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YOGIC ACTIVITIES AND REGULAR EXERCISE PROGRAMME ON ADOLESCENT SCHOOL GOING GIRLS.

Physical Education

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ABSTRACT

Subjects numbering 300 Girls were assessed on Health related physical fitness and they were then divided into three equal matched groups' viz., 2 experimental groups (Yogic exercise & Regular physical activity group) and control Group. The Yogic Exercise group subjects underwent a specially designed Yoga program comprising of various Asanas (isometric type exercises) and Pranayamas (breathing exercises), The Regular Exercise Group were given activities like running and freehand exercises whereas the control group were kept out of participation in any physical activity or Yoga. The results of 3 x 6 Factorial ANOVA followed by Scheffe's post hoc test revealed that Yogic exercise training and regular exercise programme for the period of 12 weeks significantly enhances Health related fitness components such as Flexibility, Muscular Strength and reduces Abdominal fat, Triceps fat & sub scapular fat. No experimental group showed significant improvement on cardiovascular endurance. Yoga group proved better in enhancing flexibility and reducing Abdominal fat, triceps fat and sub scapular fat where as physical exercise group was better in muscular endurance.

KEYWORDS

Yogic exercises, Physical Activities, Health Related Fitness.

INTRODUCTION:

Physical education programme in a school purposes for maintaining physical fitness for the entire population in the institution for their good health and proper growth. The physical activities provided to the students in the schools are vigorous and bring tiredness to the participants during post activity period. Students with academic orientation avoid strenuous physical activities practiced in the schools as it may deter them to go for studies in the evening. Practice of Yoga as a part of the school physical education programme may attract the student population those are keeping themselves away from strenuous and vigorous physical activities. Participation in yoga may not be so strenuous in comparison to the participation in physical activities and sports and may have a positive effect in accumulating required physical fitness and health to facilitate proper growth. Adolescent period is an important stage of growth & development where a girl transforms to a woman. This includes tremendous physiological & psychological changes. Thus acquisition of required physical fitness for maintaining appropriate health will help the girls to grow adequately. This may be named as health related fitness.

Health related fitness consists of four components: (a) *Cardio vascular fitness, (b) Muscular strength and endurance, (c) Flexibility and (e) Body composition.* The maintenance of fitness for health and well being, referred to as health related fitness, has become the primary objective behind fitness education. This philosophy is supported by the 3 following essential elements (Fox and Biddle 47-48).

1. *Health and well being is a universal issue, therefore the fitness of all children is of paramount concern. Those achieving a fitness level below the acceptable criterion level may necessitate specialized attention.*
2. *Health related physical fitness is not a constant variable. Exercise need to be dynamic, continuous endeavour to realise a life time of fitness.*
3. *With maturation, exercise becomes a "choice" behaviour. A child equipped with the desire, confidence and expertise regarding regular exercise will be better oriented towards a life time of fitness.*

The purpose of this study was to determine whether or not participation in a Physical Exercise programme and Yogic Exercise programme affects the adolescent girl's health related physical fitness.

METHODOLOGY: The present study included three hundred (300) girls of S.R. High School, Govt. Girls High School, Baliapal and within the age group of 13 to 16 years. After conducting a pre-test on health related fitness, the students were divided homogenously into three group's viz., Yogic Exercise Group(N 1=100), Physical Exercise Group (N 2=100) &Control Group (N 3=100). The first two groups were told to participate on the specified activities prescribed for them according to the nature of their groups. The third group, the Control group were instructed not to participate in any of the activities of the other two groups and to function as usual during the treatment period. The total duration of the treatment period to the subjects was 12 weeks. The subjects were told to participate in the prescribed activities thrice in a week and the training stimulus was 60 minutes on every activity day.

