

Effects of Surya Namaskar on Trunk Strength and Flexibility of School Going Children

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Abstract: ***Background and Objective:** Surya namaskar is an ideal physical exercise which involves static stretching and slow dynamic component along with regular breathing and relaxation. It has positive physiological benefits of improvement in cardio-pulmonary function, respiratory pressure, hand grip and endurance. "American College of Sports Medicine" support the use of Surya namaskar as an effective physical activity. Thus it can benefit all schools to improve the physical health and sports activities of the students. **Methodology:** Surya namaskar is independent variable whereas strength and flexibility are dependent variable. A sample of 60 students (n=60), age between 9-12 years were included. General assessment of the subjects was taken and purposive sampling was done, one minute sit-up test was carried out as outcome measure for strength, sit and reach test was carried out as outcome measure for flexibility. Experimental group A participants were given Surya namaskar intervention for total 7 weeks in which student's undergone training for the first week and after 6 weeks of intervention was given, 5 days per week for 6 weeks, whereas Control group B was given other physical activity simultaneously such aerobic exercise, dancing, running etc. pre and post data was recorded and analyzed. **Result:** Experimental group showed significant improvement in trunk strength and flexibility by practicing Surya namaskar for 6 weeks compared to control group and the data was calculated with the help of SPSS version 16, level of significance was set at 0.05. **Conclusion:** Surya namaskar is effective in improving trunk strength and flexibility of school going children. It can be used as regular physical exercise for children as a part of their physical education in school.*

Keywords: Surya namaskar, Strength, Flexibility, children.

1. Introduction

The holistic development of a child forms the basis of a healthy family structure, a productive community, and a progressive nation. Optimal growth during childhood requires a balanced integration of adequate nutrition, structured education, and regular physical activity^(1,2). However, modern lifestyle patterns have significantly reduced children's engagement in outdoor play and active recreation. Increased screen exposure through mobile phones, television, and digital entertainment has promoted a sedentary lifestyle, leading to physical inactivity and poor health outcomes^(3,4). Research indicates that school-aged children spend nearly six to eight hours daily in sedentary behaviours, which exceeds the recommended screen time of less than two hours per day⁽⁵⁾. Such prolonged inactivity contributes to reduced muscular strength, increased obesity risk, poor posture, and low endurance capacity^(6,7). Beyond physical consequences, sedentary living also impacts emotional and cognitive health by reducing attention span, academic performance, self-esteem, and emotional regulation^(8,9). Regular physical activity plays a crucial role in enhancing muscular fitness, motor coordination, emotional stability, and social adaptability among children^(10,11). Structured movement-based programs stimulate cardiovascular, musculoskeletal, and neurological systems while improving metabolic efficiency^(12,13). Furthermore, active participation in guided exercise sessions enhances concentration, memory, behavioural control, and cooperative learning, thereby contributing to overall personality development^(14,15). Schools provide an ideal environment to integrate physical activity interventions since children spend a major portion of their day in academic settings⁽¹⁶⁾. However, conventional physical education sessions often fail to sustain student interest due to repetitive routines⁽¹⁷⁾. Therefore, innovative practices that blend movement, mindfulness, and enjoyment are essential for long-term

engagement. Yoga has emerged as an effective approach that combines physical fitness with emotional regulation and mental calmness^(18,19). Yoga, an ancient Indian practice, harmonizes the body, breath, and mind through postures (asanas), breathing control (pranayama), and focused awareness⁽²⁰⁾. It is suitable for children due to its low impact, minimal equipment requirement, and potential to improve flexibility, strength, balance, and emotional resilience^(21,22). Among various yogic practices, Surya Namaskar (Sun Salutation) is a rhythmic, dynamic sequence of twelve postures synchronized with breathing, which enhances blood circulation, muscular activation, and neural stimulation^(23,24). Functionally, Surya Namaskar acts as both aerobic and resistance exercise, contributing to improved cardiovascular endurance, muscular flexibility, hormonal balance, and systemic vitality^(25,26). In addition to physical benefits, its mindful rhythm helps reduce irritability, restlessness, and technology dependency often seen in children today⁽²⁷⁾. Group practice of Surya Namaskar in schools fosters discipline, synchronization, peer bonding, and emotional maturity⁽²⁸⁾. Surya Namaskar is a cost-effective, culturally relevant, and easily implementable school-based physical activity intervention. Just five to ten daily rounds can contribute significantly to the World Health Organization's recommendation of 60 minutes of moderate to vigorous physical activity for children^(29,30). Starting the academic day with this sequence has the potential to improve classroom attention, behavioural control, and academic readiness⁽³¹⁾. With increasing physical inactivity and lifestyle-related issues among school-aged children, it becomes essential to introduce structured and engaging physical activity programs. Surya Namaskar offers a multifaceted approach to enhance strength, flexibility, emotional balance, social interaction, and cognitive alertness^(32,33). Therefore, the present study aims to determine the effect of Surya Namaskar on trunk strength and flexibility in school-going children aged 9–12 years.

