



A randomised comparative trial of yoga and relaxation to reduce stress and anxiety[☆]

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Summary

Objective: To compare yoga and relaxation as treatment modalities at 10 and 16 weeks from study baseline to determine if either of modality reduces subject stress, anxiety, blood pressure and improve quality of life.

Design: A randomised comparative trial was undertaken comparing yoga with relaxation.

Participants: One hundred and thirty-one subjects with mild to moderate levels of stress were recruited from the community in South Australia.

Interventions: Ten weekly 1-h sessions of relaxation or hatha yoga.

Main outcome measures: Changes in the State Trait Personality Inventory sub-scale anxiety, General Health Questionnaire and the Short Form-36.

Results: Following the 10 week intervention stress, anxiety and quality of life scores improved over time. Yoga was found to be as effective as relaxation in reducing stress, anxiety and improving health status on seven domains of the SF-36. Yoga was more effective than relaxation in improving mental health. At the end of the 6 week follow-up period there were no differences between groups in levels of stress, anxiety and on five domains of the SF-36. Vitality, social function and mental health scores on the SF-36 were higher in the relaxation group during the follow-up period.

Conclusion: Yoga appears to provide a comparable improvement in stress, anxiety and health status compared to relaxation.

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Introduction

Stress is experienced in response to a range of physical, occupational and emotional stimuli. Within manageable parameters one's sense of well-being is maintained, but if these stimuli go beyond normal limits they become stressors.¹ Continued exposure

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to stress can lead to physical and mental symptoms such as anxiety and depression.

Current treatment for anxiety involves psychological and pharmacological interventions and these are well-supported by evidence from randomised controlled trials. Research suggests that individuals experiencing mental health problems may not seek out professional support indicating a need for appropriate and most importantly evidence-based self-help strategies.² Therefore, much greater effort needs to be directed towards recovery and rehabilitation beyond current processes.

Mind body interventions are increasingly being used to assist with stress reduction. Relaxation is one modality that can be taught as a form of self-help to achieve a state of mental calm³ and its benefits have been supported in a systematic review evaluating the effects in relation to hypertension, headaches, insomnia and anxiety.⁴ In a separate review, the use of relaxation techniques to reduce psychosocial symptoms among people with cancer has also been undertaken⁵ which have been found to have a beneficial effect on depression, anxiety and hostility. Relaxation may therefore play a positive role with in improving psychosocial outcomes.

Yoga is an increasingly popular therapy, used to maintain wellness and assist with the management of a range of health complaints. A review of the literature identified two trials evaluating the effects of yoga on reducing anxiety and stress. In a trial of 114 subjects by Khasky and Smith, yoga and imagery were found to be more effective at increasing a relaxed state compared to the control group ($p < 0.003$) and guided imagery was more effective than yoga in reducing negative thoughts ($p < 0.03$).⁶ Malathi and Damodaran randomised 50 stressed medical students to yoga or to a non-intervention control group.⁷ A reduction in stress, improved sense of well-being and confidence was found in the yoga group ($p < 0.001$). However, the findings from both trials are limited though by their poor quality.

Limited research provides further impetus for ongoing investigation of the effects of yoga on stress and anxiety. It is essential for people to have informed evidence-based choices about effective health care; health professionals also need to be able to advise on and appropriately refer people to new and proven forms of health care that provide valid alternatives to which they seek access. Coulter and Willis identified the necessity of increasing the evidence base of CAM and this study relating to yoga seeks to do that.⁸

The primary aim of the study was to compare yoga and relaxation treatment modalities at 10 and

16 weeks from study baseline to determine if either of these modality would reduce stress, anxiety, blood pressure and improve quality of life. The secondary aim of the study was to determine if yoga and relaxation are acceptable and safe treatment modalities.

Method

A randomised comparative trial was undertaken between April and November 2004, in South Australia (SA). The trial was promoted using the media and community flyers, and was approved by the University of South Australia Research and Ethics Committee. Subjects were eligible to participate, if they were, aged between 18 and 65 years, experiencing mild or moderate levels of stress determined by the General Health Questionnaire-12 (GHQ-12),⁹ and able to attend and participate in the classes. Subjects were excluded if they scored less than 2 on the GHQ-12, were physically unable to do yoga or attend class, currently doing yoga or pregnant. Consent was obtained on initial contact.

A researcher not involved in the study prepared the randomisation schedule. Treatment assignment was determined by a restricted randomisation scheme (using balanced variable blocks) devised from computer generated random number tables. Stratification was performed by age. The randomisation schedule was concealed in sequentially numbered, sealed opaque envelopes. Subjects were randomised to a yoga or relaxation group by the research assistant.

