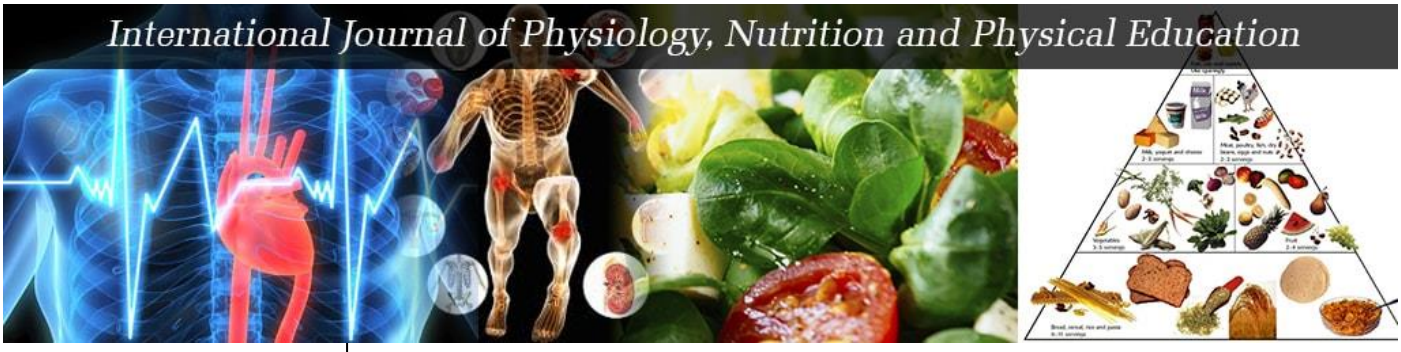

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Effect of twelve weeks strength training on selected variables of body composition of female handball players

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Abstract
The study was conducted to compare the twelve of eight weeks strength training on various variables of body composition of female handball players. To obtain data for this study, the researcher had selected (N=40) female handball players of 18 to 24 years of age group (21.17 ± 2.37 years) to act as subject, among those 40 subjects 20were selected as the controlled group and the rest of the 20 subjects were kept in the experimental group, the experimental group were given the treatment and the control group were told to carry out the normal routine. All the subjects, after having been briefed about the objective and protocol of the study, gave their consent and volunteered to participate in this study. Standard tests were used to measure the Body fat %, BMI, Impedance. The study concluded that there was no significant difference on the variables of body composition which was attributed to the fact of inequality of the age group, more about figure consciousness, influence of eating habits. It may also be due to small sample size.

Keywords: Body fat %, BMI, Impedance health related fitness, handball

Introduction
Sport performance is highly dependent on the health- and skill-related components of fitness (power, speed, agility, reaction time, balance, and Body Composition coordination) in addition to the athlete's technique and level of competency in sport-specific motor skills. All fitness components depend on body composition to some extent. An increase in lean body mass contributes to strength and power development. Strength and power are related to muscle size. Thus, an increase in lean body mass enables the athlete to generate more force in a specific period of time. A sufficient level of lean body mass also contributes to speed, quickness, and agility performance (in the development of force applied to the ground for maximal acceleration and deceleration). Reduced nonessential body fat contributes to muscular and cardiorespiratory endurance, speed, and agility development. Additional weight (in the form of nonessential fat) provides greater resistance to athletic motion thereby forcing the athlete to increase the muscle force of contraction per given workload. As with other activities, handball is not a science, but science may help to improve the performance of handball. Efforts to improve handball performance often focus on techniques and tactics at the expense of physical fitness. During a full game, elite-level players run about 3-5 kilometers at an average intensity close to the anaerobic threshold (80-90% of maximal heart rate). Within this endurance context, numerous explosive bursts of activity are required, including jumping, kicking, tackling, turning, sprinting, changing pace, and sustaining forceful contractions to maintain balance and control of the ball against defensive pressure (Stolen *et al*. 2005).

Methodology
40 female handball players from L.N.I.P.E Gwalior were randomly selected as subjects for the study, 20 were kept in control group and 20 were kept in experimental group. Based on review of Literature, correspondence with the expert and scholar's own understanding, the following variables: Body fat %, BMI, Impedance were selected as the purpose of the study.