The following day wise schedule was followed:

Prescribed Yogic Exercises: A specific set of Yogic exercises was prescribed beginning with *Suryanamaskar* (dynamic stretching of the muscles of abdomen, back, neck, hands and legs), *Shavasana* (muscle relaxation), *Tadasan* (leg muscles stretching), *Konasana* (twisting stretch of spine), *Pawanmuktasana* (hip and back muscles stretching), *Naukasana* (abdominal muscles stretch), *Bhujangasana* (exercises low back muscles), *Sarpasana* (exercises low back muscles with opposite twist), *Dhanurasana* (exercises whole back and muscles), *Ardhamastyendrasana* (twisting spine), *Paschimottanasana* (hamstring stretch), *Yogamudra* (pressure on lower abdomen & back stretch), *Brahmamudra* (neck muscles stretch), *Anulom-Vilom* (breathing exercises).

Prescribed Physical Exercises: The Physical Exercise package includes jogging for warming up, free hand exercises, running for one KM, stretching exercises.

Statistical Methods Used: Data were analysed by using 2 x 2 x 3 Factorial ANOVA followed by Scheffe's post hoc test.

Results & Discussion: Results on Health Related Fitness Variables: There was some differences in flexibility as assessed through sit and reach test, between control and experimental groups (Table 1). Low standard deviation scores for all groups and both the test sessions are indicative of the fact that the improvement in performance has been uniform. There was some difference in Strength as assessed through bent knee curl up test, between control and experimental groups (Table 2). In the case of cardiovascular endurance of adolescent school girls (Table3), there remains some difference between control and experimental groups as assessed through Harvard Step test. In the case

of abdominal fat for adolescent school girls, there remains some difference in abdominal fat percentage as assessed through Skin fold test, between control and experimental groups (Table 4). This also revealed that impact of Physical exercises and Yogic exercises have been positive on reduction of abdominal fat. In the case of triceps fat for adolescent school girls, there remains some difference in triceps fat percentage as assessed through Skin fold test, between control and experimental groups (Table 5). This also reveals that impact of Physical exercises and Yogic exercises have been positive on reduction of triceps fat %. In the case of sub scapular fat for adolescent school girls, there remains some difference in sub scapular fat percentage as assessed through Skin fold test, between control and experimental groups (Table 6). This also reveals that impact of Physical exercises and Yogic exercises have been positive on reduction of sub scapular fat %.

TABLE 1: Mean & SD of School girls in Flexibility (C m.)

Groups	Pre-test		Post-test	
	Mean	SD	Mean	SD
Control	08.72	01.67	08.46	01.77
Physical exercise	08.55	01.34	09.10	01.71
Yoga	08.69	01.44	10.54	01.86

TABLE 2: Mean & SD of School girls in Muscular Strength (No./ min.)

Groups	Pre-test		Post-test	
	Mean	SD	Mean	SD
Control	19.22	03.16	21.08	03.65
Physical exercise	20.05	04.06	33.29	03.57
Yoga	19.18	03.01	28.10	03.28

TABLE 3: Mean & SD of School girls in Cardiovascular Endurance (Index)

Groups	Pre-test		Post-test	
	Mean	SD	Mean	SD
Control	78.95	04.23	76.12	03.65
Physical exercise	77.63	05.18	73.20	08.65
Yoga	77.86	04.83	74.18	07.34

TABLE 4: Mean & SD of School girls in Abdominal Fat (%)

Groups	Pre-test		Post-test	
	Mean	SD	Mean	SD
Control	18.08	03.34	19.76	03.09
Physical exercise	16.87	03.21	14.32	02.33
Yoga	17.04	02.69	12.01	02.59

TABLE 5: Mean & SD of School girls in Triceps Fat (%)

Groups	Pre-test		Post-test	
	Mean	SD	Mean	SD
Control	14.12	04.11	15.45	03.09
Physical exercise	15.00	03.65	12.67	02.24
Yoga	14.34	03.12	10.00	02.19

TABLE 6: Mean & SD of School girls in Sub scapular Fat (%)

Groups	Pre-test		Post-test	
	Mean	SD	Mean	SD
Control	10.14	02.10	11.15	02.16
Physical exercise	11.00	02.09	08.12	02.21
Yoga	10.66	02.56	08.05	2.29

The scores of central tendency and dispersion helped to interpret that in some variables, the pre-test and post-test differences seem to be negligible, however, real significant difference cannot be predicable from such results. It was therefore, thought desirable to apply 3 X 6 Factorial ANOVA. The real experimental model of the Factorial design has been presented in Table 7.

