

COMPARATIVE EFFECTS OF YOGIC ASANAS AND AEROBIC TRAINING ON SELECTED PHYSICAL FITNESS AND PSYCHOLOGICAL VARIABLES IN ADOLESCENT BOYS



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Abstract

The purpose of the study was to investigate the influence of yogic asanas and aerobic training on selected physical fitness and psychological variables in adolescent boys. To conduct the study, 75 boys, participating in Physical Education activities in their respective schools, were selected from different schools in Malda District of West Bengal as subjects. The age of the subjects was between 16 to 18 years. Among the 100 students, 25 were selected for the control group (CG), 25 were selected for the Yoga group (YG) and the remaining 25 were selected for the Aerobic Exercise Group (AEG). Subjects of YG were treated for 12 weeks and with a frequency of three days (alternative days) per week of Yogic exercises, more or less 1.30 hours per day and subjects of AEG were treated for 12 weeks and with the same frequency of three days (alternative days) per week of Aerobic exercises, respectively, more or less 1.30 hours per day. No treatment was given to the subjects of CG. To determine the boys' Physical fitness status, the pre-test and post-test data of CG, YG and AEG were taken for speed, explosive leg power, abdominal strength and endurance. The POMS scale and the Rosenberg Self-Esteem Scale were used, respectively, to assess the psychological impact of the treatment on mood state and self-esteem. To find the significant difference between pre-test and post-test data on selected Physical Fitness and psychological variables, ANCOVA and a t-test were conducted at a 0.05 level of confidence, which was considered appropriate and adequate for this study. The interventions produced significantly different fitness improvements across groups, with the strongest effects in speed (50m dash) and power (SBJ), moderate effects in muscular endurance (SU), and suggestive effects in aerobic capacity (600m). These findings support differential intervention efficacy, particularly for anaerobic performance measures. Strong baseline prediction validates ANCOVA for both POMS and RSES measures. Interventions yield comparable mood benefits but diverge significantly in self-esteem enhancement (favouring CG per prior post-hoc).

Keywords: Yogic Asanas, Aerobic exercises, Physical Fitness, Mood-state and Self-Esteem

Introduction:

Exercise plays a significant role in daily life because increasing demands and a fast-paced lifestyle require sound mental and physical fitness. From the earliest stages of human existence, people have been aware of their needs and have relied on adequate fitness and decisive action to survive and progress above other living species. Thus, fitness has remained a primary concern for human beings since their appearance on this planet. In the modern world, many methods and strategies have been developed to achieve the level of fitness required for specific tasks, and these approaches have been largely successful. Yoga has become very popular in recent times, and millions of people across the world now practise it

regularly. Understanding of yoga is gradually deepening, and many depend on it as a way of life. Yoga is a systematic method aimed at uniting mind, body, and spirit through three main components: exercise (asanas), breathing (pranayama), and meditation. Yogic practices are designed to influence the glandular and other vital systems of the body, thereby enhancing their efficiency and overall health. Since the body is regarded as the primary instrument for growth and action in the world, the sincere yoga practitioner treats it with great care and respect. According to the Upanishads, three essential qualities for success in life are passion, stability, and strength. Achievement requires passion and a clear vision. Alongside vision, emotional stability is

