: Description of conditions suffered - total sample

Condition suffered	Frequency condition suffered (n=55)	Percentage
Muscle or joint pain	26	47.3
Fatigue	25	45.5
Tension or stress	25	45.5
Headaches	23	41.8
Sleep difficulties	19	34.5
Allergies or sensitivities	14	25.5

Table 3: Outcome measures of change over time – Mann Whitney U Test					
Outcome measures	Week 1 Median (IQR)	Week 5 Median (IQR)	Median change over time adjusted for baseline (IQR)	Mann Whitney U test	p value
Urinary cortisol Total sample Massage group Control group	6.0 (9.0) 6.5 (9.7) 6.0 (7.0)	6.5 (8.5) 6.0 (12.0) 7.0 (5.5)	-0.17 (2.54) 0.00 (1.91)	244.5	0.50
MAP Total sample Massage group Control group	93.3 (18.4) 83.3 (20.0) 93.3 (12.6)	86.6 (14.4) 83.3 (9.1) 92.4 (14.3)	-0.04 (0.19) -0.03 (0.09)	271.0	0.73
State-STAI Total sample Massage group Control group	38.0 (17.5) 44.5 (17.2) 33.0 (12.0)	37.0 (16.0) 33.0 (14.0) 40.0 (19.7)	-0.13 (0.25) 0.08 (0.56)	162.5	0.006*
Trait-STAI Total sample Massage group Control group	38.0 (16.0) 44.0 (18.7) 35.0 (12.0)	40.0 (14.0) 38.0 (12.0) 41.5 (18.2)	-0.05 (0.18) 0.05 (0.30)	166.5	0.008*

*Significant at the level less than 0.01

suffered sleep difficulties and one quarter (25.5%) had allergies or sensitivities.

The baselines measures of those who completed data collection and those who did not complete and those in the control and intervention groups were compared. At week one there were no statistically significant differences in the baseline measures of age, clinical experience, physiological or psychological scores between participants in either intervention group nor between participants who withdrew compared to those who completed the study.

The Mann Whitney U tests were used to test the change in outcome measures between Week 1 and Week 5. The following equation was used to calculate change over time and adjust for the baseline:

$$\frac{\text{Week 5 value} - \text{Week 1 value}}{\text{Week 1 value}}$$

Table 3 presents the descriptive and inferential statistics related to the outcome measures.

Table 3 indicates that the median urinary cortisol measures of the total sample, as well as the massage and control groups, were all around 6.0 and remained fairly constant over time. The mean arterial pressure was higher in the control group than the massage group and the scores remained constant for both groups. There were no statistically significant differences between the massage group and the control group in urinary cortisol or mean arterial pressure.

There was a statistically significant difference between the massage group and the control group for both the State-STAI and the Trait-STAI scores. The State-STAI score decreased slightly over time for the total sample. The State-STAI score for the massage group decreased while the State-STAI score for the control group increased. The Trait-STAI score increased slightly over time for the total sample. The Trait-STAI score for the massage group decreased while the Trait-STAI score increased for the control group over time.

DISCUSSION

Numerous studies have measured blood pressure pre and post massage therapy as one indicator of a relaxation response with conflicting results (Boone et al 2001; Hernandez-Reif et al 2000; Ferrell-Torry and Glick 1993). The study that reported a decrease in blood pressure following massage therapy had recruited subjects with clinically high blood pressure (Hernandez-Reif et al 2000). Those studies that recruited normotensive subjects reported no change in blood pressure post massage (Boone et al 2001; Ferrell-Torry and Glick 1993). In this study participants were normotensive with an average mean arterial pressure of 93.3 mmHg (see table 2). There was no statistically significant difference in blood pressure change between those who received massage therapy and those who did not (see table 3).

Previous studies have measured urinary cortisol as an indicator of stress (Heinrichs et al 2003; Deane et al 2002). In this study the participants were within the normal parameters of urinary cortisol consequently there was no significant reduction in urinary cortisol levels following massage therapy as compared to control (see table 3). This result does not support the findings of a number of underpowered, poorly controlled trials of massage therapy conducted by the Touch Research Institutes (Hernadez-Reif et al 2000; Field et al 1996; Field et al 1991).

State Trait Anxiety Inventory population norms have been calculated for healthy working adults (Spielberger 1983). In this study the control group had State-STAI and Trait-STAI scores that were below the population norms

while the massage group had STAI scores that were approximately eight points above population norms. However these differences were not statistically significant. As predicted in other studies (Hernadez-Reif et al 2000; Field et al 1996; Field et al 1991) the massage intervention resulted in a statistically significant decrease in both State and Trait-STAI scores (see table 3). Indeed for both State and Trait-STAI scores the median for the massage group decreased over time while for the control group the scores increased.