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2. Methodology

The present study was conducted on school going children of 9-12 years of age. On basis of School going children of age 9-12 years, who are not involved in any extracurricular sports activity eg- skating, swimming, karate, dancing etc. with willingness to participate for practicing Surya namaskar with their Parent's consent. Children with any musculoskeletal deformities genetic disorder, illness such as diabetes mellitus, tuberculosis, bronchial asthma, hypertension, undergone any major surgery in past 1 year were excluded. 60 subjects were selected and informed consent of each was taken. Then general assessment including Name, Age, Height, Weight, BMI (Body Mass Index) and pre- test measurement was taken that is sit and reach test for flexibility and one minute half sit-up test for muscular strength. Three trials were taken for each test and best score was recorded. Subjects were divided into two groups: Group A:- Experimental group, Group B:- Control group, Total duration of study was 7 weeks in which 1 week of training period and 6 weeks of specific protocol was followed by the group, each session was of 45 minutes 5 days in a week. After completion of seven weeks post-test measurement was taken. In experimental group Surya namaskar was performed which include warm up and cool down session also for total 45 minutes and in control group general exercise or conventional exercise was performed including warm up and cool down session of 45 minutes.

3. Result

Total 60 subjects have been participated in the study, which includes active participation of 30 participants in experimental group where Surya namaskar intervention was given and 30 participants in control group in which conventional exercise session was given for 6 weeks. The Statistical Analyses was done by using the software: STATISTICAL PACKAGE FOR SOCIAL SCIENCE (SPSS VERSION 20.0) FOR WINDOWS. Distribution of the data in both the groups was analyzed by using TEST OF NORMALITY: SHAPIRO-WILK TEST. But the data was not normally distributed, so NON-PARAMETRIC TEST was applied. Mean and Standard Deviation were calculated for the numeric data. For Experimental group and Control group, pre and post data WILCOXON SIGNED RANK TEST was used. And comparison of mean of between the groups was analyzed using MANN-WHITNEY U test. For Experimental group and control group, statistical analyses $p < 0.05$ with class interval 95% were considered as significant results

