

International Journal of Agriculture Extension and Social Development

Volume 7; SP-Issue 10; October 2024; Page No. 35-39

Received: 24-07-2024
Accepted: 30-08-2024

Indexed Journal
Peer Reviewed Journal

Study on the impact of pranayama cum aerobic training of college students on body fat

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DOI: <https://doi.org/10.33545/26180723.2024.v7.i10Sa.1223>

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Abstract

The purpose of the present study was to analyze the impact of pranayama on selected physical fitness variable during aerobic training on 60 male college students of Veterinary College, Hassan, Karnataka, India age 18 to 23 years during 2018 to 2022. The sixty students were grouped into 2 major groups (30 each) out of which 30 sedentary type and another 30 active type.

The sedentary group, was equally categorized as 2 each (15 members in each subgroup), one sedentary sub group given only aerobic training while another subgroup practiced both aerobic followed by pranayama. The same was followed for aerobic group also. After the training body fat of participants was determined. It was interesting to note that practicing aerobic followed by pranayama for 6 days in week for 12 weeks by active groups revealed drastic reduction in body fat percent of 14.70 compared to sedentary group receiving both training that was only 5.41%. Pranayama practices in college students brought significant changes on percent body fat of both active and sedentary college male students due to the effect of aerobic exercises.

Keywords: Aerobic training, pranayama, percent body fat, active, sedentary

Introduction

Sedentary and inactive people should be given opportunities to become physically active and those who are minimally active should be supported in doing more. For some people, it may be difficult to find time for sports or regular visits to the gymnasium. However, making small changes to daily routines can help these individuals reach the recommended amount of physical activity like aerobic exercises, yoga etc. Although all forms of physical activity provide some benefits, aerobic exercise is particularly effective because it causes the heart and lungs to work harder than usual. National physical activity guidelines recommend at least 150 minutes of moderate intensity or 75 minutes of high intensity aerobic activity every week. Aerobic exercise provides a wide range of benefits for the body and brain. Current recommendations for physical activity in adults are as follows: at least 150-300 minutes per week of moderate-intensity, 75-150 minutes per week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Adults should also perform muscle-strengthening activities of moderate intensity or higher that involve all major muscle groups for 2 or more days per week. The elderly should perform additional balance training and fall prevention exercises more than 3 times a week. Children and adolescents should perform at least 1 hour of moderate-to-vigorous physical activity daily, which includes vigorous aerobic activity at least 3 days per week. As part of their 60 minutes or more of daily physical activity, resistance

training and bone strengthening exercise should be done at least 3 days per week. According to new evidence, one bout of any exercises can be shorter than 10 minutes. Aerobics is a type of exercise that has many benefits for the body. The first area that benefits is overall wellness. It includes five dimensions physical, social, intellectual, occupational, and spiritual. The physical dimension of wellness includes developing cardiovascular endurance, body composition, strengths and flexibility. All these dimensions are foundational for a health. Aerobics programme can increase the quality of life for all people with special need and contributed to their socialization by spending quality, time with them ^[1].

Aerobics exercise programme can be applied for preventions and remedial purpose. The movements' therapy is used for a person of various ages and physical readiness. It established the person psycho motors integrity undermined by the acquired or congenital impairment. This type of exercise amiable the performance of movements and motoric exercise of sports person in a unique way. Numerous studies have examined the effect of aerobic exercise training on physical and mental health. Thus aerobic exercise can decrease visceral and subcutaneous fat more effectively than other exercise methods. Even though moderate exercises enhance health conditions, there are recent and consistent evidences that high intensity or strenuous exercises have even more significant positive effects on lipid profile. Importantly, whereas fitness tends to be quite specific, many health benefits can be gained from

any form of aerobic exercise. Additionally, the health gains can be achieved from relatively moderate amounts of exercise, moving from a lifestyle involving no exercise to one that involves some exercise can lead to substantial improvements in health. Aerobic exercise burns up energy (calories). Regular sessions of 30 to 60 minutes of low to moderate intensity aerobic exercise (at around 55 to 70 percent of maximum heart rate) can be an important part of a weight loss or weight management programme that is also mindful of the energy (calories) consumed as food. However, many of the health benefits associated with aerobic exercise occur independently of weight loss. Evidence from large studies has shown that active, overweight people do not have a greater risk of many diseases than inactive people who are not overweight. From a health perspective, it is of course best to be both active and a healthy weight [2].

