Dr.kishore Mukhopadhyay

American Journal of Psychiatric Rehabilitation

Expert Opinion Article

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

Mr. Aniruddha Singh Permar[1], Dr. Bibhuti Bhusan Mishra[2] , Dr. Subhabrata Kar[3] and Dr. Kishore Mukhopadhyay*[4]

[1.] Research Scholar, Fakir Mohan University, Vyasa Vihar, Nuapadhi, Balasore, Odisha.
[2.] Assistant Prof., Baliapal College of Physical Education, Baliapal, Balasore - 756026 Odisha, India
[3]. Associate Professor, Department of Physical Education, Union Christian Training College, Murshidabad, India.
[*4]. Associate Professor, Department of Physical Education, Union Christian Training College, Murshidabad, India, and Honorary Professor, department of Physical Education and sports, Sri Sri University, Cuttack, Odisha. kishore.km2007@gmail.com, https://orcid.org/0000-0001-5384-837X

*Corresponding author: Dr. Kishore Mukhopadhyay

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 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.

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

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 Equipoise: 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 Mutheleckuvan (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).

References:

1. Ajjimaporn, A., Rachiwong, S., & Siripornpanich, V. (2018). Effects of 8 weeks of modified hatha yoga training on resting-state brain activity and the p300 ERP in patients with physical disability-related stress. Journal of physical therapy science, 30(9), 1187–1192. https://doi.org/10.1589/jpts.30.1187
2. Amudhan, E. (2018). Influence of aerobic dance on muscle mass and visceral fat of school boys. Asian Journal of Multidimensional Research (AJMR), 7(2), ISSN: 2278-4853, Impact Factor: SJIF = 4.708.
3. Anastasi, A. (1988). Psychological testing (6th ed.). New York: MacMillan Publishing Company.
4. Anastasi, A. & Urbina, S. (2009). Psychological testing (7th ed) New York: Prentice Hall.
5. Bashir, S. and Mutheleckuvan, R. (1018). Effect of aerobic training on physical fitness components and physiological variables among physical education students of Annamalai University. Asian Journal of Multidimensional Research (AJMR), Vol. 7(2), 235-243.
6. Bhagat, O. L., Kharya, C., Jaryal, A., & Deepak, K. K. (2017). Acute effects on cardiovascular

oscillations during controlled slow yogic breathing. The Indian journal of medical research, 145(4), 503–512. https://doi.org/10.4103/ijmr.IJMR_830_15