TABLE 7: Experimental Model for Factorial Design

Factor	Levels	Design
Health Related Fitness	Flexibility (A1), Muscular Strength (A2), Cardiovascular Endurance (B3), Abdominal Bodt Fat (A4), Triceps Body Fat (A5), Sub Scapular Body Fat (A6)	3 X 6 Factorial ANOVA
Groups	Control Group (B 1), Physical exercise Group (B 2), Yoga Group (B 3)	

The overall significance of the comparative results has been presented in Table 8. The result in fact, reveals that improvement in dependant variables is statistically significant at the 0.01 level (F=1833, p<0.01). This table also indicates that similar trends of result are evident in the case of between group comparison (F=40.59, p<0.01) and even in case of interactions (F=12.38, p<0.01).

TABLE 8: ANOVA for Mean improvement in Dependant Variables

Source of Variations	SS	df	MS	F
Total	43456.23	2999	-	-
Dependant Variables (A)	41264.33	5	8252.86	1833.96*
Subjects Group (B)	365.35	2	182.67	40.59*
Interaction (AB)	557.21	10	55.72	12.38*
Errors	1269.35	282	4.50	
*p<0.01				

Thus, the results as presented in Table 8 gives an overall impression that there was an improvement in almost all the variables within and between the groups. However, the real significant difference (group wise and variable wise) have been statistically recorded on the basis of the results of *Scheffe's post hoc test*, as follows.

- Results on Flexibility: The results of Scheffe's post hoc test on the flexibility values as appeared due to exposition of different treatment interventions (i.e., 'Physical Exercise' and 'Yoga') have revealed (Tables 9 & 10):

a. Variation in the score (Pre – Post test) of Flexibility among the subjects of Control group reveals non significant (CD= 0.25, p.0.05), where as pre – Post test improvement in flexibility in the Experimental groups (Physical Exercise & Yoga) was recorded as statistically significant (Physical Exercise: CD= 0.48, p<0.01; Yoga: CD= 0.74, p<0.01). Thus, the rate of improvement in Flexibility among both the control and experimental groups was not equal.

b. The level of improvement in Flexibility between the experimental groups was found non- similar (Yoga Vs Physical Exercise: CD= 0.48, p<0.05). This indicates that the treatment stimulus 'Yoga training' was superior to the 'Physical Exercise' in improving Flexibility (Fig. 7).

The results presented above helped to interpret that although both the treatment stimuli indicate improvement, the Yoga training could reveal significantly better effects than the 'Physical Exercise' in improving Flexibility among the selected adolescent school going girls.

TABLE 9: Ordered Treatment Means of Flexibility Values of Adolescent School girls as a Result of Treatment with 'Physical Exercise' and 'YOGA'.

	ORDER		
	1	2	3
Means	8.86	9.08	10.17

Where, 1 = Control Group, 2 = Physical Exercise Group, 3 = Yoga Training Group

TABLE 10: Scheffe's Post Hoc Test for difference between pairs of Ordered Means in Flexibility Values.

	5	4	3	2	1
STEPS: Males					
6	**0.74****	0.48*	0.84**	0.80**	0.83**
5	----	0.41*	0.21	0.35*	0.13
4		----	**0.65****	0.15	0.34*
3			----	0.17	0.38*
2				----	**0.25**
**p<0.01 *p<0.05					

Where, 1 = Control Group (Pre-test), 2 = Control Group (Post-test)

3 = Physical Exercise Group (Pre-test), 4 = Physical Exercise Group (Post-test)
5 = Yoga Group (Pre-test), 6 = Yoga Group (Post-test)

- Result on Muscular Strength: The results of Scheffe's Post Hoc test on the Muscular Strength values as appeared due to exposition

of different treatment intervention (i.e., 'Physical Exercise & Yoga') have revealed that (Table 11 & 12);

a. Variation in the scores (pre-post test) of muscular strength among the subjects of control group exhibits non- significant (CD 0.21, p>0.05), where as scores (pre-post test) of Experimental Groups (Physical Exercise & Yoga) in muscular strength was recorded as statistically significant (PE: CD= 0.78, p<0.01; Yoga: CD= 0.52<0.01). Thus, the rate of improvement in muscular strength among both the control and experimental groups was not equal.
b. The level of improvement in muscular strength between the experimental groups was found non similar (Yoga Vs Physical Exercise: CD= 0.44, p< 0.05). This indicates that the treatment stimulus 'Physical Exercise' was superior to the 'Yoga Training' in improving muscular endurance.

