

Efficacy of Yoga and Swimming in Reducing Anxiety: A Comparative Study

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(Received May , 2011)

(Accepted December, 2012)

Abstract:

Different exercise modules and yogic practices have been claimed to reduce anxiety. However, there are very few longitudinal studies to assess and to compare improvement in mental health of subjects performing yogic asanas and breathing exercises versus those performing endurance exercises like swimming. Therefore, present study was designed to compare reduction in anxiety levels with yogic postures and breathing exercises with that of swimming.

This study was conducted in the Department of Physiology. Study design used was prospective randomized comparative Study. Hundred volunteers were included in the study and randomly divided into two groups; one practiced yogic asanas and breathing exercises and other practised swimming for 12 weeks. Beck's Anxiety Inventory was used to assess anxiety level of subjects. Anxiety levels were assessed prior to the training and then after 12 weeks of training. The total score was calculated from 21 items and high scores indicated higher anxiety levels. The average anxiety scores decreased significantly ($p < 0.0001$) in both the groups after training. In yoga group, average pretraining score of 24.25 decreased to post training score of 20.27, whereas in swimmer group it decreased from 23.57 to 20.8. However, the decrease in anxiety was similar with both modalities of exercise ($p > 0.05$).

Key Words: Anxiety, Exercise module, Swimming, Yoga.

Introduction:

Anxiety is pathological when excessive and persistent, or when it no longer serves to signal danger. It is often considered to be a major component of unhealthy lifestyle and possibly contributes significantly to the pathogenesis of not only psychiatric but also systemic disorders such as cardiovascular disease, diabetes mellitus and bronchial asthma (Gupta et al, 2006).

The vast majority of studies have shown decrease in tension and depression with acute bouts of moderate intensity exercise (Berger & Motl, 2000). Moderate intensity exercise might not optimize fitness and sport training benefits, but it had consistently been associated with desirable mood changes (Berger & Owen, 1988). Many studies have proved efficacy of yoga in reducing anxiety (Gupta et al, 2006; Brown & Gerbarg, 2005).

However, randomized prospective comparative studies between effects of endurance exercises and yoga (postures and pranayama) on reduction in anxiety are few. Therefore, the present study was undertaken to evaluate and compare the efficacy of swimming and yoga as modules (1 hour daily, 6 days a week) for reducing anxiety.

Material and Methods:

Study Set Up:

The study was conducted in the Department of Physiology in Post Graduate Research Laboratory, Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha in co-ordination with "Anekant Swadhyaya Mandir (Yoga Centre)", Ramnagar, Wardha and "Municipal Swimming Pool", managed by Police Welfare Fund, Civil Lines, Wardha.

Study Groups:

Healthy males and females with normal physical examination and with sedentary occupations between 18 and 40 years of age were included in the study. The volunteers from the general populations were motivated to participate in the study by explaining plan of the study to them. The subjects were included purely on the voluntary basis. After screening and fulfilments of inclusion and exclusion criteria, volunteers were included in the study. Initially 100 volunteers were recruited but at the end of the study, Yoga group consisted of 41 subjects ($n=41$) out of which 16 were males and 25 females. Swimmer group comprised of 40 subjects with 18 males and 22 females. Volunteers had not been engaged in yoga practice or swimming nor were they doing any physical exercise at least during 3 years preceding the study. Subjects in non-sedentary occupations, smokers, alcoholics, pregnant female, postoperative patients and subjects suffering from any hernia, cardiovascular disorder, any active respiratory

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tract infection or history of respiratory tract infection during previous 6 weeks, were excluded from the study by detailed history and thorough clinical examination.

Study Protocol:

Clearance of Institutional Ethics Committee was obtained. After selection of the subjects, they were explained about the detailed plan of work and aim of the present research project. A written informed consent was obtained from them.

One hundred volunteers were divided into cohorts of 10 subjects each and were randomly assigned (block randomization) to undergo either yogic training or swimming for a duration of 12 weeks. Before the actual training period, baseline parameters were recorded in a week's time for one cohort. In the same week the subjects of that cohort were motivated for the exercise regimen they had to follow during the entire 12 weeks period. After 12 weeks exercise by all ten subjects in that cohort, all the parameters were studied again. After baseline parameters were recorded for one cohort and the training started for that cohort, the next cohort was subjected to the same treatment. Out of the 100 subjects, 9 from the yoga group and 10 from the swimmer group dropped out in due course of the study. Thus, at the end of the study, data of 41 subjects from yoga group and 40 subjects from swimming group were analyzed.