Promoting physical activity and reducing sedentary time in males can be challenging, and interventions tailored specifically for males are limited. Understanding male perceptions of physical activity and sedentary behavior is important to inform development of relevant interventions, especially for males studying in colleges. Regular aerobic activity, such as walking, bicycling or swimming, can help you live longer and healthier. Regardless of age, weight or athletic ability, aerobic activity is good for everyone. Aerobic activity has many health benefits, no matter of age. As their body adapts to regular aerobic exercise, they will get stronger and fitter. The effect of aerobic exercises with and without pranayama practices induced adaptation on selected health related physical fitness, physiological and psychological factors of active and sedentary college men [3].

Yoga is a spiritual, mental, and physical discipline-based activity practised thousands of years ago and originated in India. Yoga is a science-rich unique holistic approach that focuses on harmony between mind and body. Recent research has demonstrated that breathing and meditation practices provide active attentional benefits. A positive effect of yogic asana practices on the different elements of body composition especially body fat percentage [4, 5]. Yoga is also considered an exercise that could be beneficial for weight loss. Yoga can be practiced by people of all body types and fitness levels because it involves slow movement, postures, and stretching repetitions [6].

Body fat percentage is a crucial indicator of obesity that decreased dramatically in the intervention done by The study evaluated the effects of a 12-week yoga interference on body composition, including relative body fat percentage. The intervention consisted of a 50-minute yoga class 2 times per week for 12 weeks. After the yoga intervention, the results found a 0.7 (0.9 - 1.5) decrease in BF % [7].

In another study, around 60 healthy female volunteers (age 16-18 yrs) were screened randomly from Midnapore District, West Bengal, India, divided into two groups: (a) Yoga Group (n = 30) and (b) Control Group (n = 30). Yoga training - 60 min/d, 06 d/wk for 12 wks was followed in yoga group with no yoga training in control group. Yoga training for the experimental group included prayer, yogic

sukshma vyayam, surya namaskar, supta Pawan muktasana, pranayama (kapalbhati, mahabandha, ujjayi & bhramari pranaya). Significant reduction ($p < 0.05$) in body fat, was noted in the yoga group after 12 weeks of yoga training when compared to baseline data from 19.3 to 15.6 percent. Further, the control group had significantly ($p < 0.05$) higher body fat (18.5 to 19.1%). It can be suggested that yoga practice may reduce body fat [8]. The study was conducted at a non-residential one-week long yoga camp and involved 51 males and 64 females aged between 18-60 years. Participants were expected to be on a homemade lacto-vegetarian diet and advised to restrict sugar, salt and fat intake. The protocol of yoga therapy included warmup exercises, pranayams, backward, forward and side bending and twisting asanas followed by shavasana and meditation. The participants underwent 1.5 hours daily yoga program for seven days under supervision of certified yoga professionals. Pre and post camp parameters were assessed by recording body fat percentage. The body fat percentage reduced by 0.79 and 0.61% in male and female groups, respectively. A seven-day yoga intervention does cause some reduction in body fat percentage, but regular yoga for longer durations may be required for tangible, sustained reduction in these parameters to benefit the individual [9]. Female college students, aged 19 to 24 were participated for an 8-week low-impact aerobics and yoga combo program and body fat percentage decreased from 34.1 percent to 30.5 percent on average. The 8-week low-impact aerobics and yoga combo program was beneficial in reducing fat percentage by 10.56 percent on average [10]. Healthy male volunteers (age 18-20 years) of 60 numbers were screened randomly divided into two groups:

(a) Yoga Group (n = 30) and (b) Control Group (n = 30). Yoga training (60 min/d, 06 d/wk for 12 wks) was followed in yoga group with no yoga training in control group. Significant reduction in body fat percent was noted in the yoga group after 12 weeks of yoga training from 16.4 to 12.7 (reduction of 22.6%) when compared to control group of 17.8 to 18.6 (increase of 4.49%). The reduction in body fat might be due to yoga training [11].

