

## Effect of Twelve Weeks Exercise Program with Pilates on Body Composition among School Boys of Manipur

**Th. Nandalal Singh<sup>a</sup>, S.Vinay Kumar Singh<sup>b</sup>**

<sup>a</sup>Assistant Professor, Department of Physical Education, Panjab University, Chandigarh, India

<sup>b</sup>Guest Faculty, Department of Physical Education, Panjab University, Chandigarh, India

---

### Abstract

The objective of this study was to find out the effects of Pilates exercise on body composition (percentage of body fat, total body fat and lean body mass) among school boys. For the purpose of the study 80 school boys from Kendriya Vidyalaya School, Loktak (Manipur) were randomly selected as subjects. The age was ranged from 14-16 years. The subjects were divided into two groups i.e. experimental group (N=40) and control group (N=40). Body composition was assessed by taking the skinfold measurement at four sites namely biceps, triceps, subscapular and suprailiac (Durnin & Womersley, 1974). The Lange Skinfold Caliper was used to assess percentage body fat. For experimental group a Pilates training programme was given to the subjects, 45 minutes per day 3 days per week during 12 weeks. To compare the mean difference between the pre-test data and post-test data, 't' test was applied using the SPSS software. Analysis of Variance (ANOVA) was applied to determine the difference between the results obtained at different stages of training (Initial week, 4<sup>th</sup> week, 8<sup>th</sup> week and 12<sup>th</sup> week) of the experimental group. Scheffee's Post-Hoc test was applied in cases where 'F'-ratio has shown significance to find out which of the differences of the paired means were significant. For testing hypothesis, the level of significance chosen was .05. Total body fat and percentage of body fat were found to be statistically significant in experimental group. In case of control group there was no significant difference found in the variables of body composition.

**KEYWORDS:** Pilates, Body Composition, Percentage of Body Fat, Total Body Fat, LBM.

---

### INTRODUCTION

Physical activity is as old as human life. A primitive man, even watchful of his foes, had to keep himself in a very good physique for his survival. Since we are living in this modern age we must of necessity devote more time and more thought to the important matter of acquiring physical fitness. This does not necessarily imply that we must devote ourselves only to the mere development of any particular set of muscles, but rather more rationally to the uniform development of our bodies as a whole-keeping all our organs as nearly as possible in their naturally normal condition so that we may live a healthy life. Pilates improves mental and physical well-being, increases flexibility and strengthens muscles through controlled movements done as mat exercises or with equipment to tone and strengthen the body.

The popularity of Pilates as a method of body conditioning has increased enormously in the last ten years. *Joseph Hubertus Pilates* formed the Pilates exercise in the early 1920s. The exercise programme was designed with the objective of increasing muscle

strength, coordination, endurance and flexibility while maintaining spine stabilization and without gaining muscle bulk. It was originally used for the rehabilitation process for the bedridden or immobile patients during First World War. *Johnson et al. (2007)* reported that Pilates exercises are suitable for each age, all body types and for all fitness abilities due to the modifiable nature of the movements. It is a useful means of increasing activity and thereby curbing the obesity epidemic. Pilates exercise could have a potential role to improve the students' postural abnormalities and it is useful to perform this exercise at schools. The principle of centering refers to the concept that all movements of the human body originate from the center or core or what Joseph Pilates called the powerhouse of the body. *Segal et al. (2004)* stated that Pilates training might result to improve body composition and flexibility. *Jago et al. (2006)* believed that Pilates exercise is a useful means of increasing activity and thereby curbing the obesity epidemic. It was also concluded that Pilates exercise could be implemented within after school programs.

## METHOD AND PROCEDURE

The purpose of this study was to find out the effects of Pilates exercises on body composition (percentage of body fat, total body fat and lean body mass) among school boys of Manipur. An experimental control group design was adopted for this study. Eighty (80) school boys from Kendriya Vidyalaya School, Loktak (Manipur) were randomly selected as subjects. The subjects were divided into two groups i.e. experimental group (N=40) and control group (N=40). The age was ranged from 14-16 years. No special motivation techniques were used to enhance their performance. Body composition was assessed by taking the skinfold measurement at four sites namely biceps, triceps, subscapular and suprailiac (*Durnin & Womersley, 1974*). The Lange Skinfold Caliper was used to assess percentage body fat.