7. Borrow, M. Harold and Mc Gee, R. (1979), (3rd edition). A practical Approach to measurement in Physical Education. Philadelphia: Lee Febiger.
8. Fleg J. L. (2012). Aerobic exercise in the elderly: a key to successful aging. Discovery medicine, 13(70), 223–228.
9. Garrett. Henry E. (1966) Statistics In Psychology and Education
10. Gezer, H., Karaahmet, O. Z., Gurcay, E., Dulgeroglu, D., & Cakci, A. (2019). The effect of aerobic exercise on stroke rehabilitation. Irish journal of medical science, 188(2), 469–473. https://doi.org/10.1007/s11845- 018-1848-4
11. Gilani, S. R. M., & Feizabad, A. K. (2019). The effects of aerobic exercise training on mental health and self-esteem of type 2 diabetes mellitus patients. Health psychology research, 7(1), 6576. https://doi.org/10.4081/hpr.2019.6576
12. Govindaraj, R., Karmani, S., Varambally, S., & Gangadhar, B. N. (2016). Yoga and physical exercise – a review and comparison. International review of psychiatry (Abingdon, England), 28(3), 242–253. https://doi.org/10.3109/09540261.2016.1160878
13. Grazioli, E., Tranchita, E., Borriello, G., Cerulli, C., Minganti, C., & Parisi, A. (2019). The Effects of Concurrent Resistance and Aerobic Exercise Training on Functional Status in Patients with Multiple Sclerosis. Current sports medicine reports, 18(12), 452–457.
14. Gupta, N., Khera, S., Vempati, R. P., Sharma, R., & Bijlani, R. L. (2006). Effect of yoga-based lifestyle intervention on state and trait anxiety. Indian Journal of Physiology and Pharmacology, 50(1), 41-47.
15. John, L., & Vasanthi, G. (2018). Effect of aerobic exercise on selected physiological variables among female students. Asian Journal of Multidimensional Research (AJMR), 7(2), ISSN: 2278-4853.
16. Kansal, D. K. (2008). *Applied measurement, evaluation & sports selection*. Sports & Spiritual Science Publication.
17. Kim S. D. (2018). Effects of yogic exercise on nonspecific neck pain in university students. Complementary therapies in clinical practice, 31, 338–342. https://doi.org/10.1016/j.ctcp.2017.10.003
18. Kishida, M., Molenaar, P. C. M., & Elavsky, S. (2019). The impact of trait mindfulness on relational outcomes in novice yoga practitioners participating in an academic yoga course. Journal of American College Health: J of ACH, 67(3), 250–262. https://doi.org/10.1080/07448481.2018.1469505
19. LeBouthillier, D. M., & Asmundson, G. J. G. (2017). The efficacy of aerobic exercise and resistance training as transdiagnostic interventions for anxiety-related disorders and constructs: A randomized controlled trial. Journal of Anxiety Disorders, 52, 43–52. https://doi.org/10.1016/j.janxdis.2017.09.005
20. Lakshmi, C. (2018). Effects of varied yogic practices on selected physiological variables among adolescent school sports students. Asian Journal of Multidimensional Research (AJMR), 7(2), ISSN: 2278-4853.
21 Sobol, N. A., Hoffmann, K., Frederiksen, K. S., Vogel, A., Vestergaard, K., Brændgaard, H., Gottrup, H., Lolk, A., Wermuth, L., Jakobsen, S., Laugesen, L., Gergelyffy, R., Høgh, P., Bjerregaard, E., Siersma, V., Andersen, B. B., Johannsen, P., Waldemar, G., Hasselbalch, S. G., & Beyer, N. (2016). Effect of aerobic exercise on physical performance in patients with Alzheimer's disease. *Alzheimer's & Dementia, 12*(12), 1207–1215. **https://doi.org/10.1016/j.jalz.2016.05.004** [conversation_history]
22. McKay, J. A., McCulloch, C. L., Querido, J. S., Foster, G. E., Koehle, M. S., & Sheel, A. W. (2016). The effect of consistent practice of yogic breathing exercises on the human cardiorespiratory system. Respiratory physiology & neurobiology, 233, 41–51. https://doi.org/10.1016/j.resp.2016.07.005
23. Murugesan, T., Raghavan, G. and Dr. V. Jeya Veerapandian (2007). Paper presented at the international conference on "metabolic syndrome in Yoga and Naturopathy" Alagappa University, Karaikudi.
24. Parthiban.V, (2009), Effect of varied packages of yogic practices on resting pulse rate, vital capacity, assertiveness and study skills Unpublished Master of Philosophy Dissertation, Submitted to Tamil Nadu Physical Education and sports University,Chennai.
25. Polsgrove, M. J., Eggleston, B. M., & Lockyer, R. J. (2016). Impact of 10 weeks of yoga practice on flexibility and balance of college athletes. International journal of yoga, 9(1), 27–34. https://doi.org/10.4103/0973-6131.171710
26. Ray, U. S., Mukhopadhyaya, S., Purkayastha, S. S., Asnani, V., Tomer, O.S., Prashad, R., Thakur, L., & Selvamurthy, W. (2001). Effect of yogic exercises on physical and mental health of young

fellowship course trainees. Indian journal of physiology and pharmacology, 45(1), 37–53.

27. Ray, U. S., Sinha, B., Tomer, O.S., Pathak, A., Dasgupta, T., & Selvamurthy, W. (2001). Aerobic capacity & perceived exertion after practice of Hatha yogic exercises. The Indian journal of medical research, 114, 215–221.
28. Reigel, R.E., Barrero, S., Martín, I., Morales-Sánchez, V., Juárez-Ruiz de Mier, R. and Hernández-Mendo, A. (2019) Relationships Between Reaction Time, Selective Attention, Physical Activity, and Physical Fitness in Children. *Front. Psychol.* 10:2278. doi: 10.3389/fpsyg.2019.02278.
29. Rishimukh (2015) Convocation address, Sri Sri University p.64-65.

30. Satish, V., Rao, R. M., Manjunath, N. K., Amritanshu, R., Vivek, U., Shreeganesh, H. R., & Deepashree, S. (2020). Yoga versus physical exercise for cardio-respiratory fitness in adolescent school children: A randomized controlled trial. International journal of adolescent medicine and health, 32(3), 20170154.

31. Selvi, K., & Indra, S. (2018). Influence of isolated and combined aerobics and progressive muscular relaxation training on selected motor fitness and psychological variables among college women students. Asian Journal of Multidimensional Research (AJMR), 7(2), ISSN: 2278-4853, Impact Factor: SJIF = 4.708.

32. Telles, S., Singh, N., Bhardwaj, A. K., Kumar, A., & Balkrishna, A. (2013). Effect of yoga or physical exercise on physical, cognitive and emotional measures in children: a randomized controlled trial. Child and adolescent psychiatry and mental health, 7(1), 37.

33. Verma, A., Shete, S. U., & Singh thAKU, G. (2014). The effect of yoga practices on cognitive development in rural residential school children in India. Memory, 6(2.80), 6- 24.

34. Vijesh, V. K., & Praveen, A. (2018). Effect of land aerobic training on selected physical variables among college students. Asian Journal of Multidimensional Research (AJMR), 7(2), ISSN: 2278-4853.