Table 1: Gender Distribution in both groups

Group	Male	Female
Experimental (Group A)	23	7
Control (Group B)	22	8

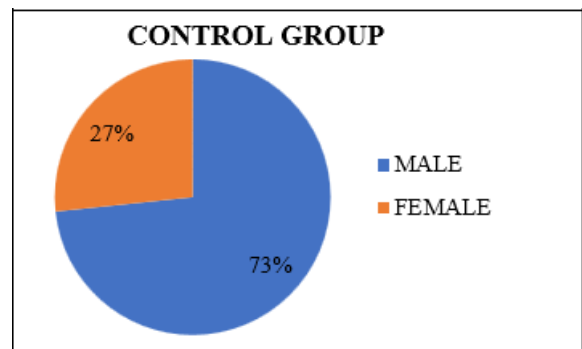
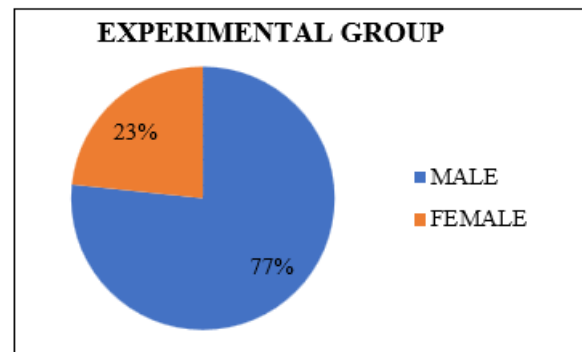
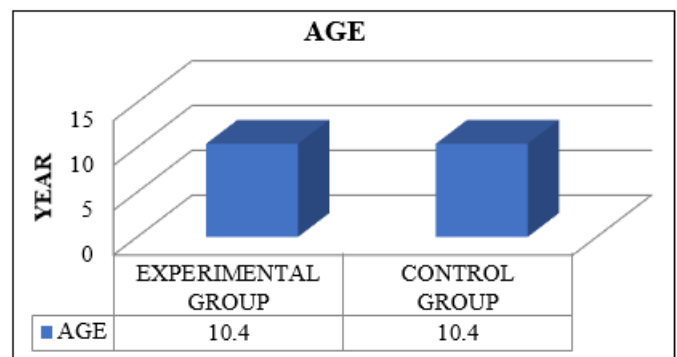
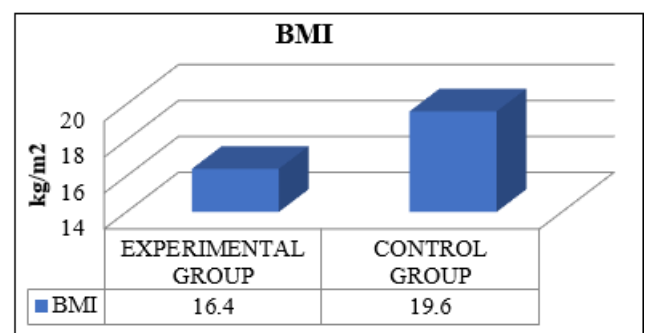


Table 2: Mean and Standard Deviation values of Age and BMI in both the groups

Groups		Mean $\pm$ SD
Experimental (Group A)	AGE	10.4 $\pm$ 1.28
	BMI	16.4 $\pm$ 3.27
Control (Group B)	AGE	10.4 $\pm$ 1.10
	BMI	19.6 $\pm$ 2.41



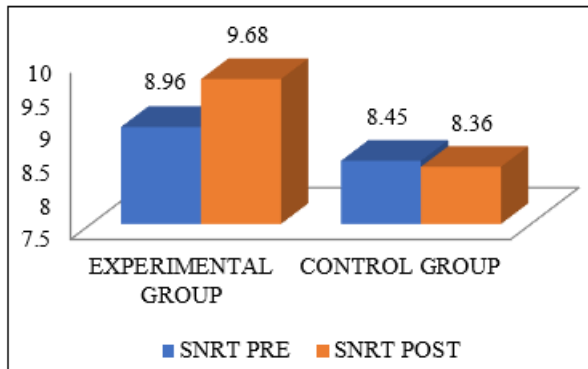
Graph 1: MEAN values in both Experimental and Control Group for AGE



Graph 2: MEAN values in both Experimental and Control Group for BMI

Within the Group Analysis (WILCOXON SIGNED RANK TEST)**Table 3:** Mean and Standard Deviation values of Sit and Reach Test in both the groups.

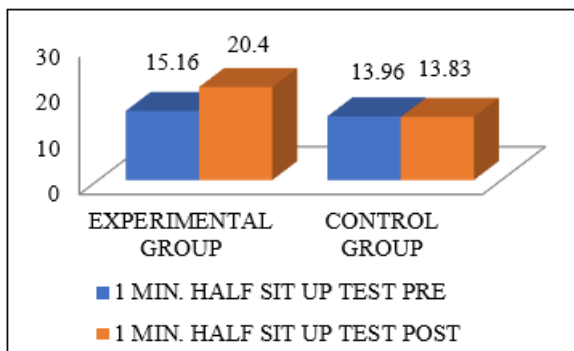
Groups		Mean $\pm$ SD (cm)	P Value
Experimental	SNRT Pre	8.96 $\pm$ 1.84	<0.001
	SNRT Post	9.68 $\pm$ 1.39	
Control	SNRT Pre	8.45 $\pm$ 2.21	0.572
	SNRT Post	8.36 $\pm$ 2.02	

**Graph 3:** PRE and POST MEAN values in both Experimental and Control Group for SIT AND REACH TEST.

There was a significant difference found on comparison of PRE MEAN and POST MEAN values of SIT AND REACH TEST in Experimental group ($p \leq 0.001$). There was no significant difference found in control group. ($p > 0.05$)

Table 4: Mean and Standard Deviation values of 1 Minute Half Sit Up Test in both the groups.