The subjects of yoga group were instructed not to practice any yogic technique other than the prescribed ones and swimmer group was advised to refrain from other physical exercises during the study. We supervised the subjects early in the morning (5.00 - 6.00 a.m) during yoga classes and swimmers from 6.00 – 7.00 a.m. every day during the training period. Participants of both the groups were allowed to do their routine activities during the study period.

The subjects were taught yogasanas and pranayamas and then they practised the same, 6 days/week for 60 minutes daily, for a total duration of 12 weeks. Iyengar yoga techniques were followed by the yoga trainers (Iyengar, 1995). Different yogasanas (yogic postures) viz. tādāsana, konāsana, utkatāsana, sarvāṅgāsana, halāsana, chakrāsana, padmāsana, dhanurāsana, makarāsana, pashchimottānāsana, vajrāsana, virāsana and shavāsana were practiced for 40 minutes and pranayamic breathing exercises with purak, rechak and kumbhak, anulom-vilom, bhastrikā, bhramari prānāyām and kapalbhāti were practised for 20 minutes. Swimming was practiced 6 days/week for

60 minutes daily. Swimming comprised freestyle in first 6 weeks (including training in first 2-3 weeks) and freestyle and breast stroke in last 6 weeks including 10 minutes of floating on the water. For novice swimmers, continuous swimming for 60 minutes is difficult; therefore, intermittent floating with deep slow breathing was introduced. It also helped to keep similarity with yoga group who practiced shavāsana for 10 minutes (Lying still and relaxed with slow deep breathing). An important limitation of the methodology was inability to compare the intensities of two modalities of exercise during 12 weeks duration. This inability was because of the fact that unlike endurance exercise, intensity of exercise for yogic asanas and pranayama is not directly related with exercise and post-exercise heart rates.

Measurement of Anxiety:

Beck's Anxiety Inventory (BAI) was used for the assessment of anxiety levels of subjects of both the exercise groups. Beck's Anxiety Inventory scale has good reliability and validity with high internal consistency and item-total correlations ranging from .30 to .71 (median=.60) and the correlations of the BAI with a set of self-report and clinician-rated scales are also all significant. Each subject was properly explained the procedure for filling the inventory; they filled the inventory during initial visit for basal parameters recordings prior to the training and post-training parameters after 12 weeks of training.

The inventory consisted of 21 questions, which the subjects were asked to fill within 10- 20 minutes. Against each question; columns labelled 0,1,2,3 were printed and subjects were required to mark (√) in the column which they felt appropriate.

The total score of each column helped in calculating the grand total of all 3 columns. The total score for all 21 questions was calculated. High scores indicated higher anxiety levels. Maximum grand score attainable was 63. A grand total between 0-21 indicated very low anxiety, between 22 and 35 indicated moderate anxiety and a score that exceeded 36 was considered a potential cause for concern (Beck et al, 1988).

Statistical Analysis:

All the data obtained was presented group-wise by descriptive statistics using mean, and standard error of mean. For differences in sex-wise composition of two study groups, Chi squared test was used. For each parameter in both yoga and swimming groups before and after training period of 12 weeks, data

distribution was tested for normality of distribution by Kolmogorov Smirnov test. As the data distribution was not normal, data were log converted and again tested for normality of distribution.

As the data distribution (Anxiety scores and log converted data) was not normal, the paired data before and after the exercise for both yoga and swimming groups was tested by Wilcoxon signed rank test.

The change in anxiety scores with exercise was studied by calculating delta i.e. difference in value before and after the exercise of both modalities. The percent change was also calculated for each parameter as percentage of change with respect to pre exercise level score. Percentage increase or decrease in value of a parameter (delta) with yoga and swimming was also compared using Mann Whitney U test as data distribution was not normal.

The statistical significance was considered at probability value less than 0.05.

The statistical calculations were done using Data Analysis tool of Microsoft Excel and Systat 12 (Systat Software, Inc. Chicago).

Results:

Yoga and swimming groups were statistically comparable with respect to age and sex distribution as shown in Table I. The average anxiety scores decreased significantly with both modalities of exercise after 12 weeks training (Wilcoxon signed rank test, $p < 0.0001$). The decrease in average anxiety scores were similar in with both yoga and swimming (Mann Whitney U test, $p > 0.05$) as shown Table III.