The interventions

All participants were required to attend either hatha yoga (intervention group) or progressive muscle relaxation classes (active control group) lasting 1 h per week for 10 weekly sessions. The class size varied between 10 and 15 individuals, with a total of 8 group sessions conducted and the two groups running concurrently in separate rooms on the University campus.

Yoga intervention

Hatha yoga was chosen as the style of yoga for the study based on a literature review and consultation with key leaders in the yoga community. Hatha yoga includes breath awareness and internal centering to remove external concerns, achieve focus and become sensitive towards internal feelings; as well as relaxation and meditation to further enhance ridding the body of 'toxins' and enable

Table 1 Yoga class routine

Savasana or Tadasana (breath awareness—lying or standing)
Shoulder, arm, head and wrist rotation
Tiryaka Tadasana (swaying palm tree pose)
Kati Chakrasana (waist rotating pose)
Uttanasana (standing forward bend)
Majariasana (cat stretch pose)
Ardho Mukha Svanasana (downward facing dog pose)
Virabhadrasana II (warrior pose)
Surya Namaskara (salute to the sun—modified)
Spinal twist
Utthita Trikonasana (triangle pose)
Badha Konasana (bound angle pose)
Utkatasana (fierce posture)
Pose of the child
Navasana (knees bent supported with hands)
Vrksasana (tree pose)
Nauka Sanchalanasana (rowing the boat pose)
Utthita Lolasana (swaying while standing pose)
Advasana—Makarasana—Matsya
Kridasana—Savasana (relaxation postures)

release from mental and emotional blockages. Accompanying this are bodily postures that address mind–body–breath coordination, strength, flexibility and balance.¹⁰ Hatha is distinct from other branches of yoga, which include, Iyengar where there is use of props such as straps, bolsters and blocks with an emphasis on precision and balance; Ashtanga which is a rigorous style involving a fast flow of aerobic like postures aimed at gaining stamina and strength; Satyananda which combines elements of other yoga branches to form a gentler style with more emphasis on longer guided relaxation and meditation.^{10,11}

Class routines varied to some degree based on the needs and abilities of the individuals. In the main, a routine followed fairly closely to that of Table 1 but involved on average 12 postures per class. The aim was to achieve appropriate relaxation to start and finish for the classes for 10 min, with stretching, balance and breathing awareness achieved through poses (using standing, seated, supine and semi-inversion positions) that would stretch and strengthen muscles, stimulate circulation and digestion and improve posture and balance through attention to body alignment.

Progressive muscle relaxation

Progressive muscle relaxation (PMR) was originally designed by Jacobson to guide people through suc-

cessive tensing and relaxation of the body muscle groups from toe to head to achieve overall body relaxation.¹² This process is easy to learn and teach, safe, non-threatening and non-competitive.

The full PMR script was written by one of the researchers with a background in psychology. Ten scripts were compiled, one for each week to enable participants to achieve full body relaxation but with a particular weekly focus on a different part of the body. While the script was being played participants assumed comfortable positions on the floor of the room using pillows, mats, rugs and/or beanbags and; gentle background ocean music was played quietly to muffle any outside sounds. Time was allowed within the PMR process each week for complete quiet and possible meditation for a period of 10–15 min.

Relaxation class participants listened to the tape recorded voice of the yoga teacher to guide them through the relaxation. The yoga teacher's voice was used for the audio tape for the relaxation group to enable internal consistency at an auditory level between the groups.

Outcome measures

Data were obtained from participant self-reported questionnaires at baseline, 10 and 16 weeks. Information collected included demographic details, assessment of anxiety, stress, quality of life and measurement of blood pressure. Two consecutive blood pressure measurements were taken 10–15 min apart. Outcome data were entered by a data entry operator, blinded to study group.

Self-reported anxiety was assessed using the 10-item version of the State Trait Personality Inventory sub-scale anxiety (STPI).¹³ The "state" anxiety sub-scale measures the subject's anxiety state and is rated on a four-point intensity scale. The STPI has good psychometric properties and has been used extensively in evaluation research. Participants were asked to respond to ten statements (e.g. *I am relaxed, I am tense*) and responses were recorded on a four-category scale (*not at all, somewhat, moderately so or very much so*), and scores ranged from 10 to 40, with a high score indicating extreme anxiety. The scale was chosen for its ability to detect a reduction in anxiety as a result of relaxation training.