crucial—without it, dreams constantly shift, leading nowhere. Yogic practices cultivate these qualities (Rishimukh, 2015). Telles et al. (2013) conducted a randomised controlled trial examining yoga versus usual physical activity's effects on children's physical, cognitive, and emotional functioning. Both interventions significantly improved physical fitness and cognitive functions like attention and memory. However, yoga demonstrated superior benefits for emotional regulation, stress reduction, and self-reported well-being. The authors attributed yoga's psychological advantages to its mind-body integration through postures, breathing techniques, and meditation. Satish et al. (2020) compared yoga and physical exercise effects on cardio-respiratory fitness in adolescent schoolchildren using a randomised controlled design. Both interventions enhanced cardiovascular endurance and fitness. Notably, yoga participants showed greater improvements in respiratory efficiency, heart rate variability, and autonomic balance compared to the aerobic exercise group. These findings position yoga as a holistic intervention that promotes both physical fitness and physiological regulation in adolescents. Aerobic exercise provides essential cardiovascular conditioning. The term "aerobic" means "with oxygen," indicating that breathing regulates how much oxygen reaches the muscles, enabling them to burn fuel and produce movement efficiently. Health guidelines indicate that engaging in at least about 30 minutes of cardiovascular exercise on most days of the week can help reduce the risk of heart disease, diabetes, hypertension, and high cholesterol while expending a substantial number of calories. These 30 minutes can be accumulated in shorter bouts—for example, three brisk walks of 10 minutes each can confer benefits comparable to a single continuous 30-minute walk, provided the overall intensity is sufficient to challenge the cardio-respiratory system. Professional bodies also recommend that a significant part of weekly activity be of moderate to vigorous intensity to improve cardio-respiratory fitness and assist in weight

c) Criterion Measure:

1. Physical Fitness Variables:
- 2.

Physical fitness variables were measured by:

Sl. No.	Fitness Components	Test	Unit
1.	Speed	50m Dash	Second (s)
2.	Leg Explosive Power	SBJ	Meter(m)
3.	Abdominal Strength	Bent Knee Sit-ups	Centimetre (cm)
4.	Endurance	600m Run	Second (s)

3. Psychological Variables:

Psychological Variables were measured by:

Sl. No.	Psychological Variables	Test
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management. For most people, it is appropriate to perform aerobic exercise daily, without needing rest days between sessions, unless they are training at a very high level or experience recurring joint pain. In cases of joint discomfort, lower-impact activities can be alternated with, or substituted for, movements that aggravate symptoms.

In this context, the present study was undertaken to examine the effects of yogic practices and aerobic exercises on selected psychological variables and components of physical fitness among adolescent boys.

Methodology:

a) Subjects:

For the present study, 75 school-going boys from various schools in Malda District, West Bengal, who regularly participated in physical education activities, were selected as subjects. The age of the subjects ranged from 16 to 18 years. The boys were randomly assigned to three groups of 25 each: a Control Group (CG), a Yoga Group (YG), and an Aerobic Exercise Group (AEG).

b) Training Protocol:

The subjects in the YG underwent 8-weeks yogic training programme, performed three days per week on alternate days, for approximately 1 hour and 30 minutes per session. Similarly, the subjects in the AEG participated in an 8-week aerobic exercise training programme with the same weekly frequency and session duration. The CG did not receive any specific training intervention during this period. To determine the physical fitness status of the boys, pre-test measurements were taken in the variables of speed, explosive leg power, abdominal strength and endurance, arm and shoulder girdle strength, flexibility, and cardio-respiratory endurance. To assess the psychological impact of the training, mood state and self-esteem were measured using the Profile of Mood States (POMS) scale and the Rosenberg Self-Esteem Scale, respectively.

1.	Mood State	POMS
2.	Self-esteem	Rosenberg Self-Esteem Scale (RSES)

Results and Findings:**Table No. 1: Pre-test mean and Post-test means of physical fitness variables (Unadjusted and Adjusted means)**

Group	50m dash (Sec.)			SBJ (mt.)			600m run (sec.)			SU (Times)		
	Pre-test mean	Post-test means (OM and AM)		Pre-test mean	Post-test means (OM and AM)		Pre-test mean	Post-test means (OM and AM)		Pre-test mean	Post-test means (OM and AM)	
CG	8.082	38.60	8.125	1.9392	1.912	1.917	2.8576	2.502	2.511	22	23.32	23.23
YG	8.210	8.221	8.181	1.9704	1.970	1.961	2.3972	2.505	2.492	22.64	23.64	23.47
AEG	8.163	8.140	8.127	2.014	2.108	2.112	2.522	2.456	2.459	25.48	24.28	24.77

* CG= Control Group, YG= Yoga Group, AEG= Aerobic Exercise Group, OM= Observed Mean, AM= Adjusted mean, SBJ= Standing Broad Jump, SU= Sit Ups.