Table I: Comparison of the yoga and swimming groups

	Yoga (n=41)	Swimming (n=40)	Statistical significance
Age (years) (Mean ±S.E.)	28.439 ± 1.41	27.7 ± 1.35	$t = 0.7338, df = 79$ $p = 0.7067$
Males (n)	16 (39.0%)	18 (45%)	$\chi^2 = 0.2968, df = 1$
Females (n)	25 (61.0%)	22 (55%)	$p = 0.5858$

Discussion:

Decrease in anxiety scores were observed following 12 weeks of yoga as well as swimming with almost similar effects with both yoga and swimming though percent improvement in anxiety scores was slightly better with yoga. Thus the hypothesis that a

Table II: Effects of exercise on Anxiety scores of Beck's Anxiety Inventory in yoga and swimming groups

Parameter	Exercise Modality	Baseline before exercise (Mean ± SEM)	After 12 weeks (Mean ± SEM)	Wilcoxon signed rank test
Anxiety score (Beck's)	Yoga (n=41)	24.25 ± 0.936	20.275 ± 1.084	$z = 5.19$ $p < 0.0001$ **
	Swimming (n=40)	23.575 ± 1.062	20.8 ± 1.014	$z = 5.3$ $p < 0.0001$ **

** Highly Significant ($p < 0.0001$)

Table III: Comparison of effects of exercise on Anxiety scores of Beck's Anxiety Inventory in yoga and swimming groups

Parameter	Exercise Modality	Change in anxiety scores after training (Percentage)	Mann-Whitney U-test
Anxiety score (Beck's)	Yoga (n=41)	-3.975 (-16.39%)	$z = -1.73$
	Swimming (n=40)	-2.775 (-11.77%)	$p = 0.0836$

change in anxiety would be different with yoga and swimming was not supported.

The vast majority of studies have shown decrease in tension, depression, anger, and confusion associated with acute bouts of moderate intensity exercise. Moderate intensity exercise may not optimize fitness and sport training benefits, but it has consistently been associated with desirable mood changes (Berger & Owen 1988; Cox et al, 2001).

Short term mood improvements have also been reported after the yoga classes. Yoga produces many beneficial emotional, psychological and biological effects and it may be easy to implement (Shapiro et al, 2007; Patel & North, 1975). Shavasan, a yogic relaxation posture, has been reported to control psychophysiological stress (Patel & North, 1975; Bera et al, 1998).

There is an altered autonomic homeostasis in response to real life stressors with a shift towards cardiac sympathetic activation and vagal withdrawal. This shift towards sympathetic may be the reason of anxiety (Srinivasan et al, 2006). Cardiac autonomic modulation at rest in subjects engaged in regular exercise goes in parasympathetic favour with substantial increase in high frequency (HF) component of heart rate variability and reduced Low frequency/High frequency ratio (Sandercock et al, 2005). Decrease in sympathetic activity has also been reported

in subjects doing yoga practice (Vempati & Telles, 2002). This favourable autonomic modulation in subjects engaged in physical activity may be responsible for reduced response to stress in the form of reduced anxiety.

With limitation of measuring intensity of exercise in yoga for comparison with swimming (as heart rates in yoga postures and pranayams are not intensity related), the evaluation of swimming and yoga as modules for reducing anxiety was done in the present study. However, the time for the intervention in both modes was same (1 hour daily, 6 days a week for 12 weeks). We found similar reduction of anxiety by these two modules of exercises though the results of the present study needs further confirmation on a larger sample size as adequacy of sample size was not tested in the present study. Similarly inclusion of only randomly selected subjects in such type of longitudinal study from general population is difficult (though included subjects were randomly assigned to two modalities of exercise) and, therefore, generalization of the results of present study must take into account this limitation.

Our finding that reduction in anxiety is similar with swimming and yogic exercise module is consistent with the finding of Cox (2000) who have reported that change in anxiety is not associated with mode of exercise. However, Berger & Owen (1988) and Steptoe & Cox (1988) have proposed that modes that are more aerobic, noncompetitive, more predictable, and repetitive are believed to promote a greater degree of stress reduction. While acute bouts of aerobic exercise are associated with immediate or delayed anxiolytic effects, resistance exercises such as recreational weight lifting does not seem to reduce the anxiety (Raglin et al, 1993; Koltyn et al, 1995). Sime (1977) has reported that the physiological response to stressors in reducing heart rate and electrodermal response is better with exercise than with meditation. Bahrke & Morgan (1978) have found that acute physical activity, noncultic meditation, and a quiet rest session are equally effective in reducing state and trait anxiety.

In conclusion, yoga (yogic postures and pranayama) as well as swimming significantly reduce anxiety within 12 weeks. However, reduction in anxiety is similar with both yoga and swimming. Therefore, both yoga and swimming can be advocated for alleviation of anxiety. In addition, other factors like cost effectiveness, facilities for recreational exercise, physical constraint, training facilities and ability of any

exercise regime to keep continued motivation and interest of the trainees should also be taken into account for exercise prescription.

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Source of Support : Nil.

Conflict of Interest: None declared.