Forty women of average age 50.07 ± 6.3 who lead a sedentary lifestyle from Lairikyengbam Leikai, Imphal East District Manipur were randomly minimized into two groups and assigned to aerobic and yoga training respectively. Aerobic and Yogic training was given to the participant for a continuous series of 8 weeks, 3 days/weeks. Each training session lasted for about 45-60 minutes with 10 minutes warm up and 5 minutes cooling down and 25-35 minutes' main activity. The load of training progressed gradually after completion of every 4 weeks. The training begins from 50- 60% intensity during the first-four weeks and increases upto 60-70% in the second-four weeks while maintaining the heart Rate. Aerobic training was composed by a sequence of aerobic exercises steps practiced at rhythm of music and yogic training composes of asanas and pranayama only. Body fat percent measurement was obtained before the commencement of training as baseline using bioelectrical impedance analyzer (BIA) methods and after 8 weeks training, the same measurement was taken as final measurements. Aerobic and yoga showed body fat

reduction of 2.2 and 2.1, respectively. Both aerobic and yoga can be practices for reduction of body fat percent ^[12].

Materials and Methods

About the participants

Sixty male college students of Veterinary College, KVAFSU, Hassan, Karnataka, India of age 18 to 23 years were selected during 2018 to 2022. These sixty students were grouped into 2 major groups (30 each) out of which 30 were active type and another 30 were sedentary type. Among the major groups of sedentary type and active type participants, 2 subgroups were made in which 15 were given only aerobic training while another 15 received aerobic cum pranayama training for a period of 12 weeks in the morning session.

Training Program

A general warm-up was performed by the participants before performing aerobic exercise and pranayama practices. Cool down exercises were performed after each session. All participants were instructed not to start any specific training programs during the 12-week period and to only perform their usual activities. Prior to the study, procedures and guidelines were presented orally and in written form. The experimental groups trained at the same time of day in the morning session, six days a week throughout the study. During the training, all participants were under direct supervision and were instructed on how to

perform each exercise.

The training regime for the major groups i.e., sedentary and active groups, lasted for twelve weeks for six days per week. Of the thirty sedentary participants 15 participants performed aerobic training only where as another 15 underwent aerobic training followed by pranayama practices. Similar regime was adopted for 30 participants of active group. The subgroups of sedentary and active groups did aerobic workout only as prescribed in Table 1. The subgroups of sedentary and active groups who practiced aerobic training with pranayama followed both Table 2 and Table 3.

Aerobic exercise regime

The experimental groups performed aerobic exercise, alternatively six days in a week for twelve weeks. In this present investigation continuous running was given as aerobic exercise. To fix the training load for the aerobic exercise group the participants were examined for their exercise heart rate in response to different work bouts, by performing continuous running of five minutes' duration for proposed repetitions and sets, alternating with recovery based on work-rest ratio. The participant's training zone was computed using Karvonen formula and it was fixed at 80%HRmax. The work rest ratio of 1:1 between repetitions and 1:2 between sets was given. The training protocol for aerobic exercise group is presented in tabular form.

Table 1: Aerobic exercise regime

Week	Day	Warm-up	Type of work	Intensity (% HR max)	Work Period			Recovery between		Cool down
					Duration (min.)	Sets x Rep	Volume/week (min.)	Sets	Repetition	
I II	Mon	and	nuous	80	5	2x3	180	1:2	1:1	Exerci
	Tue									
III	Wed									
	Thu									
	Fri									
	Sat									
IV V VI	Mon									
	Tue									
	Wed									
	Thu									
	Fri									
VII VIII IX	Sat									
	Mon									
	Tue									
	Wed									
	Thu									
X XI XII	Fri									
	Sat									
	Mon									
	Tue									
	Wed									
	Thu									
	Fri									
	Sat									

Pranayama Practices

During the training period, the participants of aerobic training with pranayama practices group (active & sedentary group) performed pranayama practices six days a week for twelve weeks after completion of their aerobic training workout. The pranayama practices included in this training

programme were Anuloma Viloma, Nadi Suddhi, Ujjai, Suryadedana, Bhastrika and Kapalabhati respectively. The training programme was conducted in the morning sessions from 6 `O'clock onwards. The training load was progressively increased once in three weeks. The training schedule and the methods of performing the selected

pranayamas are briefed in tabular form.