The Pilates exercises were administered for 12 weeks by the researcher himself. At the start of the exercise programme, data were collected on the body composition variables as the pre-test data. After 4<sup>th</sup> week and 8<sup>th</sup> week of the training programme, another set of data were collected just to see the progress, and at the end of 12<sup>th</sup> week, the post-test data were collected for the analysis purpose. As the training session advances, the intensity of the load was increased by increasing repetition and duration. Forty-five minutes Pilates exercise three days per week i.e. on Tuesday, Thursday and Saturday were given. Prior to the training programme the experimental group had a warming up session. In the first week to second week the Pilates exercises i.e. side bridge (5 sec hold x 3 sets), single leg forward bridge (5 sec hold x 3 sets), star bridge (5 sec hold x 3 sets), v-ups (5 reps x 3 sets), straight leg elbow to knee curls (5 reps x 3 sets), cycling twists (5 reps x 3 sets), spine twist (5 reps x 3 sets), the side bend (5 reps x 3 sets), the leg pull (5 reps x 3 sets) and shoulder bridge (5 reps x 3 sets) were given to the experimental group. After every two weeks the training load gradually increased by 5 sec (for hold exercises) and 5 repetitions (for repetition exercises) but there was no change in the sets of the exercises. The control group was tested prior to the training programme (pre-test) and after the cessation of the training programme (post-test).

To compare the mean differences between the initial (pre-test) and final (post-test) scores of experimental and control group, 't' test was employed. The data pertaining to all the body composition variables obtained through four different stages of testing (Initial week, 4<sup>th</sup> week, 8<sup>th</sup> week and 12<sup>th</sup> week) from experimental group were statistically analyzed employing F test (ANOVA). Scheffe's Post-Hoc test was

applied in cases where ‘F’-ratio has shown significance to find out which of the differences of the paired means were significant. For testing hypothesis, the level of significance chosen was .05.



Figure 1: Illustration of Side Bend



Figure 2: Illustration of V-ups



Figure3: Illustrations of Skinfold Measurement

**RESULTS**

The comparison of body composition between initial and final scores for experimental and control group among school boys is presented in table-1.

**Table-1**  
**COMPARISON OF INITIAL AND FINAL SCORES OF BODY COMPOSITON FOR EXPERIMENTAL GROUP (EG) AND CONTROL GROUP (CG)**

BODY COMPOSITIO N	GROU P	INITIA L MEAN	SD	FINAL MEAN	SD	MD	S.E.	‘t’
Percentage of Body fat	EG	21.24	3.69	18.12	3.97	3.12	0.86	<b>3.64*</b>
	CG	19.09	3.14	19.70	2.98	0.60	0.68	0.88
Total Body Fat	EG	12.21	4.34	9.82	4.07	2.39	0.94	<b>2.54*</b>
	CG	10.85	2.53	11.23	2.43	0.38	0.55	0.69

<b>Lean Body Mass</b>	EG	44.12	5.28	42.77	5.14	1.35	1.16	1.16
	CG	45.45	2.61	45.37	2.84	0.08	0.61	0.55

*\*Significant at .05 level*

$$t'_{.05(78)} = 1.99$$

The 't' values of percentage of body fat (3.64) and total body fat (2.54) in experimental group were found to be statistically significant as the tabulated value was 1.99 with 78 degree of freedom at .05 level of significance. With regard to pre-test and post-test scores for experimental group on the lean body mass, the 't' value (1.16) was not found to be statistically significant. Descriptive analysis of different stages of training on body composition among school boys is presented in table-2.

**Table-2**  
**DESCRIPTIVE ANALYSIS OF DIFFERENT STAGES OF TRAINING ON BODY COMPOSITION AMONG SCHOOL BOYS (EXPERIMENTAL GROUP)**

<b>BODY COMPOSITON</b>	<b>INITIAL</b>		<b>FOURTH</b>		<b>EIGHTH</b>		<b>TWELFTH</b>	
	<b>MEAN</b>	<b>SD</b>	<b>MEAN</b>	<b>SD</b>	<b>MEAN</b>	<b>SD</b>	<b>MEAN</b>	<b>SD</b>
<b>% of Body fat</b>	21.24	3.68	20.44	3.82	19.06	4.04	18.12	3.97
<b>Total Body Fat</b>	12.21	4.34	11.66	4.30	10.65	4.30	9.82	4.07
<b>LBM</b>	44.12	5.27	44.13	5.23	43.85	5.10	42.77	5.14

The initial week of percentage of body fat was the maximum with the mean value of 21.24 and SD value 3.68, followed by fourth, eighth and twelfth week with mean values of 20.44, 19.06 and 18.12 and SD values 3.82, 4.04 and 3.79 respectively. The lowest was shown by twelfth with mean value of 18.12. In case of total body fat, the initial week's mean value 12.21 was the maximum, SD value was 4.34, followed by fourth, eighth, and twelfth week with mean values of 11.66, 10.65 and 9.82 and SD values 4.30, 4.30 and 4.07 respectively. The lowest was shown by twelfth with mean value of 9.82. Fourth week of lean body mass with the mean value 44.13 was the maximum, SD value was 5.23, followed by initial, eighth, and twelfth week with mean values of 44.12, 43.85 and 42.77 and SD values 5.27, 5.10 and 5.14 respectively. The lowest was shown by twelfth with mean value of 42.77. The comparison body composition among different stages of Pilates training of school boys for experimental group is presented in Table-3.