The 12-item GHQ-12⁹ was used to measure psychological stress. The GHQ-12 has been clinically validated, has well-established psychometric characteristics and is generally accepted as a valid and reliable measure of psychological impairment in Australian populations. It can be used for repeated

administration for comparison within the same population, or as a screening tool.⁹ A score of 0–3 was administered to the questionnaire items and total scores ranged from 0 to 36, with high scores indicating extreme stress.

The SF-36 health status measure is psychometrically robust, clinically credible and used to measure health related quality of life.¹⁴ It consists of eight health concepts, physical functioning, role limitation due to physical health problems, bodily pain, general health, vitality, social functioning, role limitation due to emotional problems and mental health wellbeing. The responses to each SF-36 domain are summed to provide eight scores, these scores are then transformed into a multi-item scale that ranged from 0 (poorer health) to 100 indicating good health.¹⁴

Participants were also asked to describe their reasons for participation in the research, whether their expectations from their involvement in the study were met and if any benefit had been obtained from participating in the trial.

Sample size

The sample size was calculated using the STPI, as the primary outcome measure. A total sample of 86 participants per group was required to have 80% power, to detect at the 0.05 level, a two-point change in STPI between the two study groups, assuming a standard deviation of three.⁷ Allowing for a 15% withdrawal rate, a total sample size of 100 subjects per group was required.

Analysis

All data were analysed on an intention to treat basis using SPSS Version 12.0.1.¹⁵ One baseline (time 1) and two follow-up measurements were made at 10 weeks (time 2) and 16 weeks (time 3). As the follow-up measures were not equally spaced, and to ensure that changes in outcomes were detected over time, the three measures (STPI, GHQ-12 and SF-36) were reduced to two summary measures, short-term and long-term effects. These two measures were calculated as the difference between time 2 and baseline (short-term effects) and time 3 minus time 2 (long-term effects), respectively. Mean differences in short-term and long-term effects of therapy between groups were determined using independent Student *t*-tests. Ninety-five percent confidence intervals were based on mean differences in scores of the STPI, GHQ and SF-36. Chi-square tests was used for categorical data. Levels of significance were reported at $p < 0.05$ and $p < 0.01$.

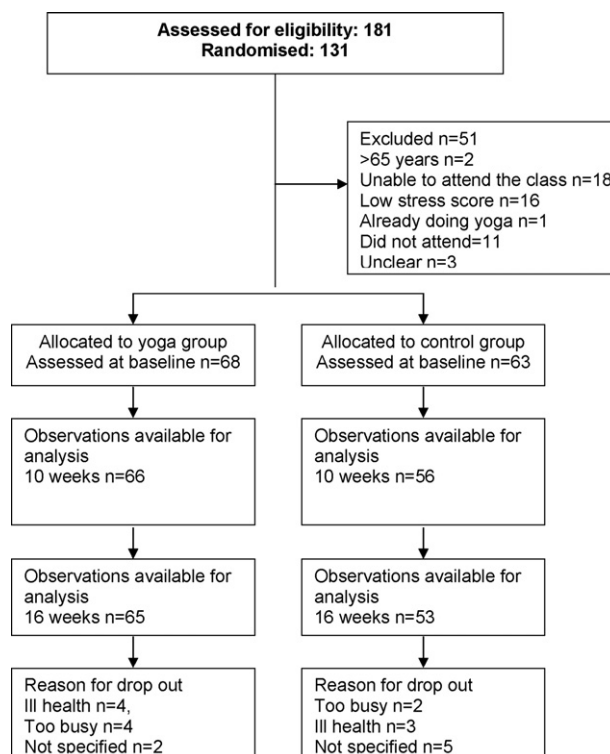


Figure 1 Participant flow chart.

Results

Recruitment and follow-up

A total of 131 subjects were randomised to the trial. Data were received from 119 (90%) subjects at the end of the 10 week intervention and 117 (89%) subjects at the end of the 6 week follow-up (Fig. 1). Ten subjects withdrew from the yoga group following the first or second session. The reasons given included, ill health, too busy or an unspecified reason. In the relaxation group 13 subjects withdrew. Their reasons included being too busy, ill health or an unspecified reason.

