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Comparative Analysis Of Yoga And Aerobic Exercises On Psychological, Physical, And Physiological Health In School Students

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Abstract
The study examined the comparative effects of yoga and aerobic exercises on the mental, physiological, and physical health of school going children. A total of one hundred and twenty participants were selected randomly in either one of the groups namely: yoga (n = 60) and aerobic exercise (n = 60). Psychological health was evaluated with the help of Perceived Stress Scale (PSS) and the State-Trait Anxiety Inventory (STAI), physical health with the help of Body Mass Index (BMI) and Sit-and-Reach test of flexibility, and physiological with the help of Heart Rate (HR) and systolic blood pressure (BP). The results indicated that both interventions had significant improvement in all parameters ($p < 0.05$). Yoga had more stress and anxiety reductions and larger flexibility improvements, but aerobic exercise a little better in the HR and BP cardiovascular results. These findings suggest that yoga and aerobic exercise have a positive effect on the health of students in schools, and a combination of the two practices can have a multidimensional impact on psychological well-being, physical fitness, and cardiovascular health.
Keywords: *Yoga, Aerobic Exercise, Psychological Health, Physical Health, Physiological Health, Adolescents, School Students.*

1. INTRODUCTION

Adolescence is a period of critical development involving a rapid physical growth, hormonal changes, and cognitive as well as social development. Students are under more academic pressure, social pressure, emotional swings and all this during this period may have a negative impact on their psychological, physical and physiological health. Balanced health profile in adolescence is critical to the overall wellbeing, performance in school and the development of life-long healthy habits.

Physical activity is also established as one of the factors that facilitate wellness and health among adolescents. Exercise in its various formats has different advantages based on the nature and intensity of exercise. Yoga is an Indian-based ancient method, which focuses on harmonizing the body and mind with the help of integrating postures (asanas), controlled breathing (pranayama), and meditation. Yoga has been linked to less stress and anxiety, increased flexibility, better concentration and emotional regulation. Conversely, aerobic exercises, including jogging, skipping, dance aerobics and circuit training, mainly focus on cardiovascular endurance, muscular strength and physical fitness as well as help in mood enhancement by secretion of endorphins.

Despite the established benefit of both yoga and aerobic exercises in improving health, there is lack of systematic studies to compare the effects of the two in various areas, such as psychological, physical, and physiological, specifically in school students. Knowing these relative effects would help in designing effective school-based health programs able to meet the holistic needs of adolescents.

1.1. Objectives of the Study

- To evaluate how yoga and aerobic workouts affect schoolchildren's psychological well-being (stress and anxiety).
- To assess how yoga and aerobic workouts affect teenagers' physical health metrics (such as flexibility and BMI).
- To evaluate and compare how yoga and aerobic workouts affect schoolchildren's heart rate and blood pressure, two physiological health indicators.

2. LITERATURE REVIEW

Telles et al. (2013) undertook a randomized controlled trial to determine the impact of yoga and usual physical activity on the physical, cognitive, and emotional functioning of children. The researchers found out that the two interventions had great effects in improving physical fitness and cognitive functions such as attention and memory. Yoga had a stronger impact on emotional regulation, stress reduction, and self-reported well-being, however. The authors inferred that mind-body integration in yoga, which involves postures, breathing methods, and meditation must have been a factor in its superior efficacy in relation to psychological health.

Satish et al. (2020) compared the effects of yoga and physical exercise on cardio-respiratory fitness in adolescent school children in a randomized controlled study. The researchers determined that the two interventions enhanced cardiovascular endurance and fitness. It is important to note that, respiratory efficiency, heart rate variability, and autonomic balance were exhibited to be better in yoga participants than the aerobic exercise group. The results indicated that yoga not only facilitated physical fitness, but also enhanced physiological control, and therefore, yoga is a holistic drug to adolescent health.

Govindaraj et al. (2016) offered an extensive review of the comparison of yoga and physical exercise in the various health domains; physical, psychological, and physiological. The review found that aerobic or conventional physical exercises were very effective in enhancing muscular strength, endurance and body composition, but that yoga has a supplementary effect in flexibility, stress reduction, emotional stability and regulation of the autonomic nervous system. The authors stressed that combining yoga with physical activity may produce synergistic benefits, resulting in a balanced body and mind development, especially in children and adolescents that are experiencing a rapid physical and emotional development.