Criterion measures
For the collection of data the body analyzer test was conducted on L.N.I.P.E female handball players, a total of 40 subjects were selected and out of them 20 were kept in experimental

group and 20 in control group, the experimental group were given the treatment. The following tests were administered:

1. The subjects were analyzed on TANITA Body composition analyzer SC-330ST machine, which is installed in the research laboratory of L.N.I.P.E Gwalior.
2. The prescribed strength training was given at the weight training hall of the department.

Administration of the test

The tests was conducted at L.N.I.P.E Gwalior, for the collection of data the test was conducted on 40 female handball players of L.N.I.P.E Gwalior, the training was given to the experimental group and the control group were told to carry out their normal daily routine The following tests will be administered:

1. Impedance of the subjects was taken by using Tanita body composition analyzer SC-330ST machine.
2. BMI was measured at Tanita body composition analyzer SC-330ST machine.
3. Body fat % of the subjects were also measured at Tanita body composition analyzer SC-330ST machine.

During each session of the training the subjects were informed of the different Training Schedule. They were oriented & motivated to give their best performance in the training session.

Statistical technique

The reliability of data was established by using ANCOVA and also reliability was ensured by establishing the tester's competency and reliability of tests.

Findings

The findings measured Body composition variables i.e. percent body fat, body mass index & impedance after twelve weeks of strength training, the findings refers exclusively to the selected female handball players. The present sample that was tested on these variables are presented below and discussed in the following tables:

Table 1: Descriptive analysis of post test on BMI

Treatment Groups	Mean	Std. Deviation	N
Experimental Group	21.04	1.85	20
Control Group	21.01	1.69	20
Total	21.03	1.74	40

In the Table I it can be seen that the mean and standard deviation of both the control group and experimental group.
The mean and standard deviation of different post testing groups after adjustment have been shown in table 2:-

Table 2: Adjusted mean and standard error of experimental and control group in post testing

Treatment Groups	Mean	Std. Error
Experimental Group	21.08	.128
Control Group	20.98	.128

Further, adjusted means and standard deviation for data on BMI of both the groups during post testing is shown in table 2. These values are different from that of unadjusted values shown in table 1.
The final results of ANCOVA have been shown in table 3:-

Table 3: ANCOVA table for the post test data on BMI

Source	Type I Sum of squares	Df	Mean Square	F	Sig.
Pre test on BMI	107.178	1	107.178	326.203	.898
Treatment group	.101	1	.101	.307	.008
Error	12.157	37	.329		
Total	17809.78	40			

Table 3 shows the f- value for comparing the adjusted means of the two groups (treatment and control) during post testing. Since p-value for f statistics is 0.898 which is more than 0.05, it is insignificant. Thus the null hypothesis of no difference among the adjusted post means for the data on BMI in both the groups failed to be rejected at 5% level.
Since f- statistics is insignificant, post hoc comparison has been made for adjusted means of two groups which is shown in table 4:-

Table 4: Post hoc comparison of adjusted means of the data on BMI obtained in post hoc measurement.

(I) Treatment Groups	(J) Treatment Groups	Mean Difference (I-J)	Std. Error	Sig.
Experimental Group	Control Group	.100	.181	.583

The p- value for mean difference between experimental and control group is 0.583. Since p-value is more than 0.05 and hence they are insignificant at 5% level.
The mean and standard deviation of both groups during post testing have been shown in table 5:-

Table 5: Descriptive statistics of post test of fat percentage

Treatment Groups	Mean	Std. Deviation	N
Experimental Group	24.64	4.18	20
Control Group	25.13	4.09	20
Total	24.88	4.09	40

The mean and standard deviation of different post testing groups after adjustment have been shown in table 6:-

Table 6: Adjusted mean and standard error of experimental and control group in post testing

Treatment Groups	Mean	Std. Error
Experimental Group	24.27	.088
Control Group	25.49	.088

Further, adjusted means and standard deviation for data on fat percentage of both the groups during post testing is shown in table 4. These values are different from that of unadjusted values shown in table 4.
The final results of ANCOVA have been shown in table 7:

Table 7: ANCOVA table for the post test data on fat percentage

Source	Type I Sum of squares	Df	Mean Square	F	Sig.
Pre test on fat percentage	645.690	1	645.690	4160.674	.000
Treatment group	14.70	1	14.701	94.731	.000
Error	5.74	37	.155		
Total	25429.290	40			

Table 3 shows the f- value for comparing the adjusted means of the two groups (treatment and control) during post testing. Since p-value for f statistics is 0.00 which is less than 0.05, it is significant. Thus the null hypothesis of no difference among the adjusted post means for the data on fat percentage in both the groups may be rejected at 5% level.
Since f- statistics is significant, post hoc comparison has been made for adjusted means of two groups which is shown in table 8:-

Table 8: Post hoc comparison of adjusted means of the data on fat percentage obtained in post hoc measurement

(I) Treatment Groups	(J) Treatment Groups	Mean Difference (I-J)	Std. Error	Sig.
Experimental Group	Control Group	-1.218	.125	.000

The p- value for mean difference between experimental and control group is 0.00. Since p-value is less than 0.05 and hence they are significant at 5% level
The mean and standard deviation of both groups during post testing have been shown in table 9:-

Table 9: Descriptive statistics of post test of impedence

Treatment Groups	Mean	Std. Deviation	N
Experimental Group	676.40	34.54	20
Control Group	673.10	29.91	20
Total	674.75	31.93	40

The mean and standard deviation of different post testing groups after adjustment have been shown in table 10:-

Table 10: Adjusted mean and standard error of experimental and control group in post testing

Treatment Groups	Mean	Std. Error
Experimental Group	666.91	1.319
Control Group	682.58	1.319

Further, adjusted means and standard deviation for data on impedance of both the groups during post testing is shown in table 10. These values are different from that of unadjusted values shown in table 9.
The final results of ANCOVA have been shown in table 11:-

Table 11: ANCOVA table for the post test data on impedance

Source	Type I Sum of squares	Df	Mean Square	F	Sig.
Pre test on impedance	38442.263	1	38442.263	1156.07	.000
Treatment group	2246.915	1	2246.915	67.57	.000
Error	1230.337	37	33.252		
Total	18251284.00	40			

Table 3 shows the f- value for comparing the adjusted means of the two groups (treatment and control) during post testing. Since p-value for f statistics is 0.00 which is less than 0.05, it is significant. Thus the null hypothesis of no difference among the adjusted post means for the data on impedance in both the groups may be rejected at 5% level.
Since f- statistics is significant, post hoc comparison has been made for adjusted means of two groups which is shown in table 12:-

Table 12: Post hoc comparison of adjusted means of the data on impedance obtained in post hoc measurement

(I) Treatment Groups	(J) Treatment Groups	Mean Difference (I-J)	Std. Error	Sig.
Experimental Group	Control Group	-15.670	1.907	.000

The p- value for mean difference between experimental and control group is 0.00. Since p-value is less than 0.05 and hence they are significant at 5% level.

Discussion of findings

From the findings it can be clearly inferred that there are no significant difference in the Body Composition variables i.e. BMI, but the study also showed that there was found significant on Body fat percent & Impedance after twelve weeks of strength training on the selected female handball players. The result of the study shows that there was significant difference on the variables of body composition which was attributed to the fact of inequality of the age group, more about figure consciousness, influence of eating habits except the B.M.I. It was hypothesized that the strength training would significantly improve the selected variables of body composition such as body fat percent, body mass index & Impedance but the body mass index was found to be insignificant and the body fat percent and impedance was found significant, The findings of the study showed that there was no significant improvement in selected variables of body composition such as body mass index after strength training, Hence on the basis of the results of the study, the hypothesis was rejected at 0.05 level of significance. For body mass index bit it was also accepted for body fat percent and impedance, hence there was significant differences found among body fat percent and impedance.

Conclusion

In the light of the study undertaken certain limitation imposed by the experimental conditions, the scholar arrived at the following conclusion. Body mass index was not significantly improved due to the influence of strength training among the female handball players but Percentage of body fat & impedance were significantly improved so, the study concluded that there were significant difference on the variables of body composition which was attributed to the fact of inequality of the age group, more about figure

consciousness, influence of eating habits except the body mass index It may also be due to small sample size.

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