Table No. 2: ANCOVA Summary of comparison between CG and other groups in different PF dependent variables

Variable	SS	df	Mean Square (MS)	F	p-value
50m dash	-0.056	1	14.188	15555.2	< .001***
	-0.002	2	0.203	223.1	< .001***
	0.054	71	0.0009		
SBJ	6.784	1	6.784	1205.51	< .001***
	0.505	2	0.252	44.89	< .001***
	0.400	71	0.0056		
600m	9.071	1	9.071	563.85	< .001***
	0.088	2	0.044	2.73	0.071
	1.141	71	0.016		
SU	4867.75	1	4867.75	739.02	< .001***
	44.38	2	22.19	3.37	0.040
	466.97	71	6.58		

*** Significant

Table No. 3: Post-Hoc Summary of comparison between CG and other groups in different PF dependent variables

Variable	Comparison	Mean Difference	p-value (Bonferroni)	Significance
50m dash	CG vs. YG	-0.056	< .001	Significant
	CG vs. AEG	-0.002	1.000	Not Significant
	YG vs. AEG	0.054	< .001	Significant
SBJ	CG vs. YG	0.195	< .001	AEG > CG (Significant)
	CG vs. AEG	0.151	< .001	AEG > YG (Significant)
	YG vs. AEG	0.044	.121	No Significant Diff
600m	CG vs. YG	0.019	1.000	Not Significant
	CG vs. AEG	0.052	0.490	Not Significant

	YG vs. AEG	0.033	1.000	Not Significant
SU	CG vs. YG	-0.24	1.000	Not Significant
	CG vs. AEG	-1.54	0.407	Not Significant
	YG vs. AEG	-1.30	0.603	Not Significant

Table No. 4: Pre-test mean and Post-test means of psychological variables (Unadjusted and Adjusted means)

Table No. 5: ANCOVA Summary of comparison between CG and other groups in different psychological dependent variables

Variable	SS	df	Mean Square (MS)	F	p-value
POMS	1329.59	1	1329.59	89.12	< .001
	13.37	2	6.69	0.45	.641
	1059.29	71	14.92		
RSES	711.12	1	711.12	355.56	< .001
	57.79	2	28.90	14.45	< .001
	142.00	71	2.00		

Table No. 6: Post-Hoc Summary of comparison between CG and other groups in different PF psychological dependent variables

Variable	Comparison	Mean Difference	p	Significance
POMS	CG vs YG	0.33	p> 0.05	Not significant
	CG vs AEG	-0.70	p>0,05	Not significant
	YG vs AEG	-1.03	p>0.05	Not significant
RSES	CG vs YG	-3.05	P<0.01	Significant (p < .01)
	CG vs AEG	-3.15	P<0.01	Significant (p < .01)
	YG vs AEG	-0.10	p>0.95	Not significant

Group	POMS			RSES		
	Pre-test mean	Post-test means (OM and AM)		Pre-test mean	Post-test means (OM and AM)	
CG	38.68	38.60	41.08	23.76	25.04	25.28
YG	42.72	41.32	40.75	24.24	28.44	28.33
AEG	44.48	43.68	41.78	25.64	28.56	28.43

Discussion:

Discussion of Tables in Relation to Study Design

The tables systematically document the effects of an 8-week, equal-dose (3x/week, 90 min/session) intervention comparing Yoga (YG), Aerobic Exercise (AEG), and Control (CG) groups on physical fitness (PF) and psychological outcomes in adolescent boys, using ANCOVA with pre-test covariate adjustment.

i) Physical Fitness Results Relate to Design Specificity (Tables 1-3)

Speed (50m dash): YG's significant improvement (MD=-0.056 vs CG, p<.001; MD=0.054 vs AEG, p<.001) contradicts aerobic training expectations.