Kumar et al. (2016) investigated the impact of aerobic exercises, yoga, and mental imagery to relieve stress on college students. They showed that the three interventions resulted in significant perceived stress reductions and relaxation improvements. Nevertheless, yoga was especially efficient in reducing physiological indices of stress, including heart rate and blood pressure, and psychological relaxation. This paper has emphasized the distinctive ability of yoga to cover both the mental and physiological components of health, and the argument in support of its applicability in stress management and well-being in general.

3. RESEARCH METHODOLOGY

3.1. Research Design

The research adhered to an experimental comparative research design consisting of a pre-test and post-test construct, to compare and evaluate the outcome of yoga and aerobic activities on the psychological, physical, and physiological well-being of school-going learners.

3.2. Population and Sample

The study population consisted of schoolchildren. Random sampling was used to select 120 students. Respondents were then randomly grouped into two equal groups:

- Yoga Group (n = 60)
- Aerobic Exercise Group (n = 60)

Inclusion Criteria:

- Regular school attendance.
- No history of chronic health conditions or significant orthopedic disorders.

Exclusion Criteria:

- Students receiving special athletic training.
- Students taking long-term medication that may impair physical or psychological well-being.
- Informed consent was obtained from the students and their parents/guardians prior to participation.

3.3. Intervention Procedure

The two groups were subjected to structured training activities for **8 weeks** under the guidance of trained instructors.

- **Yoga Group:** Participated in yoga-based sessions.
- **Aerobic Exercise Group:** Participated in aerobic-based sessions.

3.4. Parameters Measured

1. Psychological Health

- **Stress:** Measured using the Perceived Stress Scale (PSS).
- **Anxiety:** Measured with the State-Trait Anxiety Inventory (STAI).

2. Physical Health

- **Body Mass Index (BMI):** Calculated from height and weight measurements.
- **Flexibility:** Measured using the Sit-and-Reach Test.

3. Physiological Health

- **Heart Rate (HR):** Recorded manually at the radial pulse.
- **Blood Pressure (BP):** Systolic and diastolic values recorded using a digital sphygmomanometer.

3.5. Data Collection Procedure

- Pre-test data were taken before the intervention.
- Post-test data were taken at the end of the 8-week program.
- Measurements were conducted in the morning to minimize the influence of diurnal variations.
- Participants were advised not to consume caffeine, heavy meals, or perform vigorous exercise prior to testing.

3.6. Statistical Analysis

The data was analyzed using SPSS (Version XX). The following procedures were applied:

- **Descriptive Statistics:** Mean and Standard Deviation (SD) of each parameter.
- **Paired t-test:** To identify changes in pre- and post-intervention measurements within groups.
- **Independent t-test:** To compare the results of post-intervention outcomes between yoga and aerobic groups.
- **Level of Significance:** $p = 0.05$.

4. RESULTS AND DISCUSSION

The researchers assessed the impact of 8 weeks of interventions of yoga and aerobic exercise on the psychological, physical, and physiological well-being of school-going children. Comparison of pre-test and post-test measurements was conducted among and between the two groups to determine the efficacy of each intervention.

Table 1: Psychological Health Parameters

Group	Stress Pre		Stress Post		t-value (Paired)	Anxiety Pre		Anxiety Post		t-value (Paired)
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Yoga (n=60)	25.0	5.2	16.0	4.0*	15.21	48.0	6.1	34.0	5.2*	18.05
Aerobic (n=60)	25.2	5.5	19.5	4.3*	10.45	48.1	6.2	39.0	5.5*	12.32

