



RESEARCH ARTICLE

EFFECT OF SWISS BALL AND CRUNCHES ON MUSCULAR STRENGTH AND ABDOMINAL STRENGTH

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ABSTRACT

The aim of the present study was to evaluate the effect of Swiss ball and crunches on muscular strength and abdominal strength. For the purpose of the study 30 sedentary male students from Pondicherry University were randomly selected and their age ranged between 19-22 years. Subjects were asked to assemble in the multipurpose hall in the morning hours and were given training. The subjects were hostel students and their food patterns were similar. Their life style and living condition were not taken into consideration. They were divided into three groups A, B and C with 10 subjects in each group. Group A was kept under control group (CG), group B was treated with Swiss ball training (SBTG) and group C were given crunches exercise (CEG). The subjects of group B and C underwent training for twelve weeks with the duration of 45 minutes. The training was started at 6.30 am and it was given for 6 days per week. The pre test and post test on muscular strength and abdominal strength was measured using push up test and bent knee sit-ups. The data was statistically analysed by using ANCOVA to find out the significant difference among the three groups. The finding of the study revealed that there was a beneficial effect on muscular strength and abdominal strength for both the experimental groups when compared to the control group. The training was more effective for the group doing CEG than the group B (SBTG) group.

Key words: Swiss ball, Crunches, Muscular Strength and Abdominal Strength

INTRODUCTION

Strength training as a form of exercise gets little to no attention compared to cardiovascular training. Strength training is often acknowledged as a beneficial thing to do for optimal health, but not essential enough to regularly incorporate into the exercise routine. Strength is required before power training and it helps to lay the foundation for overall body conditioning. Strength is the single most dominant factor in predicting and also improving speed. It is not the only factor but it is definitely the main one that can bring about the most significant results. The Swiss ball permits a range of exercises that are based on the ability of the user to move with the motion of the ball while performing the exercise, using the ball to both support the body during the movement as well as to provide a measure of resistance to the muscles employed in the movement. Crunches isolate the abdominal muscles without engaging muscles of the hips. Crunches are also safer than sit-ups because it does not compress the spine as much. When paired with adequate weight loss, doing crunches regularly leads to domen. Traditional exercises for working abdominal musculature are the sit-up and the crunch. Recently, crunches have emerged as the preferred exercise because of reduced emphasis on anterior neck and hip flexor muscles.

Since the principal reason for performing a crunch, or sit-up, is to train the abdominals and not the hip flexors, the motion should be performed to minimize hip flexor activity. In contrast to a sit-up, a crunch is typically performed by lifting only the head and shoulder blades off the floor. This not only minimizes lumbar motion, but also reduces psoas activation, and therefore reduces the compressive and shear stress on the lumbar vertebra. An integral component of most training programs is the use of exercises to increase abdominal strength.

MATERIALS AND METHODS

Selection of subjects

To achieve the purpose of this study, 30 sedentary students were randomly selected from different departments in Pondicherry University, Puducherry. The subjects' age ranged between 19 to 22 years as per the university records.

Inclusion and exclusion criteria

The subjects were oriented for this study and the purpose of the study was explained. The method of performing the test on muscular strength and abdominal strength was explained to the subjects before conducting the test. The research scholar

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Table 1. Mean and standard deviation for pre and post test on muscular strength and abdominal strength

Variables	Groups	N	Test	Mean	Std. Deviation
Muscular Strength	Control group	10	Pre test	16.40	1.08
			Post test	16.00	1.15
	Swiss ball group	10	Pre test	15.90	1.37
			Post test	18.90	1.59
	Crunches group	10	Pre test	15.50	1.08
			Post test	20.70	1.70
Abdominal Strength	Control group	10	Pre test	16.70	1.16
			Post test	16.20	1.14
	Swiss ball group	10	Pre test	17.70	1.16
			Post test	20.90	0.99
	Crunches group	10	Pre test	17.50	1.78
			Post test	22.50	2.95

Table 2. Anova table for muscular strength and abdominal strength of control, Yogasana group and Swiss ball group

Variables	Source of Variance	df	Sum of squares for x	Sum of squares for y	Mean squares X	Mean squares Y	'F' ratio
Muscular Strength	Between Groups	2	4.07	112.47	2.03	56.33	24.89
	Within Groups	27	37.80	61.00	1.40	2.26	
	Total	29	41.87	173.47			
Abdominal Strength	Between Groups	2	5.60	214.47	2.80	107.23	29.25
	Within Groups	27	52.70	99.00	1.95	3.67	
	Total	29	58.3	313.47			

*Significant at 0.05 level of confidence with degrees of freedom for 2 and 27. Required table value at 0.05 level is 3.36.

