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IMPROVEMENT IN OXIDATIVE STATUS WITH PRANAYAMA IN YOUNG HEALTHY FEMALES

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ABSTRACT

Background: The modern living lifestyle is known to produce various physical & psychological stresses & subject the individual to produce oxidative stresses as well. The aim of the present study is to assess the effect of pranayama on the antioxidant status of the body. **Methods:** Thirty female volunteers between 18-21 years who were enthusiastic for yoga and the design of the study were of prospective type. They exercised daily for 40 minutes under supervision by yoga expert at the yoga OPD of SMS hospital, Jaipur for 8 weeks in the morning hours. The control group was a group of 30 ages, sex matched sedentary volunteers. The subjects of both experimental as well as control group were studied for estimation of superoxide dismutase (SOD) activity and lipid peroxide levels. The blood samples were collected at the start of the experiment and at the end of the exercise and control groups. **Results.** The results showed a significant decrease in the plasma levels of free radicals, indicating a reduction in free radical-mediated stress. The activity of superoxide dismutase (SOD) was found to be increased from a pre-training level of 11.59 units/mg protein. **Conclusion.** Pranayama and meditation can have a positive impact on the free radical status of a body. By selectively breathing through either nostril, sympathetic or parasympathetic activity can be altered, providing therapeutic implications for stress management and metabolism regulation.

Keyword: SOD, free radicals, pranayama

INTRODUCTION:

Chikungunya Yogic techniques produce remarkable psychological changes and have sound scientific basis **(1, 2, 3).** Pranayama, the fourth step of ashtang yoga is important component yoga training. The paradox of aerobic life is that aerobic organic cannot exist without oxygen, yet oxygen also happens to be

inherently dangerous to their very existence. The reductive environment of the cellular milieu provides ample opportunities for oxygen to undergo unscheduled univalent reduction. Thus the superoxide anion radical, hydrogen peroxide and the extremely reactive hydrogen radical are common products of life in an aerobic environment, and these agents are responsible for oxygen toxicity **(4).** To survive in such an unfriendly oxygen environment, living organisms generate or garner from their surroundings a variety of water and lipid-soluble antioxidant compounds. Additionally, a series of antioxidant enzymes whose role is to intercept and inactivate reactive oxygen intermediate, are synthesized by all known aerobic organisms. Although extremely important, sometimes the antioxidant enzymes and compounds are not completely effective preventing oxidative damage. To deal with the damage that does still occur, a series of damage removal/repair enzymes, for proteins lipid & DNA, are synthesized. Since oxidative stress may vary from time to time, organisms are able to adapt to such fluctuating stresses by inducing the synthesis of antioxidant and damage removal/ repair enzymes **(5).** With increased awareness and interest in health and natural remedies, yogic techniques including pranayama are gaining importance and becoming increasingly acceptable to the scientific community. There is evidence that pranayama training produces deep psychosomatic relaxation **(1, 6).**

Understanding the impact of pranayama on the antioxidant status of the body is crucial for unraveling the potential health benefits of yogic practices. By examining the changes in lipid peroxide levels and SOD activity, this study aims to shed light on the effects of pranayama on oxidative stress and the body's defense mechanisms against it. The findings could contribute to a better understanding of the role of pranayama in promoting overall well-being and provide insights into its potential application as a natural strategy for combating oxidative stress-related conditions.

METHODS:

The present study was conducted in the Department of Physiology in collaboration with the Department of Biochemistry, SMS Medical College, Jaipur. The cases selected for this study were 30 female volunteers' between18-21 years that were enthusiastic for yoga and the design of the study was of prospective type. The control group was a group of 30 ages, sex matched sedentary volunteers. The methodology of the study was explained to them and informed consent was taken. Only those volunteers were selected who did not have history or clinical symptoms of any disease and did not indulge into any addiction like alcohol, smoking or tobacco in any form. Pregnant subjects were excluded.

The subjects were given training in pranayama and relaxation techniques. They exercised daily for 40 minutes under supervision by yoga expert at the yoga OPD of SMS hospital, Jaipur for 8 weeks in the morning hours. At the start of the study blood sample were collected of the subjects of both experimental as well as control group for estimation of SOD activity and lipid peroxide levels. Similarly a sample of blood was taken at the end of 8 weeks of the study.

The objective of exercise was to improve the stress adaptability of the subjects various exercise were so

chosen so as to achieve the stated objectives. Exercises carried out were pranayama, which included- Kapalbhati kriya, Dheerag swas preksha, Anulom-vilom, Bhramari and 'Om' chanting. At the end of the pranayama session, subjects took up practice of Meditation. They were made to sit in a comfortable asana- Sukhasana or padmasana.

RESULTS:

The lipid peroxide (MDA) contents were estimated according to the modified method by Ohkawa et al **(7).** SOD was measured by the modified method of Mc Cord and Fridovich **(8).**

Statistical analysis of the work was carried out using students paired t-test. The P value, Mean and standard deviation of the data were determined.