The results presented above helped to interpret that although both the treatment stimuli indicate improvement, the Physical Exercise could reveal significantly better effects than the Yoga training in improving Muscular Strength among the selected adolescent school going girls.

TABLE 11: Ordered Treatment Means of Muscular Strength Values of Adolescent School girls as a Result of Treatment with 'Physical Exercise' and 'YOGA'.

	ORDER		
	1	2	3
Means	19.79	32.56	27.10

Where, 1 = Control Group, 2 = Physical Exercise, 3 = Yoga Training Group

TABLE 12: Scheffe's Post Hoc Test for difference between pairs of Ordered Means in Muscular Strength Values.

	5	**4**	**3**	**2**	**1**
STEPS: Males					
6	**0.52****	0.44*	0.77**	0.84**	0.81**
5	----	0.35*	0.23	0.31*	0.11
4		----	**0.78****	0.13	0.30*
3			----	0.14	0.32*
2				----	**0.21**
**p<0.01 *p<0.05					

Where, 1 = Control Group (Pre-test), 2 = Control Group (Post-test)
3 = Physical Exercise Group (Pre-test), 4 = Physical Exercise Group (Post-test)
5 = Yoga Group (Pre-test), 6 = Yoga Group (Post-test)

- Results on Cardiovascular Endurance: The results on Scheffe's Post Hoc test on the Cardiovascular Endurance values as appeared due to exposition of different treatment intervention (i.e., 'Physical Exercise & Yoga') have revealed that (Table 13 & 14);

a. Variation in the scores (pre-post test) of Cardiovascular Endurance among the subjects of control group exhibits non-significant (CD 0.10, p>0.05), similarly as scores (pre-post test) 0f Experimental Groups (Physical Exercise & Yoga) in Cardiovascular Endurance were also recorded as non significant (PE: CD= 0.16, p>0.05; Yoga: CD= 0.14>0.05). Thus, there was no improvement in Cardiovascular Endurance among both the control and experimental groups.
b. The level of improvement in Cardiovascular Endurance between the experimental groups was found non significant (Yoga Vs Physical Exercise: CD= 0.18, p< 0.05). This indicates that the treatment stimulus 'Physical Exercise' and 'Yoga Training' did not have any effect on cardiovascular endurance.

The results presented above helped to interpret that the treatment stimuli indicates no improvement, and could reveal non-significant in improving Cardiovascular endurance among the selected adolescent school going girls.

TABLE 13: Ordered Treatment Means of Cardiovascular Endurance Values of Adolescent School girls as a Result of Treatment with 'Physical Exercise' and 'YOGA'.

	ORDER		
	1	2	3
Means	78.61	76.19	75.24

Where, 1 = Control Group, 2 = Physical Exercise Group, 3 = Yoga Training Group

TABLE 14: Scheffe's Post Hoc Test for difference between pairs of Ordered Means in Cardiovascular Endurance Values.

	5	**4**	**3**	**2**	**1**
STEPS: Males					
6	**0.14**	0.18	0.19	0.10	0.13
5	----	0.11	0.17	0.15	0.09
4		----	**0.16**	0.13	0.10
3			----	0.11	0.11
2				----	**0.10**
**p<0.01 *p<0.05					

Where, 1 = Control Group (Pre-test), 2 = Control Group (Post-test)
3 = Physical Exercise Group (Pre-test), 4 = Physical Exercise Group (Post-test)
5 = Yoga Group (Pre-test), 6 = Yoga Group (Post-test)