The mean age of subjects was 44 years (S.D. 11.8 years) and they were mostly women (83%), working full or part time (67%), married or in a de facto relationship (58%), Caucasian (97%) and had finished high school education (79%). Thirty-two subjects (24%) reported taking medication and 77 (67%) used non-pharmacological methods to reduce their stress and anxiety (Table 2). The mean GHQ-12 score for subjects was 18.6 (S.D. 6.1) and scores were normally distributed. The mean STPI score was 24.0 (S.D. 5.2). SF-36, STPI and GHQ-12 scores did not vary by participant age and gender ($p > 0.05$). Lower scores on seven out of eight

Table 2 Baseline characteristics of participants at randomisation

Characteristics	Yoga (n = 68)		Relaxation (n = 63)	
	n	%	n	%
Age (years, mean ± S.D.)	45	11.2	44	12.5
Gender				
Female	54	79.4	55	87.3
Male	14	20.6	8	12.7
Employment status				
Working full time	49	72.1	38	60.3
Education				
Finish high school	56	82.4	46	74.2
Tertiary education	39	57.4	38	60.3
Marital status				
Married/defacto	40	58.9	36	58.1
Single	19	27.9	16	25.8
Separated/divorced/other	8	13.2	10	16.1
Race				
Caucasian	67	98.5	60	95.2
Other	1	1.5	3	4.8
STPI (mean score ± S.D.)	24.0	5.4	24.0	5.0
GHQ-12 (mean score ± S.D.)	19.2	6.2	18.0	6.2
SF-36 (mean score ± S.D.)				
Physical function	82.1	18.7	85.1	15.7
Physical role function	59.5	41.4	63.9	30.3
General health perceptions	57.0	10.0	53.3	9.1*
Emotional role function	46.1	39.4	41.8	40.1
Social function	62.0	29.1	61.1	23.6
Bodily pain	62.3	26.3	64.3	19.0
Mental health	52.7	17.0	56.0	16.5
Vitality	35.6	18.7	37.7	15.3
Systolic blood pressure (mean ± S.D.)	121.5	15.6	118.0	15.7
Diastolic blood pressure	76.7	10.7	75.1	9.7

* Significant difference between groups ($p=0.03$). STPI, State Trait Personality Inventory sub-scale anxiety; GHQ-12, General Health Questionnaire; SF-36, Short Form-36.

SF-36 domains were reported for this study population compared with the health population norms of a comparable adult population in South Australia (SA). Physical functioning was the sole domain comparable to the SA population.¹⁶

Primary outcomes

Table 3 presents the changes in effects between yoga and relaxation groups from baseline to the end of the 10 week intervention (time 2) and between the end of the intervention and the follow-up period at 16 weeks. Over time, there was an improvement in both groups with a reduction in stress and anxiety scores and improvements in the SF-36 scores. Overall yoga was found to be as effective as relaxation with reducing stress and anxiety and on seven domains of the SF-36 from baseline to the end

of the intervention. Yoga was found to be more effective than relaxation as demonstrated by an improvement in mental health at the end of the intervention (time 2). There was no change in blood pressure between groups at the end of the intervention ($p < 0.06$).

At the end of the follow-up period (time 3) there were no differences between groups in stress, anxiety and on five domains of the SF-36. Respondents from the relaxation group achieved significantly higher mean scores for social functioning, mental health and vitality at the end of the 6 week follow-up (time 3) compared to those from the yoga group.

Subjects in both groups attended an average of five classes (S.D. 2.9). The reasons for the varying compliance between groups was similar with reasons given, for example, ill health (21% over-

Table 3 Changes in effects between yoga and relaxation groups

	Short-term effects baseline to 10 weeks		Long-term effects 10–16 weeks	
	Mean difference 95% CI	<i>p</i> -Value	Mean difference 95% CI	<i>p</i> -Value
STPI				
Yoga vs. relaxation	−0.89 (−3.25 to 1.46)	0.45	0.34 (−1.69 to 2.37)	0.74
GHQ				
Yoga vs. relaxation	0.84 (−3.58 to 1.89)	0.54	1.35 (−0.89 to 3.60)	0.23
SF-36				
Yoga vs. relaxation				
Physical function	0.34 (−5.34 to 6.03)	0.90	−.090 (−5.28 to 3.46)	0.68
Physical role function	2.67 (−14.61 to 19.97)	0.76	−1.47 (−14.24 to 11.30)	0.82
General health perceptions	−0.61 (−4.60 to 3.27)	0.76	0.05 (−3.29 to 3.39)	0.97
Emotional role function	−8.26 (−25.25 to 8.72)	0.33	−3.38 (−17.58 to 10.81)	0.63
Social function	3.54 (−6.25 to 12.95)	0.46	−8.42 (−15.70 to −1.12)	0.02
Bodily pain	−1.21 (−8.41 to 5.98)	0.74	−1.46 (−8.88 to −5.95)	0.69
Mental health	7.80 (1.06 to 14.55)	0.02	−7.05 (12.63 to −1.47)	0.01
Vitality	5.28 (−1.22 to 11.80)	0.11	−7.06 (−13.97 to −0.15)	0.04

STPI, State Trait Personality Inventory anxiety sub-scale; GHQ, General Health Questionnaire; SF-36, Short Form-36.

all), social commitments (9%) and a range of other reasons.

