IJIRR

International Journal of Information Research and Review
Vol. 1, Issue, 11, pp. 173-175 November, 2014

Full Length Research Article

EFFECT OF DIFFERENT METHODS OF STRENGTH TRAINING ON SELECTED MOTOR FITNESS COMPONENTS OF WOMEN COLLEGE STUDENTS

***Elamaran, M.**

Department of Physical Education and Sports Sciences, Annamalai University, Annamalai Nagar, Tamilnadu, India

ARTICLE INFO

Article History:
Received 15th August, 2014
Received in revised form
20th September, 2014
Accepted 24th October, 2014
Published online 30th November, 2014

Keywords:

Strength training,
Isometrics,
Isotonic exercises.

ABSTRACT

The study was proposed to analyze the effect of different methods of strength training on selected motor fitness components of women college students. To achieve this purpose of the study, forty-five (45) women students from Elisabeth Polytechnic College, Perambalur, were randomly selected as subjects. The subjects confined to this study were in the age group of eighteen to twenty years. The selected subjects were divided into three groups, namely: isometric training group, isotonic training group, and control group. The experimental groups underwent the respective strength training programmes for eight weeks and the control group, which does not undergo any type of systematic training programme during the period of study. The study was restricted to the appraisal of arm-shoulder strength endurance and abdominal strength endurance two days prior to and immediately after the eight weeks of strength training programmes for the subjects considered in this study. The pre and post test data of both the groups thus collected were statistically examined by applying analysis of covariance. The Bonferroni post hoc test was applied to find out the paired mean differences. The outcome of the study demonstrates both the isometric and isotonic strength training programmes were effective in improving arm-shoulder strength endurance and abdominal strength endurance compared to control group, yet the isotonic strength training programme is distinctively better than isometric strength training in enhancing the motor fitness components.

INTRODUCTION

The improvement and maintenance of physical fitness or condition is perhaps the most important aim of sports training. Each person requires a different type and level of physical condition and as a result different type of fitness training or conditioning is required for different people. There are many different methods of strength training, the most common being the use of gravity or elastic/hydraulic forces to oppose muscle contraction. Resistance training is a form of strength training in which each effort is performed against a specific opposing force generated by resistance (*i.e. resistance to being pushed, squeezed, stretched or bent*). Exercises are isotonic if a body part is moving against the force. Exercises are isometric if a body part is holding still against the force. Resistance exercise is used to develop the strength and size of skeletal muscles. Properly performed, resistance training can provide significant functional benefits and improvement in overall health and well-being.

Corresponding author: Elamaran, M.
Department of Physical Education and Sports Sciences, Annamalai University, Annamalai Nagar, Tamilnadu, India.

Isometric exercises are opposed by a force equal to the force output of the muscle and there is no net movement. This mainly strengthens the muscle at the specific joint angle at which the isometric exercise occurs, with some increases in strength at joint angles up to 20° in either direction depending on the joint trained *(Kitai and Sale, 1989).* In comparison, isotonic exercises strengthen the muscle throughout the entire range of motion of the exercise used. Isometric exercises can be used for general strength conditioning and for rehabilitation where strengthening the muscles without placing undue stress on the joint is warranted. Volume for a classic strength training routine is prescribed based on the number of sets and repetitions. The equivalent in isometric exercises is the length of time each action is held for and the number actions in total. Research has measured both longer duration actions (*i.e. 10 seconds or above*) and fewer repetitions, and shorter duration actions (*i.e. 2-3 seconds*) with more repetitions (Schott, McCully and Rutherford, 1995; Lyle and Rutherford, 1998; McDonagh and Davies, 1984). Both approaches seem to increase static strength. Thereby, it is worthwhile to have an understanding the

distinction of the facts with regard to the nature of influence that isometric and isotonic strength training possesses on selected motor fitness components. Hence, the focus of this study was to analyze the effect of different methods of strength training on selected motor fitness components of women college students.