Table 2: Type of pranayama practice followed

Weeks	List of Yogasanas	Duration (min.)	Frequency	Stretching exercise (min.)
I to III	Anuloma	15	Monday Tuesday Wednesday Thursday Friday Saturday	10
IV to VI	Viloma	20		
VII to IX	Nadi Suddhi	25		
X to XII	Ujjai Suryadadana Bhastrika Kapalabhati	30		

Collection of the data

The data on body fat was collected two days before (pretest) and after (posttest) the experimental period of 12 weeks.

Measuring of body fat pf participants

The participant was asked to stand erect. The skin fold measurements were taken of three sites namely chest, abdominal and thigh. The skin fold was grasped between the thumb and index finger about one centimeter from the site at which caliper was to be applied above the finger holding the skin fold. All measurements were made to the nearest millimeter. The percent body fat was found out by applying the formula, Brozek (1963) ^[13] formula - $BF = (4.57/\rho - 4.142) \times 100$

$$\text{Percent Body } \phi \alpha \tau = \frac{4.570}{\text{Body Density}} - 4.142 \times 100$$

Body Density (BD) was calculated by using the following formula ^[14]:

$$\text{Body Density} = 1.1093800 - (0.0008267) (X) + (0.0000016) (X^2) - 0.0002574 \times \text{age}$$

Where X=the sum of chest, abdominal and thigh skin fold measurements

Statistical Analysis

All the values obtained in the result of the present study were average of three trials. The data was analysed using R software (R-4.3.1 for Windows) ^[15] for statistical computing. ANOVA tables were prepared to analyse the data and the critical difference was calculated ($P=.05$) and used to identify the significant differences that are indicated in the result tables through superscripts. The formula for the critical difference (CD) was

$$CD = \sqrt{2 \times MSS(E)} \times t_{\alpha} @ 0.05 \text{ level of significance}$$

Where, MSS (E) = Mean Sum of squares of the error; r = number of replications; $t_{0.05}$ = table t from value at 0.05 level of significance.

Results and Discussion

The pre and posttest mean values on percent body fat of active and sedentary men performed aerobic training alone as well as aerobic training with pranayama practices are given in Table 3. Initially the percent average body fat of sedentary group with only aerobic was 22.12 that became 20.97 after aerobic exercise while in another subgroup

where aerobic cum pranayama was practiced, body fat in pretest 21.83 came to 20.65 after both the training practices. The difference was 1.15% in the aerobic while it was 1.18% in aerobic and pranayama of sedentary subgroup. In active group the initial body fat percent was 21.35 and 21.02 in aerobic and aerobic cum pranayama participants, that came down to 21.02 and 17.93, respectively after the respective training with difference of 1.85% and 3.09%. Statistically significant differences were noticed among the major groups as well as sub groups with respect to training programmes practiced by the participants. These results eventually indicated the need of both aerobic exercises and pranayama for college students to keep them active in their daily life.

Table 3: Effect of training on body fat of different groups

Groups	Training Type			
	Subgroups			
	Only aerobic		Aerobic + Pranayama	
	Percent body fat			
	Pre	Post	Pre	Post
Sedentary	22.12a	20.97a	21.83a	20.65a
Active	21.35b	19.50b	21.02b	17.93b
CD (P=.05)	0.82	1.52	0.85	2.76

Note

- All the values are average of 3 trials
- CD - Critical difference
- Different superscripts in the column indicate significant difference at $P=.05$ level.