**Table-3**  
**COMPARISON OF BODY COMPOSITION AMONG DIFFERENT STAGES OF PILATES TRAINING OF SCHOOL BOYS FOR EXPERIMENTAL GROUP**

<b>BODY COMPSITION</b>	<b>SOURCE OF VARIANCE</b>	<b>SUM OF SQUARES</b>	<b>df</b>	<b>MEAN SQUARE</b>	<b>F-value</b>
<b>Percentage of Body Fat</b>	Between Group	232.77	3	77.59	5.15*
	Within Group	2351.71	156	15.07	
	Total	2584.48	159		
<b>Total Body Fat</b>	Between Group	134.67	3	44.89	2.48
	Within Group	2823.18	156	18.09	
	Total	2957.85	159		

<b>Lean Body Mass (LBM)</b>	Between Group	49.74	3	16.58	0.62
	Within Group	4192.75	156	26.88	
	Total	424.49	159		

*\*Significant at .05 level*

$$F_{.05}(3, 156) = 2.66$$

Table-3 clearly indicates that there was significant difference found at different stages of training among school boys on the variable of percentage of body fat since the value of F obtained at .05 level was 5.15 whereas, the value needed for significance was 2.66 for 3 and 156 degrees of freedom at .05 level. There were no significant differences found at different stages of training among school boys on the variables of total body fat and lean body mass, since the value of F obtained at .05 level were 2.48 and 0.62 whereas, the value needed for significance was 2.66 for 3 and 156 degrees of freedom at .05 level. To find out the paired mean differences where F test is significant the Scheffe's Post-Hoc test was employed and the data pertaining to this is presented in table-4.

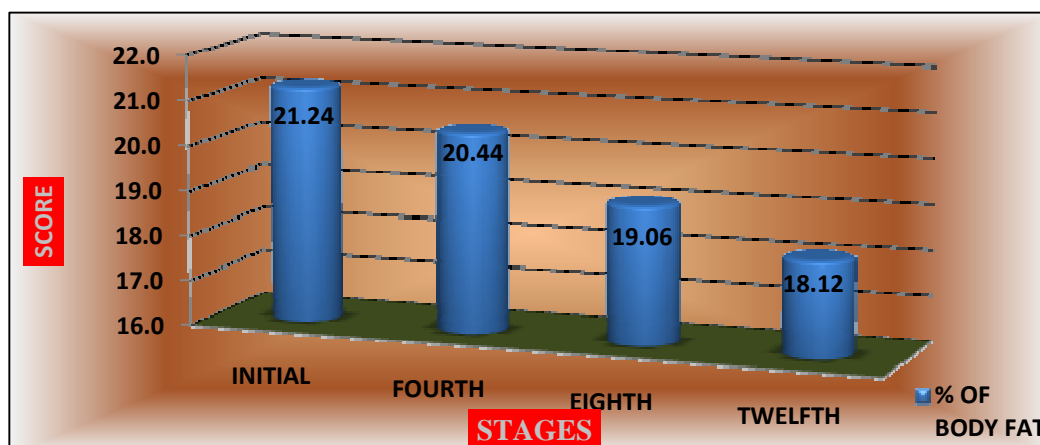
**Table- 4**  
**SIGNIFICANT DIFFERENCES BETWEEN THE PAIRED MEANS ON**  
**PERCENTAGE OF BODY FAT AT DIFFERENT STAGES OF TRAINING**  
**AMONG SCHOOL BOYS**

<b>GROUPS</b>				<b>Mean Difference (MD)</b>
<b>INITIAL</b>	<b>FOURTH</b>	<b>EIGHTH</b>	<b>TWELFTH</b>	
21.24	20.44			0.79*
21.24		19.06		2.18*
21.24			18.12	3.12*
	20.44	19.06		1.38*
	20.44		18.12	2.32*
		19.06	18.12	0.94*

*\*Significant at .05 level*

$$I_{.05}(3, 156) = 0.59$$

Table-4 clearly indicates that the significant differences existed in percentage of body fat as a result of twelve weeks of Pilates exercise among school boys between initial and fourth week, initial and eighth week, initial and twelve week, fourth and eight week, fourth and twelve week, eighth and twelve week as the values obtained of mean differences were 0.79, 2.18, 3.12, 1.38, 1.38, 2.32 and 0.94 respectively, as the value of critical differences (I) needed to be significant was 0.59 for 3 and 156 degrees of freedom at .05 level as shown in figure-4.