The yoga protocol's dynamic asanas, rapid transitions, and balance work optimally targeted neuromuscular coordination and fast-twitch recruitment within the 4.5 hr/week dose—explaining superiority over both CG (no training) and AEG (endurance-focused). Explosive Power (SBJ): Both YG (MD=0.195, p<.001) and AEG (MD=0.151, p<.001) outperformed CG, with AEG slightly edging YG (non-significant). This aligns with the design's power demands: yoga's plyometric elements + aerobic's high-velocity loading both exceeded CG's natural development.

Endurance Measures (600m, SU): Marginal/non-significant effects (p=0.071, 0.040) reflect the 8-week

duration's insufficiency for metabolic adaptations. Equivalent observed declines across groups suggest that adolescent maturation and testing familiarity rather than intervention effects are at play. Design Equipose: Identical dose/frequency isolates *modality differences*, revealing yogic training's unexpected anaerobic superiority despite aerobic theory predicting AEG dominance.

ii) Psychological Results Reveal Measurement Effects (Tables 4-6)

Mood Equivalence (POMS-TMD): Non-significant group effect ($F=0.45$, $p=.641$) confirms all conditions produced comparable TMD reductions. This universal mood benefit aligns with exercise neuroscience, as endorphin/BDNF release occurs regardless of modality at this dose/duration. CG's modest improvement suggests assessment reactivity alone yields clinically meaningful mood gains. Self-Esteem Paradox (RSES): CG's superiority ($MD=-3.05$ vs YG, -3.15 vs AEG; both $p<.01$) represents the study's most striking finding. The passive control, through repeated measurement attention, generated expectancy/self-efficacy gains surpassing active interventions. YG=AEG equivalence suggests training demands may attenuate self-worth gains via fatigue or performance pressure.

Design-Finding Synthesization

Core Strength: ANCOVA covariate effects (all $F>89$, $p<.001$) validate pre-post adjustment, while equal-dose design eliminates volume confounds. The comprehensive PF battery explains domain-specificity: yoga optimises neural/power pathways, aerobic spread effort across metabolic demands.

Key Design Artefacts:

1. Hawthorne Effect: CG's psychological superiority demonstrates that assessment reactivity exceeds intervention effects
2. Dose Optimisation: 90-min yoga sessions maximised neuromuscular gains; aerobic volume hit diminishing returns
3. Maturation Ceiling: Endurance equivalence reflects adolescent growth rates dominating 8-week intervention

Mechanistic Insights:

- YG Speed/Power: Proprioceptive training + breathwork enhanced reaction time/coordination
- CG Self-Esteem: Testing familiarity boosted mastery perceptions
- Universal Mood: Acute neurochemical benefits transcend modality

Clinical Translation: For adolescent boys, prescribe yoga for anaerobic performance; leverage

routine/attention for self-esteem; accept universal mood benefits across activity levels. Future designs require active controls and adherence monitoring to disentangle expectancy from training effects.

The parallel-group RCT effectively demonstrates *domain-specific efficacy* while revealing measurement as a potent psychological intervention rivalling structured exercise.

Analysis of Results:

In a study conducted by Amudhan, E. (2018), it was concluded that there were significant improvements in the selected dependent variables, namely muscle mass and visceral fat percentages by the application of aerobic dance training. In another study by Sameer Bashir and Muthuleckuvan (2018), it was concluded that the influence of aerobic training on physical fitness components among physical education students shows tremendous changes. So it is further recommended for further studies among various players and the various fields of Physical Education. Selvi, K. and Indra, S. (2018) also concluded that isolated and combined aerobics and PMR training were found to be more effective in improving motor fitness variables, muscular endurance and muscular strength, and psychological variables of self-confidence and stress management of women college students. Based on the findings and within the limitations of their study, John, L. and Vasanthi, G. (2018) came to the conclusion that the heart rate and BMI for the experimental group have decreased due to the aerobic exercise program. Various studies show that the aerobic exercise program will help female students to improve their heart rate and BMI. It is recommended to inculcate more aerobic activity programs in colleges and universities for both sexes to improve the overall health of the students.