Table 1: MDA and SOD levels in the study group

Yoga group (n = 30)	**Before pranayama (Mean ± S.D.)**	**After pranayama (Mean ± S.D.)**	**P value**
M.D.A X 10^{-6} mole/ml	9.57±0.55	8.20±0.77	<0.01 Very significant
SOD Units/mg protein	11.59±3.15	13.05±2.67	>0.05 Not significant

Table 1 presents the MDA and SOD levels in the yoga group. Before pranayama training, the mean MDA level was 9.57 ± 0.55 x 10^(-6) mole/ml, which decreased significantly to 8.20 ± 0.77 x 10^(-6) mole/ml after pranayama training ($p < 0.01$). This decrease in MDA levels indicates a reduction in lipid peroxidation, suggesting a decrease in oxidative stress. On the other hand, the SOD levels in the yoga group showed no significant change before (11.59 ± 3.15 units/mg protein) and after (13.05 ± 2.67 units/mg protein) pranayama training ($p > 0.05$).

Table 2: MDA and SOD levels in the control group

Control group (n = 30)	**At the start of study (Mean ±S.D.)**	**At the end of study (Mean ± S.D)**	**P value**
MDA X 10^{-6} mole/ml	9.31±0.64	9.06±0.55	>0.05 Not significant
SOD Units/mg protein	11.94±3.15	12.95±2.67	>0.05 Not significant

Table 2 displays the MDA and SOD levels in the control group. There were no significant changes in the MDA levels between the start of the study (9.31 ± 0.64 x 10^(-6) mole/ml) and the end of the study (9.06 ± 0.55 x 10^(-6) mole/ml) ($p > 0.05$). Similarly, the SOD levels in the control group did not show any significant differences before (11.94 ± 3.15 units/mg protein) and after (12.95 ± 2.67 units/mg protein) the study ($p > 0.05$).

The results indicate that pranayama training led to a significant decrease in MDA levels, indicating reduced lipid peroxidation and oxidative stress in the yoga group. However, there were no significant changes in SOD levels, suggesting that pranayama did not affect the antioxidant enzyme activity in this study.

It is important to note that the control group did not undergo any intervention and showed no significant changes in MDA and SOD levels, indicating that the observed changes in the yoga group were likely attributable to the pranayama training rather than natural variations over time.

DISCUSSION:

Pranayama breathing has been shown to alter the autonomic activity. Telles et al have demonstrated that pranayama breathing through right hostril results in an increase in sympathetic activity whereas left nostril breathing reduces it **(9).** Raghuraj et al has reported that slow pranayama (Anulom-vilom) increases parasympathetic activity whereas fast pranayama (Kapalbhati) increases the sympathetic activity **(10).** Pranayama is a yogic breathing practice, which is known experimentally to produce a profound calming effect on the mind. They are well known for their effect on relieving mental **stress (11, 12, 13)**. In the present study emphasis has been given on the breathing exercise and Meditation. Both of them are considered to be relaxation methods, which helps a person to de-stress.

These results suggest that breathing selectively through either nostril could have a marked relaxing effect on the sympathetic nervous system. The therapeutic implications, being able to alter metabolism by changing the breathing pattern **(14).** Practice of such technique not only helped the subjects to de-stress but also improved their response to further stressful stimulus.

The plasma lipid peroxide level showed a significant change from pre-training level of 9.57 nm/ml to a post-training mean value of 8.20 nm/ml (P value <0.01) in the exercise group as compared to a non-significant change in the control group. This implies that there was a decrease in the production of free radicals following yogic practice. Lipid peroxidation is a free radical mediated phenomenon and plasma lipid peroxidation level may reflect the degree of free radical mediated stress. **(15)**

Moreover the activity of SOD was found to be an increased from a pre training level of 11.59 units/mg protein. However, this change was not found to be statistically significant, but it does show a tendency to increase in value. In the control group there was a similar increase from 11.94 to 12.95 units/mg protein.

This study implies that the products of lipid peroxidation decrease with yogic exercises viz. pranayama and meditation. Free radicals are produced secondary to various stimuli-biological, chemical and environment **(16).**These stimuli include any form of stress, either physical or mental to the biological system.

CONCLUSION

In conclusion, the present study provides evidence that the practice of pranayama, a component of yoga training, can have a positive impact on the antioxidant status of the body. The results showed a

significant decrease in lipid peroxide levels, indicating a reduction in free radical-mediated stress, following eight weeks of pranayama exercises and meditation. Additionally, although not statistically significant, there was a tendency for an increase in the activity of superoxide dismutase (SOD), an antioxidant enzyme.

The findings support the idea that pranayama breathing techniques, which have been shown to modulate autonomic activity, can induce a profound calming effect on the mind and help relieve mental stress. By selectively breathing through either nostril, sympathetic or parasympathetic activity can be altered, providing therapeutic implications for stress management and metabolism regulation.

The observed decrease in lipid peroxide production and the potential increase in SOD activity suggest that pranayama and meditation contribute to improving the free radical status of the body. These practices may play a role in reducing oxidative stress-induced damage caused by various stimuli, including physical and mental stressors.

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