The body fat percent reduction in sedentary aerobic subgroup was marginal and also very slight decrease was noticed in sedentary aerobic cum pranayama subgroup accounting for 5.21 and 5.41, respectively (Table 4). This may be assumed due to lower activity levels in the daily life of the group. But major reduction in body fat percent was clearly visible in both the subgroups of active group i.e., only aerobic and aerobic cum pranayama with values of 9.37 and 14.70, respectively. The reason behind this group of participants to shed the body fat may be due to their activities adopted in their life style.

Table 4: Reduction of percent body fat of different groups after training

Groups	Training Type	
	Subgroups	
	Only aerobic	Aerobic + Pranayama
	Percent body fat reduction	
Sedentary	5.21	5.41
Active	9.37	14.70

The present study showed substantial decrease in body fat percentage in male college students who participated in the training programme comprising of both aerobic exercises and pranayama, a part of yoga training. Only practicing aerobic exercises also reduced the body fat but addition of pranayama still helped in the burning of body fat, as depicted in this study. Many authors have supported the present study and their studies are quoted below. On par with present study national physical activity guidelines recommend at least 150 minutes of moderate intensity or 75 minutes of high intensity aerobic activity every week ^[1]. Aerobic exercise burns up energy (calories). Regular

sessions of 30 to 60 minutes of low to moderate intensity aerobic exercise (at around 55 to 70 percent of maximum heart rate) can be an important part of a weight loss or weight management programme that is also mindful of the energy (calories) consumed as food [2]. The effect of aerobic exercises with and without pranayama practices induced adaptation on selected health related physical fitness, physiological and psychological factors of active and sedentary college men [3]. Yoga is a spiritual, mental, and physical discipline-based activity practised thousands of years ago and originated in India. Yoga is a science-rich unique holistic approach that focuses on harmony between mind and body, also considered an exercise that could be beneficial for weight loss [5, 6].

The intervention of yoga consisted of a 50-minute yoga class 2 times per week for 12 weeks. After the yoga intervention, the results found a 0.7 (0.9 - 1.5) decrease in body fat percentage [7]. In another study, around 60 healthy female volunteers (age 16-18 yrs) of Midnapore District, West Bengal, when practiced yoga training - 60 min/d, 06 d/wk for 12 wks significant reduction in body fat, was noted in the yoga group after 12 weeks of yoga training when compared to baseline data from 19.3 to 15.6 percent. Further, the control group had significantly higher body fat (18.5 to 19.1%) [10]. The study was conducted at a non-residential one-week long yoga camp and involved 51 males and 64 females aged between 18-60 years. The body fat percentage reduced by 0.79 and 0.61% in male and female groups, respectively [8]. Female college students, aged 19 to 24 were participated for an 8-week low-impact aerobics and yoga combo program and body fat percentage decreased from 34.1 percent to 30.5 percent on average [9]. In healthy male volunteers (age 18-20 years) of 60 numbers significant reduction in body fat percent was noted in the yoga group after 12 weeks of yoga training from 16.4 to 12.7 (reduction of 22.6%) when compared to control group of 17.8 to 18.6 (increase of 4.49%) [11]. Forty women of average age 50.07±6.3 who lead a sedentary lifestyle from Lairikyengbam Leikai, Imphal East District Manipur were given aerobic and yogic training for 8 weeks, 3 days/weeks (45-60 min with 10 min warm up and 5 min cooling down and 25-35 min main activity). Aerobic and yoga showed body fat reduction of 2.2 and 2.1, respectively. The authors suggested that both aerobic and yoga can be practiced for reduction of body fat percent [12].

Conclusion

The present study helped to indicate that practicing aerobic exercises followed by pranayama by sedentary as well as active groups of male college students reduced their body fat. Thus both practices if applied in the daily routine of college students may significantly bring changes in their body composition and structure thus leading to a healthy life style which in turn aid in their studies. This study can be extended to both genders and to a larger group of college students and further to elder groups also.

Acknowledgement

The present study is a part of 1st author's dissertation work. The authors are indebted to the participants for taking part in the present study and to the Dean of Veterinary College, KVAFSU, Hassan, for providing the permission to use the sports ground for the training programme.

Conflict of Interest: None.

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