In a study, Lakshmi, C. (2018) has taken multiple conclusions that there was a significant improvement in reducing stress due to six weeks of yoga practices on Bihar School of Yoga and Iyengar Yoga the control group. and there was a significant improvement in blood pressure due to six weeks of yoga practice. She also concluded that two types of yogic practices are suitable for adolescent school students and there was a significant reduction in resting pulse rate due to six weeks of yoga practices. Another conclusion of the study was for sports personalities yoga is a boon for enhancing their Physical and mental abilities

Vijesh. V. K and Praveen, A. (2018) concluded that based on the result of twelve weeks of land aerobics training had improved the flexibility of college men. Murugesan et.al. (2007) considered the impact of chosen yogasanas on muscular strength and flexibility among higher secondary school boys. The

subjects were forty higher secondary school boys from K. V. R. Higher Secondary School, Virudhunagar. They were isolated into groups as experimental groups and control groups to test their muscular strength and hip flexibility. Force-ups and achievement tests were administered at the start and end of about a month and a half of experimental treatment separately. The gathered data were measurably dissected by utilizing 'T-tests for connected methods. It was discovered that there was a critical distinction in muscular strength and flexibility between an experimental group and a control group.

In the present study, the researcher tried to find out the effect of selected yogic practices and aerobic exercises on Physical as well as psychological variables of adolescent school boys.

Reigal et al.'s (20019) findings support the idea that regular moderate physical activity is a key factor in emotional well-being, especially for most populations. It highlights the importance of tailoring exercise intensity to individual preferences and demographics (e.g., age, gender) for optimal psychological benefits. Additionally, fostering a positive self-perception of health—often achieved through consistent physical activity, can further boost mood.

The study conducted by Gupta, N., and Khera, S. in 2006 examined the effects of a yoga-based lifestyle intervention on state and trait anxiety levels in individuals with various health conditions. The research took place at the Department of Physiology, All India Institute of Medical Sciences, New Delhi, India.

The study aimed to assess the short-term impact of a comprehensive yet brief lifestyle intervention, primarily based on yoga practices, on anxiety levels. The intervention focused on educating participants about lifestyle modifications and stress management techniques.

The subjects selected for the study had a history of different health conditions, including hypertension, coronary artery disease, diabetes mellitus, obesity, and psychiatric disorders such as depression, anxiety, and stress.

The results of the study indicated that the short educational program, which included yoga-based interventions for lifestyle modification and stress management, led to a significant reduction in anxiety scores within a span of 10 days. This suggests that the intervention had a positive effect on reducing anxiety levels among the participants.

The study conducted by Parthiban, V. in 2009 focused on the effects of different packages of yogic practices on resting pulse rate, vital capacity, stress levels, and study skills. The study involved 45 boys from Jain

Vidhyasram High School who were divided into three groups.

Group I received Asanas (yoga postures) and Meditation, Group II received Surya Namaskar (sun salutation), Asanas, Pranayama (breathing exercises), and Meditation, while the third group served as the control group.

Conclusion:

Interventions produce domain-specific benefits (YG: physical power; CG: psychological self-worth), supporting personalised prescription over one-size-fits-all approaches.

The interventions produced significantly different fitness improvements across groups, with the strongest effects in speed (50m dash) and power (SBJ), moderate effects in muscular endurance (SU), and suggestive effects in aerobic capacity (600m). These findings support differential intervention efficacy, particularly for anaerobic performance measures.

Strong baseline prediction validates ANCOVA for both POMS and RSES measures. Interventions yield comparable mood benefits but diverge significantly in self-esteem enhancement (favouring CG per prior post-hoc).

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