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ORIGINAL ARTICLE

EFFECT OF ISOLATED AND COMBINED SWISS BALL AND FLEXIBILITY TRAINING ON SELECTED PHYSICAL FITNESS AND SKILL PERFORMANCE VARIABLES AMONG SCHOOL VOLLEYBALL PLAYERS

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Abstract:

The purpose of the present study was to investigate the effect of isolated and combined Swiss ball and flexibility training on selected physical fitness and skill performance variables among school volleyball players. To achieve this purpose, forty male volleyball players studying various schools in Vellore district, Tamilnadu, India, during the academic year 2012-2013 were randomly selected as subjects and their age ranged from 16 to 18 years. The selected subjects were divided into four groups of ten subjects each. Group-I underwent Swiss ball training, group-II underwent flexibility training, group-III underwent combined Swiss ball and flexibility training, and group-IV acted as control. All the subjects of the four groups were tested on selected dependent variable namely speed, muscular strength, flexibility, coordination, serving ability and volleying ability at before the commencement of training programme (pre-test) and after the respective training for a period of twelve weeks (post-test). The data collected from the three groups prior to and post experimentation on selected dependent variables were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since four groups were involved, whenever the obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases the level of confidence was fixed at 0.05 for significance. It was concluded that combined Swiss ball and flexibility training was significantly better than isolated Swiss ball training and flexibility training in improving speed, muscular strength, serving ability and volleying ability. In improving flexibility of the volleyball player's flexibility training was significantly better than combined training and Swiss ball training however, no significant differences were found between the experimental groups in altering the coordination of the volleyball players.

KEY WORDS:

Swiss ball training, flexibility training, physical fitness and skill performance

INTRODUCTION

Volleyball is a complex game of simple skills. It has also shown in recent years that there is a trend that volleyball payers adopt the technique, tactics and physical performance. Volleyball game requires comprehensive ability including physical, technical, mental and tactical abilities. Among them physical abilities of players exert marked effects on the skills of the players themselves and the tactics of the team. The skills like higher attack, powerful jumping-serve, attack from the back row and aggressive blocking are now widely used by volleyball players. All these bring forward greater demand for specific physical fitness and physique of volleyball players. In volleyball, technical and tactical skills, anthropometric characteristics and individual physical performance capacities are most important factors that contribute to the success of a team in competitions (Hakkinen, 1993).

Swiss Ball training is purported to enhance neuromuscular and cardiovascular function.

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Furthermore Swiss Ball training is reported to be superior to conventional abdominal training for the development of a stable midsection, reportedly vital for optimal function. However, empirical data to support the claims made by clinicians, trainers and users of Swiss Balls are lacking. Data from Swiss Ball studies conducted thus far indicate greater activation of the abdominal musculature, when compared to other forms of abdominal training. Moreover, of the published and unpublished training studies conducted to date, it appears Swiss Ball training may lead to greater core stability. Unlike other physical parameters, there appears to be no 'Gold Standard' for quantification of core stability. This, coupled with the lack of sensitivity of athletic performance measures employed in studies to date, has likely led to the lack of significant findings.

Although flexibility is generally considered one of the five components of physical fitness, its exact contribution to general health is even less clearly defined the its importance to athletic performance. Within the realm of sport there are may activities where high degrees of flexibility in specific joints are desirable for enhanced performance in both quantitative and qualitative athletic activities (Foster, 1995). Flexibility is an important, yet often neglected, component of physical fitness. To maintain proper alignment and pelvic tilt, the abdominal and hamstring muscles must be strengthened and the erector spine and hip flexor muscle groups must be flexed for long period and for joggers and runners. Flexibility is the ability of a joint to move fluidly through its full range of motion (ROM). Static flexibility is a measure of the total ROM at the joint; dynamic flexibility is a measure of the torque or resistance to movement. Both types of flexibility are vital in performance of sport skills as well as everyday activities (Heyward, 1991).

Swiss balls are commonly employed in physical therapy and athletic conditioning setting to enhance core stability. Flexibility training will improve all-round strength and flexibility, especially in vital areas such as the abdominal oblique's, and also shoulder girdle. The concept of Swiss ball and flexibility training has been the focus of controversy among sports scientists and trainers in recent years. The research literature does not provide all the answers, and practitioners report different levels of success using a variety of modes and techniques. The present scientific study is to investigate the isolated and combined effect of Swiss ball and flexibility training on physical fitness and skill performance variables of the volleyball players.