MATERIALS AND METHODS

For the purpose of the study, forty-five (45) women students from Elisabeth Polytechnic College, Perambalur, were randomly selected as subjects. The subjects confined to this study were in the age group of eighteen to twenty years. The selected subjects were divided into three groups. The experimental Group I was designated as isometric training group and Group II as isotonic training group. Both the experimental groups undergone respective training programme for eight weeks. Group III is the control group, which does not undergo any type of systematic training programme during the period of study. The study was restricted to the appraisal of arm-shoulder strength endurance and abdominal strength endurance two days prior to and immediately after the eight weeks of strength training programmes for the subjects considered in this study. The variables considered in this study were assessed using push-ups test for one-minute, bent-knee sit-ups test for one-minute, and digital stopwatches by adopting standardized procedures. The pretest-posttest non-equivalent groups quasi-experimental research design was considered involving randomized sampling technique. The data thus collected were statistically examined by applying analysis of covariance to find out the significant improvement if any. Since three groups were involved in the study, the Bonferroni post hoc test was applied to find out the paired mean differences. The α value of 0.05 was set for statistical significance. The selected subjects were segregated into three groups, of which group-I underwent isometric strength training, group-II underwent isotonic strength training, group-III acted as control. The subjects were asked to perform all the prescribed number of repetition for the isotonic exercises and the duration for isometric exercises before moving on the next exercise. The details of exercise and the training plan for experimental groups have been given in Table I.

Table 1. Training Schedule

Week	Duration of Isometric Exercise (in seconds)	Number of Repetition of Isotonic Exercise	No. of Sets	Recovery between Exercise (in seconds)	Recovery between Sets (in minutes)
I	6	3	2	10	2
II	9	4			
III	12	5		12	2 ½
IV	15	6			
V	6	3	3	15	3
VI	9	4			
VII	12	5		18	3 ½
VIII	15	6			

The following exercises were performed during each session of the week for eight weeks, with the training load and recovery as specified in the above schedule.

Isotonic Exercises	**Isometric Exercises**
Squat Jumps	Plank Bridge
Lateral Box Push Offs	Breakfast Table Biceps
Modified Pushups	Isometric Squats
Jump to Box	Tea Table Triceps
Split Squat Jumps	Side Bridge
Bench Dips	Armchair Forearms
Lateral Jump to Box	Door Frame Shoulder Press
Lateral Hurdle Jumps	Isometric Leg Extensions
Crunches	Isometric Hip Extensions
Back Extensions	Isometric Hip Abductions

RESULTS

The analysis of covariance on arm-shoulder strength endurance of experimental groups and control group were statistically examined and presented in Table 2. The graphical illustration of data on arm-shoulder strength endurance was given in Figure 1.

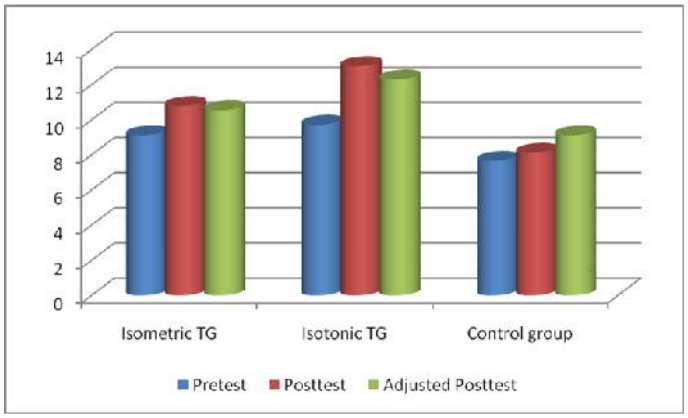

Figure 1. Graphical representation of data on arm-shoulder strength endurance

Table 2. Analysis of Covariance on Arm-Shoulder Strength Endurance of Experimental and Control Groups

	Isometric TG	Isotonic TG	Control group	F	Sig.
Pretest	9.13 ± 2.06	9.73 ± 1.75	7.66 ± 1.76	4.878	.012
Posttest	10.8 ± 2.17	13.06 ± 2.12	8.13 ± 0.91	27.233	.000
Adjusted Posttest	10.55	12.31	9.13	36.568	.000

The results of the analysis of covariance in Table 2 shows that there is a statistically significant variation on arm-shoulder strength endurance among groups (isometric, isotonic and control) confined to this study for the pretest, posttest, and adjusted posttest means, as obtained *F* values were 4.878 ($p = 0.012$), 27.233 ($p < 0.05$), and 36.568 ($p < 0.05$). The findings of the study make it obvious that the arm-shoulder strength endurance improved considerably. Since, the obtained *F* for adjusted posttest mean was significant, the Bonferroni post hoc test was applied and it is given in Table 3.