Groups		Mean $\pm$ SD	P Value
Experimental	1 Min. Half Sit Up Test Pre	15.16 $\pm$ 5.06	<0.001
	1 MIN. HALF SIT UP TEST POST	20.40 $\pm$ 3.76	
Control	1 Min. Half Sit Up Test Pre	13.96 $\pm$ 2.56	0.674
	1 MIN. HALF SIT UP TEST POST	13.83 $\pm$ 2.16	

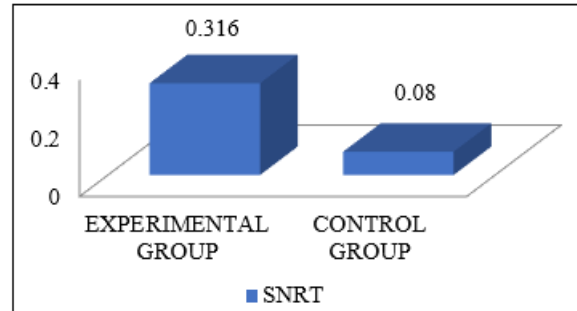
**Graph 4:** PRE and POST MEAN values in both Experimental and Control Group for 1 MIN. HALF SIT UP TEST.

There was a significant difference found on comparison of Pre- Mean and Post- Mean values of One Minute Half Sit-Up TEST in Experimental group ($p \leq 0.001$). There was no

significant difference found in control group. ($p > 0.05$) between group analysis by (MANN-WHITNEY U TEST)

Table 5: Mean Difference of SIT AND REACH TEST between the Groups

Groups		Mean $\pm$ SD	P Value
SNRT	Experimental	0.316 $\pm$ 0.81	0.001
	Control	0.08 $\pm$ 0.69	

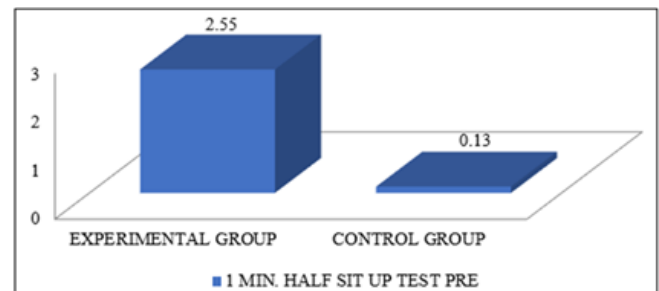
**Graph 5:** Mean Difference of Experimental and Control Group for Sit and Reach Test

There was a significant difference found on comparing the MEAN DIFFERENCE of SIT AND REACH TEST between the groups ($p < 0.05$).

(Experimental group showed more significant difference compare to control group)

Table 6: Mean Difference of One Minute Half Sit-Up Test between the Groups

Groups		Mean $\pm$ SD	P Value
1 Min. Half Sit Up Test Pre	Experimental	2.55 $\pm$ 3.46	0.001
	Control	0.13 $\pm$ 1.25	

**Graph 6:** Mean Difference of Experimental and Control Group for One Minute Half Sit-Up Test

There was a significant difference found on comparing the MEAN DIFFERENCE of ONE MINUTE HALF SIT-UP TEST between the groups ($p < 0.05$). (Experimental group showed more significant difference compare to control group)

4. Conclusion

The study concludes that Surya namaskar is effective in improving attention, trunk strength and flexibility in school going children. There is significant improvement i.e. $p < 0.001$, sit and reach test and one minute half sit-up test showed significant improvement in school going children. Thus, Surya namaskar can be used as regular physical exercise for children as a part of physical education.

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