Table 3. Calculation of analysis of covariance on muscular strength and abdominal strength of Yogasana group, Swiss ball groups and control group

Variables	Source of Variance	df	Sum of Squares x	Sum of Squares y	Sum of Squares x.y	Mean Squares x.y	'F' ratio
Muscular Strength	Between Groups	2	4.07	112.47	149.43	74.71	114.53
	Within Groups	27	37.80	61.00	13.44	0.52	
	Total	29	41.87	173.47			
Abdominal Strength	Between Groups	2	5.60	214.47	173.94	86.97	25.37
	Within Groups	27	52.70	99.00	89.13	3.43	
	Total	29	58.30	313.47			

*Significant at 0.05 level of confidence with degrees of freedom for 2 and 27. Required table value at 0.05 level is 3.36.

Table 4. Ordered adjusted means and differences between means for experimental groups and control group in analysis of covariance problem on muscular strength

Crunches group	Swiss ball group	Control group	Mean differences
21.19	18.94	-	2.25
21.19	-	15.48	5.71
-	18.94	15.48	3.46

*Significant at 0.05 level. Scheffe's confidence interval at 0.05 level is 0.829.

Table 5. Ordered adjusted means and differences between means for experimental groups and control group in analysis of covariance problem on abdominal strength

Crunches group	Swiss ball group	Control group	Mean differences
22.41	20.73	-	1.68
22.41	-	16.46	5.95
-	20.73	16.46	4.27

*Significant at 0.05 level. Scheffe's confidence interval at 0.05 level is 2.15.

explained and demonstrated the push up test and bent knee sit-ups to the subjects. The recordings of the measurements were made known to the subjects with a view to familiarize about their performance. The subjects of the experimental groups received personalized attention and supervision of the trainer in relation to the Swiss ball and crunches. The training was carried out in the multipurpose hall in the physical education department. The training was given for forty five minutes in the morning hours at 6.30 am for twelve weeks. The subjects living condition and life style were not taken into consideration for this study. The subjects were hostlers and their food pattern was similar. Table I shows the mean and standard deviation for pre and post test scores on muscular

strength test for control group, Swiss ball group and crunches group. The initial and final means for control, Swiss ball group and crunches group on muscular strength test were 16.40 and 16.00, 15.90 and 18.90, 15.50 and 20.70. The mean and standard deviation for pre and post test scores on abdominal strength test for control group, Swiss ball group and crunches group. The initial and final means for control, Swiss ball group and crunches group on muscular strength test were 16.70 and 16.20, 17.70 and 20.90, 15.750 and 22.50. Table II discloses the pre and post test results of ANOVA on muscular strength for three different groups namely control, Swiss ball group and crunches group. The calculated 'F' value is 24.89, which is significant at 0.05 level of confidence. This implies that there

is a significant change due to the effect of selected training. The table discloses the pre and post test results of ANOVA on abdominal strength for three different groups namely control, Swiss ball group and crunches group. The calculated 'F' value is 29.25, which is significant at 0.05 level of confidence. This implies that there is a significant change due to the effect of selected training.