Measurement issues in stress research

An issue in this study was whether or not to use salivary or urinary measures of cortisol. Previous studies have measured urinary cortisol as an indicator of stress (Heinrichs et al 2003; Deane et al 2002). Other researchers postulated that as urinary cortisol is a measure of stress it would be a useful parameter to use as an outcome measure in intervention studies (Hernadez-Reif et al 2000; Field et al 1996; Field et al 1991). Based on these studies urinary cortisol was used as an outcome measure in this randomised controlled trial. However the week one urinary cortisol levels of all but one of the participants were within normal parameters and did not demonstrate that participants were experiencing high stress levels. As most of these participants had normal levels of urinary cortisol it was unlikely that massage intervention would reduce the urinary cortisol level and this was demonstrated by the results. The usefulness of urinary cortisol measurement in healthy populations, as an indicator of stress, must therefore be questioned in future studies.

Other studies have used salivary cortisol measurement to determine stress levels (Yang et al 2001; Schulz et al 1998). Typically, this method has involved collecting saliva by holding an absorbent cotton roll in the mouth until saturated and then placing the roll in a capped plastic vial that was frozen prior to laboratory analysis. The laboratory then analysed the saliva using a radioimmunoassay (RIA) technique. There are discrepancies in the literature in relation to the most accurate measure for cortisol (Lin et al 1997). It remains unclear from this work whether salivary cortisol would be a useful outcome measure for intervention studies conducted in healthy populations.

The general premise that chronic stress leads to high cortisol levels has already been challenged in nursing populations (Yang et al 2001). Work with trauma sufferers also suggests that our understandings of the link between chronic stress and cortisol secretion are incomplete and potentially more complex than previous work has suggested (Briere 1997).

LIMITATIONS

The results of this study need to be treated with caution because of the lack of sensitivity of some outcome measures when used in healthy populations.

All the nurses in this sample recorded early morning urinary cortisol levels within the normal range of 1-25 nmol/mmol. Changes in cortisol level within this normal range cannot be assumed to reflect a change in stress levels; rather normal diurnal or hormonal fluctuation. In addition, other studies indicated that blood pressure would be a useful outcome measure. However blood pressure was mostly within normal parameters and would not decrease because of the floor effect.

The small sample size recruited to this study limits the conclusions that can be reached. However, the randomisation process did provide two matched cohorts. A lack of funding for the project meant than no more nurses were able to be recruited. Even so, this study represents a significant improvement in sample size when compared to other massage intervention trials (Hernadez-Reif et al 2000; Ferrell-Torry and Glick 1993).

Other small studies have included placebo controls. These studies showed a variation in the effectiveness of massage compared to placebo (Hernadez-Rief et al 2000, Field et al 1996). In this study non intervention control was used rather than placebo control. Future studies may need to consider having both non intervention and placebo control groups.

RECOMMENDATIONS

The results of this study suggest that massage therapy may be beneficial in the workplace to decrease levels of anxiety. Nurses often work in difficult and stressful situations and are constantly faced with the dilemmas associated with resource shortages. By offering access to supportive strategies for individuals, managers are demonstrating a commitment to the mission statements that espouse caring for the carers. Weekly massage therapy sessions provided to all staff may reduce psychological stress levels and improve the retention rates of nurses. Indeed, in the hospital used as the setting for this study, massage is now offered to staff at a discounted rate within the workplace.

Future massage intervention studies need to employ larger sample sizes underpinned by adequate power analysis. Further examination of the usefulness of cortisol and blood pressure measurement in healthy populations needs to be undertaken. It may be that the prevalence of stress related symptoms is a more useful outcome measure. Future studies may benefit from including symptom indices as outcome measures. In particular, headache, fatigue, muscle/joint pain and sleeping difficulties warrant further investigation.

CONCLUSION

Weekly sessions of massage therapy, over a five week period, appear to decrease levels of anxiety in nurses employed in an acute care facility, compared to controls. Massage therapy does not appear to have an effect on

physiological measures of stress in healthy populations. While the nurses in this study had normal levels of urinary cortisol, were normotensive and were healthy enough to participate in the workforce, they demonstrated a high incidence of symptoms such as headaches, insomnia, muscle / joint pain and fatigue. These symptoms are linked in the literature to stress and they may prove to be more sensitive outcome measures in future massage intervention studies.

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