Additional outcomes

Subjects' expectations from participating in the study were met in 77% (82) of cases. The benefits reported by subjects included relaxation (relaxation 36% versus yoga 16%) and flexibility (yoga 32% versus relaxation 22%). Twenty percent of subjects (70% yoga and 30% relaxation) also reported that participating in the study contributed towards helping them to make some lifestyle changes, this included dietary modifications and making time for themselves. Sleep was also improved in 41% of subjects, however there were no differences between groups.

At the time of the follow-up questionnaire subjects indicated whether they had continued with their practice of yoga or relaxation. A difference was found between the groups with 64% practising relaxation compared with 42% in the yoga group ($p < 0.01$).

Use of medication was reported by 21 (17%) subjects and use of non-pharmacological agents by 59 (48%) of subjects. This was a reduction over time but no difference was observed between the groups. Subjects were also asked to report any after effects immediately after the weekly yoga or relaxation intervention. Effects such as headaches and sleepiness (positive effect) were reported by 42 subjects (76%) in the yoga group and 28 subjects (53%) in the relaxation group ($p < 0.18$). A feeling of relaxation was reported by 18 subjects receiving yoga and 13 in the relaxation group. Ninety-one

(78%) subjects said they would participate in the study again if they had the opportunity with no difference found between groups.

Discussion

This study investigated the health benefits of yoga in reducing stress, anxiety and quality of life. The health status of study participants comprised levels of stress, with mild to moderate levels of anxiety, which improved for both groups by the end of the intervention. These findings extend those of previous research and indicate both interventions were effective and acceptable to subjects for managing their stress and anxiety. In general, yoga was as effective as relaxation techniques in reducing anxiety, stress and increasing physical and mental health and sleep ability. The interventions were shown to result in significant short-term benefits that were maintained in the long-term. Although class attendance occurred less frequently than anticipated, an average of five classes provided beneficial short- and longer-term effects in both groups.

During the follow-up period subjects in the relaxation group reported higher scores on three domains of the SF-36. Although only one-half of subjects continued to practise during the follow-up period, the health benefits were sustained. The greater effectiveness and use of relaxation by subjects during the follow-up period suggests that this may have been easier to incorporate into their daily life and hence been more practical for them than yoga. It is possible that teaching yoga may have

required more time for subjects to consolidate their new skills.

The expectations of the study participants have been reported elsewhere.¹⁶ Participants' expectations centered around their hopes for changes in their health, their wishes for control of their stress and the ability to relax and their desire for peace of mind and inner calm.¹⁶ The responses from subjects at the end of the trial indicate a broader benefit to their health and wellbeing from participating in the trial.

The strengths of our study include the methodological rigour, for example, use of appropriate clinical outcomes, concealed randomisation ensuring no selection bias, blinding of the study analyst and high rates of follow-up outcome data. The limitations of this study include a lack of blinding of study participants. The question of what effect time may have contributed to the outcome is unknown, however the plateau and continued improvement in the relaxation group during time 3 suggests a continued therapeutic effect. Learning the skill of yoga could be considered to be more challenging initially than relaxation and therefore an underestimation of the therapeutic effect of yoga cannot be excluded. The average attendance in both groups may limit the study's ability to determine the true effectiveness of yoga, but this pragmatic trial highlights the potential limitations of undertaking yoga in the community.

The current study supports previous research suggesting yoga may have a beneficial effect in reducing stress and anxiety. Stress is a growing and significant public health problem that results in important physiological, emotional, social and economic consequences to individuals, their family and the community at large. For individuals looking for self-help interventions to assist with the management of their stress and anxiety, yoga and relaxation may provide viable treatment modalities for relieving these symptoms.

Future research could examine the therapeutic effects of the individual interventions, as well as other styles of yoga. Studies incorporating a wait list control could examine the effects of spontaneous remission, and confirm that observed changes in health status may be credited to the interventions and not to other confounding variables. Further studies are required using larger samples and longer periods of follow-up with the possible inclusion of biochemical studies as objective measures of

health to determine an outcome endpoint for mind body treatments.

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