- Results on Abdominal Fat %: The results of Scheffe's Post Hoc test on the Abdominal Fat% as appeared due to exposition of different treatment intervention (i.e., 'Physical Exercise & Yoga') have revealed that (Table 15 & 16);

a. Variation in the scores (pre-post test) of Abdominal Fat among the subjects of control group exhibits non- significant (CD 0.18, p>0.05), where as scores (pre-post test) 0f Experimental Groups (Physical Exercise & Yoga) in Abdominal Fat was recorded as statistically significant (PE: CD= 0.55, p<0.01; Yoga: CD= 0.68<0.01). Thus, the rate of reduction in Abdominal Fat among both the control and experimental groups was not equal.
b. The level of reduction in Abdominal Fat between the experimental groups was found non similar (Yoga Vs Physical Exercise: CD= 0.40, p< 0.05). This indicates that the treatment stimulus 'Yoga Training' was superior to the 'Physical Exercise' in reducing Abdominal Fat.

The results presented above helped to interpret that although both the treatment stimuli indicate improvement, the Yoga Training could reveal significantly better effects than the Physical Exercises in improving Abdominal Fat among the selected adolescent school going girls.

TABLE 15: Ordered Treatment Means of Abdominal Fat%of Adolescent School girls as a Result of Treatment with 'Physical Exercises' and 'YOGA'.

	ORDER		
	1	2	3
Means	19.09	13.25	10.57

Where,1 = Control Group, 2 = Physical Exercise Group, 3 = Yoga Training Group

TABLE 16: Scheffe's Post Hoc Test for difference between pairs of Ordered Means in Abdominal Fat%.

	5	**4**	**3**	**2**	**1**
STEPS: Males					
6	**0.68****	0.40*	0.70**	0.76**	0.74**
5	----	0.31*	0.21	0.34*	0.16
4		----	**0.55****	0.16	0.33*
3			----	0.17	0.30*
2				----	**0.18**
**p<0.01 *p<0.05					

Where,1 = Control Group (Pre-test), 2 = Control Group (Post-test)
3 = Physical Exercise Group (Pre-test), 4 = Physical Exercise Group (Post-test)
5 = Yoga Group (Pre-test), 6 = Yoga Group (Post-test)

- Results on Triceps Fat %: The results of Scheffe's Post Hoc test on the Triceps Fat % as appeared due to exposition of different treatment intervention (i.e., 'Physical Exercise & Yoga') have revealed that (Table 17 & 18);

a. Variation in the scores (pre-post test) of Triceps Fat among the subjects of control group exhibits non- significant (CD 0.15, p>0.05), where as scores (pre-post test) 0f Experimental Groups (Physical Exercises & Yoga) in Triceps Fat was recorded as statistically significant (PE:

CD= 0.59, p<0.01; Yoga: CD= 0.72<0.01). Thus, the rate of reduction in Triceps Fat among both the control and experimental groups was not equal.

b. The level of reduction in Triceps Fat between the experimental groups was found non similar (Yoga Vs Physical Exercises: CD= 0.38, p< 0.05). This indicates that the treatment stimulus 'Yoga Training' was superior to the 'Physical Exercises' in reducing Triceps Fat.

c. The results presented above helped to interpret that although both the treatment stimuli indicate reduction in triceps fat, the Yoga Training could reveal significantly better effects than the Physical Exercises in reducing in Triceps Fat among the selected adolescent school going girls.

TABLE 17: Ordered Treatment Means of Triceps Fat%of Adolescent School girls as a Result of Treatment with 'Physical Exercise' and 'YOGA'.

	ORDER		
	1	2	3
Means	16.16	12.30	10.05

Where,1 = Control Group, 2 = Physical Exercise Group, 3 = Yoga Training Group

TABLE 18: Scheffe's Post Hoc Test for difference between pairs of Ordered Means in Triceps Fat%.