*$p < 0.05$, significant improvement

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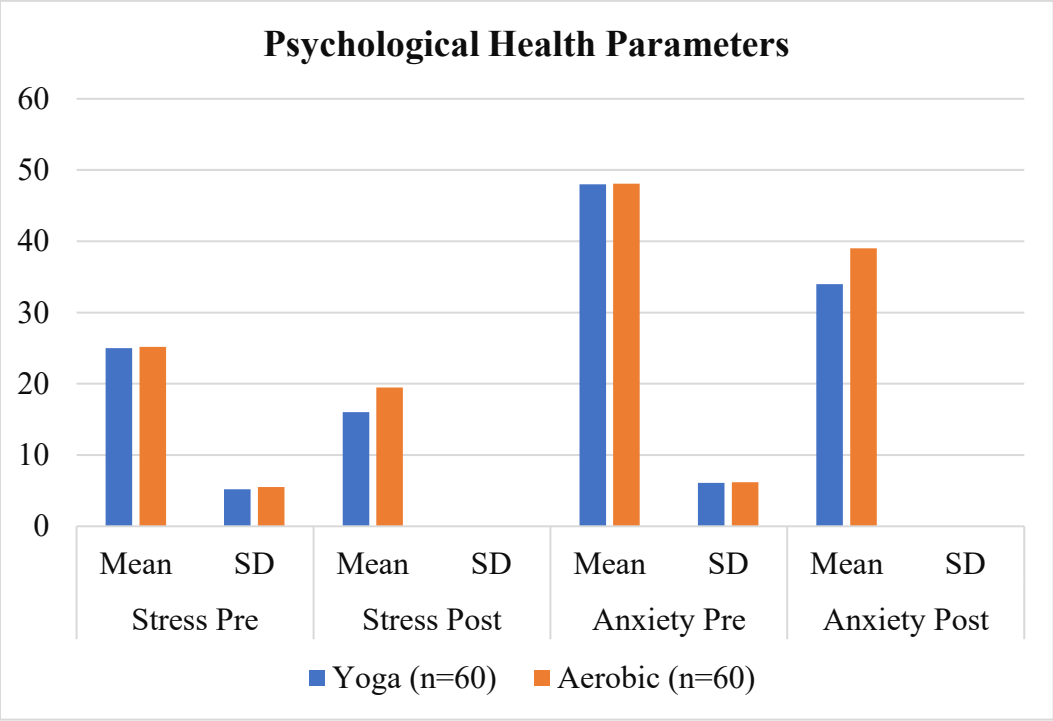

Figure 1: Psychological Health Parameters

The results in Table 1 reveal that the yoga and the aerobic exercise interventions contributed to the psychological health of school students significantly during the 8-week study. The average stress score in the yoga group was reduced at post-test (16.0 ± 4.0) compared to the pre-test (25.0 ± 5.2), and the average score of the anxiety group was significantly lower (34.0 ± 5.2) than the average score of the pre-test (48.0 ± 6.1). In a similar manner, in the aerobic exercising control group, the mean stress score dropped to 19.5 ± 4.3 as compared to the 25.2 ± 5.5 and the anxiety score decreased to 39.0 ± 5.5, also with significant difference ($p < 0.05$). When comparing the two groups, yoga had a greater reduction in the levels of stress and anxiety over aerobic exercises, which could be an indication that yoga is more effective in promoting psychological well-being amongst adolescents. These findings give an emphasis on the role of mind-body therapies such as yoga towards mental health promotion in schools.

Table 2: Physical Health Parameters

Group	BMI Pre		BMI Post		t-value (Paired)	Flexibility Pre		Flexibility Post		t-value (Paired)
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Yoga (n=60)	22.4	2.1	21.7	1.8*	6.32	20.4	4.3	29.0	4.4*	16.11
Aerobic (n=60)	22.5	2.2	21.8	1.9*	5.45	21.1	4.2	25.5	4.1*	10.02