**Figure: 4**  
**Mean Scores of Percentage of Body Fat at Different Stages of Training**

## DISCUSSION

With regard to pre-test and post-test scores for experimental group on the percentage of body fat and total body fat, the 't' value was found to be statistically significant. There was significant difference found at different stages of training among school boys on the variable of percentage of body fat. The Scheffe's post-hoc test revealed that there was an improvement in the percentage of body fat of the subjects. The significant difference in percentage of body fat of the experimental subjects was noticed after twelve weeks of Pilates exercise programme. The probable reason attributed to the significant differences in the above-mentioned parameters may be that the twelve week of Pilates exercise programme mentioned earlier with a frequency of 3 days/week was sufficient to bring about significant changes in percentage of body fat and total body fat of experimental subjects. Moreover, for the reason for the insignificant differences in the mentioned parameters may be that the duration or the intensity of the training programme, dietary pattern would have been insufficient to obtain the changes. Similar studies have been reported by Cakmakci (2011). He examined the effects of 8 weeks Pilates Exercise on body composition in obese women. The result showed that eight weeks of Pilates training programme has been found to be effective on weight, body mass index, lean body mass, waist-hip ratio, biceps, triceps, fat percentage, basal metabolic rate, and flexibility in Pilates training group. The research findings of Jago et al. (2006) support the findings of the present study. He concluded that Pilates exercise holds promise as a means of reducing obesity and participation for 4 weeks in a Pilates exercise programme lowered the BMI percentile. The present findings are in line with the findings of Segal et al. (2004) he concluded that Pilates exercise improved flexibility. However, its effect on body composition, health status, and posture are more limited and may be difficult to establish. The finding of the present study has revealed encouraging results. The results will assist the physical educators, fitness trainers, coaches, physicians etc. in their professional life and also the students or the athletes can include Pilates exercise in their exercise routine as a conditioning exercise for the betterment of their academic and sports career.

## CONCLUSION

On the basis of the findings of the study, the following conclusions were framed:

- The experimental group showed significant changes in body composition variables and no significant changes were found in the control group.
- A significant difference was found between pre-test and post-test on percentage of body fat and total body fat among school boys of Manipur.
- Lean body mass does not significantly improve through a participation in twelve weeks of Pilates exercise programme in school boys.
- Participating in twelve weeks of Pilates exercise programme improves the percentage of body fat and total body fat in the school boys. The percentage of body fat significantly improved during eighth week and after twelfth week, it further improved.

## REFERENCES

1. Barrow, H.M. and Mc Gee. R. (1979). “*A Practical Approach to Measurement in Physical Education*”, Lea & Febiger: London.
2. Cakmakci, O. (2011). “The Effect of 8 Week Pilates Exercise on Body Composition in Obese Women”. *Collegium Antropologicum*, Vol 35(4), pp. 1045-1050.
3. Durnin, J.V.G.A. and Womersley, J. (1974). “Body fat assessed from the total body density and its estimation from skinfold thickness: measurements on 481 men and women aged from 16 to 72 years”. *British Journal of Nutrition*, 32, 77-97.
4. Jago, R. et al. (2006) “*Effect of 4 Weeks of Pilates on the Body Composition of Young girls*”. *Preventive Medicine*, Volume 42, pp 177-180.
5. Johnson E.G., Larsen A., Ozawa H., Wilson C. A., Kennedy K. L. (2007). “*The effects of Pilates-based exercise on dynamic balance in healthy adults*”. *Journal of Bodywork and Movement Therapies*, Vol. 11 (3), (pp 238-242).
6. Menezes, A. (2004). “*The Complete Guide to Joseph H. Pilates’ Techniques of Physical Conditioning*” Hunter House Inc. Publishers, Alameda CA.
7. Peterson, J. (2009) “*Teaching Pilates for Postural Faults, Illness & Injury: A Practical Guide*”. *Butterworth Heinemann, Elsevier Ltd.*
8. Segal, N. A. & Hein, J. B. J. (2004). “*The Effects of Pilates Training on Flexibility and Body Composition: An Observational Study*”. *Arch Phys Med Rehabil*; 85:1977–81.
9. Williams, M. H. (1990). “*Lifetime Fitness and Wellness: A Personal Choice*”. Brown Publishers: U.S.A.