METHODOLOGY

Selection of Subjects

To achieve the purpose of the study, forty male volleyball players studying various schools in vellore district, Tamilnadu, India, during the academic year 2012-2013 were selected as subjects. The age of the selected subjects were ranged from 16 to 18 years. The selected subjects were medically examined by a qualified physician and certified that they were medically and physically fit enough to undergo the training programme. The selected subjects were randomly assigned into four equal groups of 10 subjects each. The subjects of group-I underwent Swiss ball training, group-II underwent flexibility training, group-III underwent combined Swiss ball and flexibility training, and group-IV acted as control.

Selection of Variables and Tests

The selected dependent variables and the test items used to collect data are presented in table-I.

Table-I: Selection of Dependent Variables and Tests

S. No.	Variables	Test Items
1	Speed	50 meters
2	Muscular Strength	Bent knee sit ups
3	Flexibility	Sit and reach test
4	Coordination	Nelson Reaction Test
5	Serving ability	Russell Lange Serving Test
6	Volleying ability	Bready Wall Volley Test

Training Programme

In this study, training programme was administered to the volleyball players for twelve weeks with three training units per week. The experimental group-I performed Swiss ball training, group-II performed flexibility training, and group-III performed combined Swiss ball and flexibility training. The training sessions were held every other day, so that the body could rest. Group-IV was the control group they did not undergo any training. The subjects of Swiss ball training group (group-I) performed 7 ball exercises for the period of 12 weeks. The subjects of flexibility training group (group-II) performed 7 stretching exercises for the period of 12 weeks. Whereas, the subjects of experimental group-III performed Swiss ball training (7 Swiss ball exercises) for the first six weeks and mobility training (7 stretching exercises) for the remaining six weeks.

The Swiss ball exercise such as step stretch, triangle stretch, calf stretch, knee to chest stretch, chest stretch, shoulder crossover, triceps stretch and flexibility exercises namely shoulder rolls, back arch, leg extensions, back raises, sit-backs, forward leans and leg raises are selected for this study. The duration and intensity of the exercises was increased accordingly. Apart from the above treatment the players irrespective of groups was allowed to play their regular game.

Collection of the Data

The data collected on selected physical fitness and skill performance variables were measured two days prior to the training and immediately after the training programme for each of the dependent variables separately.

Experimental Design and Statistical Technique

The experimental design in this study was random group design involving 40 subjects, who were divided at random in to four group of ten each. The data collected from the four groups prior to and post experimentation on selected dependent variables were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since four groups were involved, whenever the obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test to determine the paired mean differences, if any. In all the cases the level of confidence was fixed at 0.05 for significance.

Results

The data collected from the experimental and control groups on selected physical fitness and volleyball skill performance variables were statistically analyzed by analysis of covariance and the results are presented in table-II.

Table – II: Analysis of Covariance on Selected Physical Fitness and Skill Performance Variables of Experimental and Control Groups

	Swiss ball training	Flexibility training	Combined training	Control Group	So V	Sum of Squares	Df	Mean squares	'F' ratio
Speed	7.57	7.49	7.19	7.88	B	3.252	3	1.084	83.38*
					W	0.440	35	0.013	
Muscular Strength	25.12	24.78	27.05	21.92	B	170.52	3	56.84	26.44*
					W	75.11	35	2.15	
Flexibility	39.83	48.09	44.68	34.17	B	898.662	3	299.55	49.27*
					W	212.91	35	6.08	

Coordination	0.31	0.32	0.30	0.41	B	0.10	3	0.03	7.50*
					W	0.15	35	0.004	
Serving ability	30.14	30.46	32.99	27.15	B	135.78	3	45.26	15.29*
					W	103.59	35	2.96	
Volleying ability	28.72	29.61	31.11	26.89	B	28.16	3	9.39	8.03*
					W	40.91	35	1.17	

(The required table value for significance at 0.05 level of confidence with df 3 and 35 is 2.87)
*Significant at .05 level of confidence

The obtained 'F' ratio value for the adjusted post-test means on speed, muscular strength, flexibility, coordination, serving ability and volleying ability of experimental and control groups are 83.38, 26.44, 49.27, 7.50, 15.29 and 8.03 respectively which are greater than the required table value of 2.87 for the degrees of freedom 3 and 35 at 0.05 level of confidence. Hence it is concluded that significant differences exist between the adjusted post test means of four groups on selected dependent variables of school volleyball players. Since, the obtained 'F' ratio value in the adjusted post test means is found to be significant, the Scheffe'S test is applied as post hoc test to find out the paired mean difference, and it is presented in table-III.