Table 3. Post Hoc Test for the Paired Mean Differences on Arm-Shoulder Strength Endurance

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
isometric TG	isotonic TG	-1.756*	.341	.000
	control group	1.418*	.356	.001
isotonic TG	control group	3.173*	.374	.000

*. The mean difference is significant at the .05 level.

Table 3 reveals that all the paired means on arm-shoulder strength endurance differed significantly. It shows that both the experimental groups contributed to the development of arm-shoulder strength endurance, where isotonic strength training group gained greater arm-shoulder strength endurance than that of isometric strength training group.

The analysis of covariance on abdominal strength endurance of experimental groups and control group were statistically examined and presented in Table 4. The graphical illustration of data on abdominal strength endurance was given in Figure 2.

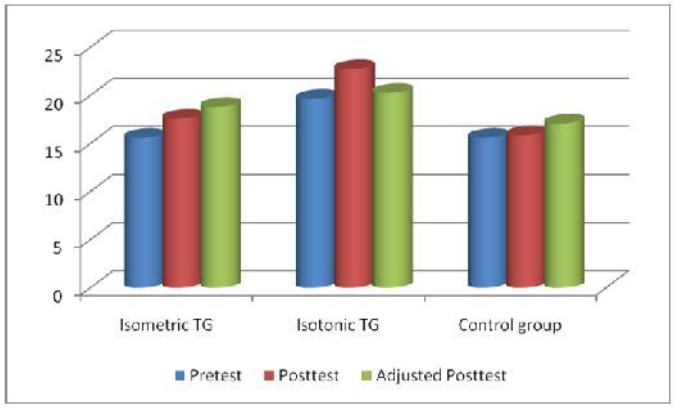

Figure 2. Graphical representation of data on abdominal strength endurance

Table 4. Analysis of Covariance on Abdominal Strength Endurance of Experimental and Control Groups

	Isometric TG	Isotonic TG	Control group	F	Sig.
Pretest	15.6 ± 3.15	19.66 ± 8.21	15.6 ± 3.15	2.836	.070
Posttest	17.6 ± 3.15	22.73 ± 7.62	15.86 ± 2.23	7.858	.001
Adjusted Posttest	18.823	20.288	17.089	55.345	.000

The results of the analysis of covariance in Table 4 shows that there is a statistically significant variation on abdominal strength endurance among groups (isometric, isotonic and control) confined to this study for the posttest, and adjusted posttest means, as obtained *F* values were 7.858 ($p = 0.001$), and 55.345 ($p < 0.05$), while no difference exist for the pretest as obtained *F* is 2.836 ($p = 0.070$). The findings of the study make it obvious that the abdominal strength endurance improved considerably. Since, the obtained *F* for adjusted posttest mean was significant, the Bonferroni post hoc test was applied and it is given in Table 5.

Table 5. Post Hoc Test for the Paired Mean Differences on Arm-Shoulder Strength Endurance

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
isometric TG	isotonic TG	-1.465*	.306	.000
	control group	1.733*	.291	.000
isotonic TG	control group	3.199*	.306	.000

*. The mean difference is significant at the .05 level.

Table 5 reveals that all the paired means on abdominal strength endurance differed significantly. It shows that both the experimental groups contributed to the development of abdominal strength endurance, where isotonic strength training group gained greater abdominal strength endurance than that of isometric strength training group.

Either concentric or eccentric muscle contractions might be a part of the dynamic resistance exercise program. Concentric muscle contractions can offer very high forces and thus an appropriate overload stimulus. Eccentric contractions can actually produce more muscular force than that obtained during an isometric muscle contraction (Kannen, 1986). Although no joint movement occurs, isometric exercise is considered functional because it provides a strength base for dynamic exercise (Hall and Brody, 1980). They also viewed that dynamic exercise has the advantages of increased joint movement and muscle strengthening that results in functionally more efficient muscle-joint complex. The findings of the present study too upholds that isotonic strength training is superior to isometric strength training in the development of muscular strength endurance.

Conclusion

The outcome of the study demonstrates both the isometric and isotonic strength training programmes were effective in improving arm-shoulder strength endurance and abdominal strength endurance compared to control group, yet the isotonic strength training programme is distinctively better than isometric strength training in enhancing the motor fitness components.

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