The above table III shows the adjusted means for the post test data of ANCOVA among the three groups on balance. The calculated 'F' value is 114.53 is greater than the required table value 3.36 at 0.05 level of confidence. This indicates that there is a significant difference among the groups which indicates that there is an effect in training programme which in turn induces changes in the post test programme. The adjusted means for the post test data of ANCOVA among the three groups on balance. The calculated 'F' value is 25.37 is greater than the required table value 3.36 at 0.05 level of confidence. This indicates that there is a significant difference among the groups which indicates that there is an effect in training programme which in turn induces changes in the post test programme. Whenever, the obtained 'F' ratio value is found to be significant, the Scheffe's post hoc test is applied to find out the paired mean differences, and it is presented in tables. The Table IV shows the Scheffe's post-hoc method of testing the significance for the differences between the paired means following a significant analysis of co-variance for crunches, Swiss ball and control groups. The adjusted mean on muscular strength in order of magnitude and the difference between the means for the control and two experimental groups are given in the table. The mean differences between the crunches group and Swiss ball group are 2.25, which is significant at 0.05 level of confidence. In the comparison between crunches group and control group the difference are 5.71, which is significant at 0.05 level of confidence. The ordered adjusted means on muscular strength and differences between Swiss ball group and control group are 3.46, which is significant at 0.05 level of confidence. This indicates that the crunches group had a better improvement when compared to the Swiss ball group and control group. The differences in means of crunches group, Swiss ball group and control group is presented in Fig. 1.

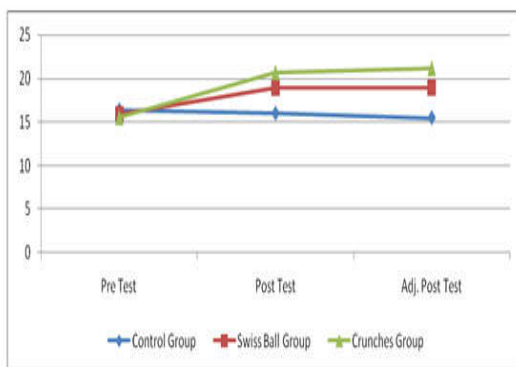


Fig. 1. Mean differences among experimental groups and control group on muscular strength test

The table IV shows the Scheffe's post-hoc method of testing the significance for the differences between the paired means following a significant analysis of co-variance for crunches, Swiss ball and control groups. The adjusted mean on

abdominal strength in order of magnitude and the difference between the means for the control and two experimental groups are given in the table. The mean differences between the crunches group and Swiss ball group are 1.68, which is insignificant at 0.05 level of confidence. Hence it shows improvement there is no significant difference between crunches group and Swiss ball group. In the comparison between crunches group and control group the difference are 5.95, which is significant at 0.05 level of confidence. The ordered adjusted means on abdominal strength and differences between Swiss ball group and control group are 4.27, which is significant at 0.05 level of confidence. This indicates that the crunches group had a better improvement when compared to the Swiss ball group and control group. The differences in means of crunches group, Swiss ball group and control group is presented in Fig. 2.

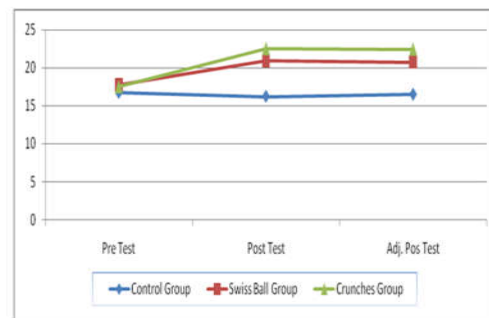


Fig. 2. Mean differences among experimental groups and control group on abdominal strength test

DISCUSSION

The study was framed to analyze the effect of Swiss ball and crunches on muscular strength and abdominal strength on sedentary men (aged 19 and 22 years). The subjects were given training on Swiss ball and crunches exercise continuously for a period of 12 weeks for six days in a week. The selected physical variables are muscular strength and abdominal strength. The main aim of the study was to enhance the efficiency of physical fitness of the college men. The result of the study is in consonance with the findings of the following studies by Sternlicht and Rugg (August 2003), Escamilla *et al.*, (May 2006), Sternlicht *et al.*, (May 2007), Escamilla *et al.*, (May 2010) and Sternlicht *et al.*, (February 2005)

CONCLUSION

It was observed from the pre test results, that there is no significant difference among control and experimental groups. While the post test results of control and experimental groups revealed that, there is a significant difference among the three groups. The training program has influenced the experimental groups where as there is no effect in the control group. In the analysis of co-variance on muscular strength and abdominal strength among control and two experimental groups, a significant difference was revealed which throws light on the application for twelve weeks Swiss ball training and crunches exercise. From the statistical analysis it is clear that both the training programmes had its own effect. But the crunches group showed significant effects in the muscular strength and abdominal strength when compared to Swiss ball training and control group.

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