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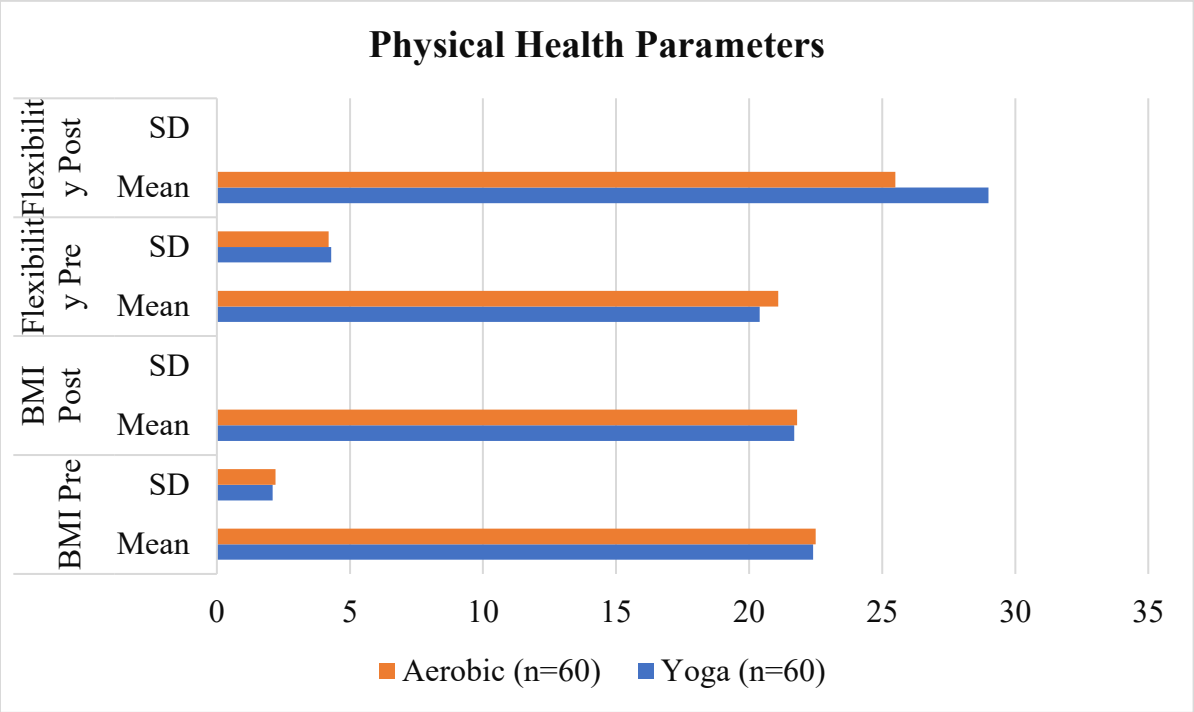

Figure 2: Physical Health Parameters

Table 2 shows the outcomes of 8 weeks of the intervention of yoga and aerobic exercises on physical health of school students assessed using measure of BMI and flexibility. The resultant means of the BMI in the yoga group fell by 2.4 to 1.8 (22.4 21.7), and the resultant mean of the flexibility in the yoga group rose to 29.0 20.4 (both statistically significant, $p < 0.05$). Likewise, aerobic exercise group experienced the shift in the BMI of 22.5 ± 2.2 to 21.8 ± 1.9 and the increase in the flexibility of 21.1 ± 4.2 to 25.5 ± 4.1, which were significant ($p < 0.05$). Although both interventions were effective in improving BMI and flexibility, yoga showed stronger improvement as regards flexibility than aerobic exercises. The results of these studies indicate that yoga might be especially helpful in ensuring flexibility and physical fitness in adolescents, whereas aerobic activities are advantageous to weight control and physical wellbeing.

Table 3: Physiological Health Parameters

Group	HR Pre		HR Post		t-value (Paired)	BP Systolic Pre		BP Systolic Post		t-value (Paired)
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Yoga (n=60)	80.1	6.0	72.3	5.3*	12.15	122.0	8.3	116.0	7.0*	9.42
Aerobic (n=60)	81.0	5.9	70.5	5.1*	15.21	123.4	8.2	115.2	6.8*	10.05