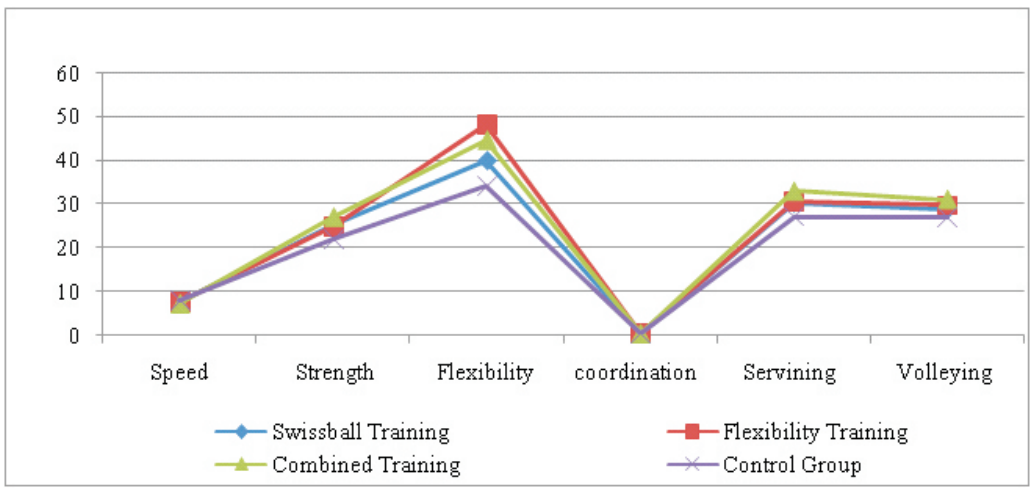
Table –III: Scheffe's Post Hoc Test for the Differences among Paired Means of Experimental and Control Groups

Variables	Mean differences						Confidence Interval
	Swiss ball &Flexibility training	Swiss ball & Combined training	Swiss ball & Control group	Flexibility & Combined training	Flexibility & Control group	Combined training & Control group	
Speed	0.08	0.38*	0.31*	0.30*	0.39*	0.69*	0.15
Muscular Strength	0.34	1.93*	3.20*	2.27*	2.86*	5.13*	1.92
Flexibility	8.26*	4.85*	5.66*	3.41*	13.92*	10.51*	3.24
Coordination	0.01	0.01	0.10*	0.02	0.09*	0.11*	0.08
Serving ability	0.32	2.85*	2.99*	2.53*	3.31*	5.84*	2.26
Volleying ability	0.89	2.39*	1.83*	1.50*	2.72*	4.22*	1.42

*Significant at .05 level

The Scheffe's post hoc analysis proved that when comparing the experimental groups with control group there were significant mean differences exist between them on selected physical fitness and skill performance variables Since, the mean differences were higher than the confident interval values at .05 level of significance. When comparing the experimental groups no significant differences was found between experimental groups on coordination and also no significant differences was found between Swiss ball training and flexibility training on speed, muscular strength, serving ability and volleying ability

Figure-I: Line Diagram showing the Adjusted Posttest Mean Values on Selected Physical Fitness and Skill Performance Variables



DISCUSSION

The above findings can also be substantiated by observations made by renowned experts in the science of sports training. Marshall and Desai (2010) provided evidence for one advanced Swiss ball exercise providing a significant whole-body stimulus. A primary benefit of exercising with an exercise ball as opposed to exercising directly on a hard flat surface is that the body responds to the instability of the ball to remain balanced, engaging many more muscles (Vera-Garcia, Grenier & McGill, 2000). Most frequently, the core body muscles such as the abdominal muscles and back muscles are the focus of exercise ball fitness programs. Those muscles become stronger over time to keep balance (Mayo, 2007).

The result of the present study are also in agreement with the studies conducted by Burke (2000) compared 2 methods of delivering the same proprioceptive neuromuscular facilitation (PNF) flexibility exercise protocol: one manual and the other machine. Both training groups had significant improvements on trunk flexion and right hip flexion. Nittoli (1995) have found changes in concentric and eccentric torque, and range of motion (ROM) after chronic stretching programs. In order to maintain optimal training levels and take advantage of the potential benefits, it is suggested that swiss ball and flexibility training sessions not be missed. swiss ball and flexibility training has been proven to increase muscle force, strength, coordination, and power, all of which are essential to Volleyball players.

CONCLUSION

Due to the effect of Swiss ball training, flexibility training, and combined training the speed, muscular strength, serving ability and volleying ability of the volleyball players was significantly improved. It was also concluded that combined Swiss ball and flexibility training was significantly better than isolated Swiss ball training and flexibility training in improving the speed, muscular strength, serving ability and volleying ability of the volleyball players. In improving flexibility of the volleyball player's significant differences were found among experimental groups however flexibility training was significantly better than combined training and Swiss ball training. The coordination of the volleyball player's was significantly improved as a result of combined and isolated Swiss ball training and flexibility training, however no significant differences were found between the experimental groups.

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