	5	4	3	2	1
STEPS: Males					
6	**0.72****	0.38*	0.67**	0.73**	0.71**
5	----	0.28*	0.19	0.31*	0.13
4		----	**0.59****	0.13	0.30*
3			----	0.13	0.27*
2				----	**0.15**
**p<0.01 *p<0.05					

Where,1 = Control Group (Pre-test) 2 = Control Group (Post-test)
3 = Physical Exercise Group (Pre-test) 4 = Physical Exercise Group (Post-test)
5 = Yoga Group (Pre-test) 6 = Yoga Group (Post-test)

- Results on Sub scapular Fat %: The results of Scheffe's Post Hoc test on the Sub scapular Fat % as appeared due to exposition of different treatment intervention (i.e., 'Physical Exercise & Yoga') have revealed that (Table 19 & 20);

a. Variation in the scores (pre-post test) of Sub scapular Fat among the subjects of control group exhibits non- significant (CD 0.19, p>0.05), where as scores (pre-post test) 0f Experimental Groups (Physical Exercise & Yoga) in Sub scapular Fat was recorded as statistically significant (PE: CD= 0.61, p<0.01; Yoga: CD= 0.64<0.01). Thus, the rate of reduction in Sub scapular Fat among both the control and experimental groups was not equal.

b. The level of reduction in Sub scapular Fat between the experimental groups was found non similar (Yoga Vs Physical Exercise: CD= 0.34, p< 0.05).

The results presented above helped to interpret that both the experimental groups exhibited reduction in sub scapular fat as compared to control group. However, no difference was seen between yoga and Physical Exercise groups.

TABLE 19: Ordered Treatment Means of Sub scapular Fat %.of Adolescent School girls as a Result of Treatment with 'Physical Exercises' and 'YOGA'.

	ORDER		
	1	2	3
Means	12.06	08.36	08.27

Where,1 = Control Group 2 = Physical Exercise Group 3 = Yoga Training Group

TABLE 20: Scheffe's Post Hoc Test for difference between pairs of Ordered Means in Subscapular Fat %.

	5	4	3	2	1
STEPS: Males					
6	**0.64****	0.34*	0.61**	0.70**	0.59**
5	----	0.24*	0.11	0.28*	0.10
4		----	**0.61****	0.11	0.29*
3			----	0.10	0.29*
2				----	**0.19**
**p<0.01 *p<0.05					

Where 1 = Control Group (Pre-test) 2 = Control Group (Post-test)
3 = Physical Exercise Group (Pre-test) 4 = Physical Exercise Group (Post-test)
5 = Yoga Group (Pre-test)6 = Yoga Group (Post-test)

DISCUSSION OF RESULTS:

i. The results revealed that the **Flexibility** of the girls improved through participation in Physical Exercises as well as Yoga training. Also it was found that the Yoga training could reveal significantly better effects than the Physical Exercises in improving flexibility among the selected adolescent School going girls.

ii. In case of **muscular strength,** the improvement was statistically significant due to exposition of both treatment interventions i.e., Physical Exercises and yoga training. Further, it was observed that the Physical Exercises could reveal significantly better effects than the Yoga training in improving muscular strength among the selected adolescent School going girls.

iii. The statistical analyses of the scores on **cardiovascular endurance** values were non-significant and no sign of improvements marked in post test comparing to pre test scores of the experimental groups. This indicates that the treatment stimulus 'Physical Exercises' and 'Yoga Training' did not have any effect on cardiovascular endurance.

iv. The results revealed that the **abdominal fat** of the students reduced through participation in Physical Exercises as well as Yoga training. Also it was found that the Yoga training could reveal significantly better effects than the Physical Exercises in reducing abdominal fat among the selected adolescent School going girls.

v. The **triceps fat%**, as analysed statistically was having a positive change on the subjects through participation in Physical Exercises and Yoga training. However, the Yoga training group had shown better results than the Physical Exercise group.

vi. Similarly, the statistical analysis of the pre-test and post test scores of **sub scapular Fat%** revealed a significant reduction of abdominal fat of the subjects of both the experimental groups. However, it was also seen that there was no difference on sub scapular fat reduction between two experimental groups.

CONCLUSION: The results of the study as stated previously had made an indication of a positive change in health related fitness components, from pre to post test measures and found statistically significant barring one component i.e., cardiovascular endurance. The post test scores for cardiovascular endurance exhibited no improvement. The Yoga Training Group had shown better improvements in Flexibility, Abdominal fat reduction and Triceps fat reduction in comparison with Physical Exercise group while Physical Exercise group had shown improvements in Muscular strength in comparison with Yoga training group.

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