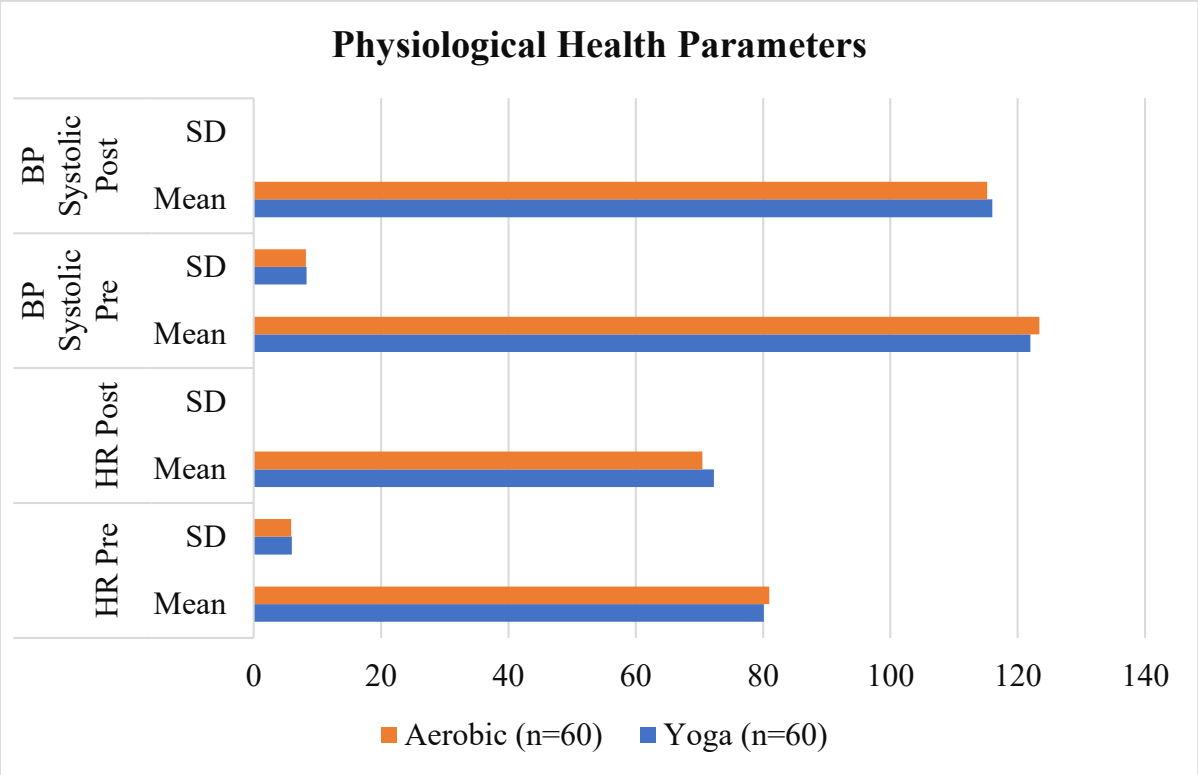

Figure 3: Physiological Health Parameters

School students reported the effects of 8 weeks of yoga and aerobic exercise interventions in terms of physiological health parameters (heart rate, RHR, and systolic blood pressure, BP) (Table 3). The mean RHR was reduced in 0.92 and systolic BP also decreased in the yoga group to 72.3 + 5.3 and 116.0 + 7.0 respectively that were significantly different ($p < 0.05$). RHR in aerobic exercise group was also significantly reduced to 70.5 + 5.1 and systolic BP also reduced to 115.2 ± 6.8 ($p < 0.05$). The two interventions also worked in cardiovascular parameters improvement, however, aerobic exercises had a slightly better effect in reducing RHR and BP compared to yoga, which implies their impact on cardiovascular fitness was stronger. The findings highlight the fact that yoga and aerobic can play an important role in physiological fitness, and that aerobic exercises possess a minor advantage in enhancing cardiovascular efficiency in adolescents.

5. CONCLUSION

The results of this research show that yoga and aerobic exercise positively impact the psychological, physical and physiological health of school children. Yoga seems to concentrate particularly on lowering the level of anxiety, stress, and enhancing flexibility, which could lead to mental wellbeing and musculoskeletal wellbeing. Even though positive effects on psychological and physical conditions also accompanied aerobic exercise, the positive changes in cardiovascular health, demonstrated by decreases in HR and blood pressure, were a bit stronger. Generally, this paper indicates that the inclusion of yoga and aerobic as part of school programs may offer a holistic solution in helping students stay healthy emotionally, physically, and cardiovascular. Properly designed and monitored exercise programs are suggested to promote the general development and well-being in adolescence.

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