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Influence of Swiss Ball Training on Selected Physical Physiological and Performance Related Variables among Badminton Players

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Abstract

The purpose of the study was to investigate the impact of Swiss ball training programme on selected physical, physiological and performance related variables among Badminton players. For the present study 20 male Badminton players from Bharathidasan University, affiliated college, Tiruchirappalli, Tamilnadu State, India, were selected at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly assigned to two equal groups of ten each and named as Group 'A' and Group 'B'. Group 'A' underwent Swiss ball training and Group 'B' acted as control and not exposed any specific training / conditioning. The physical, physiological and performance related variables namely maximum strength, core strength, leg explosive power, breath holding time, peak expiratory flow rate, maximum heart rate, resting heart rate, systolic blood pressure, diastolic blood pressure, forehand clear, and backhand clear were chosen as variables. The standardized tests / equipments were used to collect relevant data namely 1RM bench press, plank test, sergeant vertical jump, digital stop watch, peak flow meter, 2.4 kilometer run in tread mill, digital heart rate / blood pressure monitor, Poole forehand clear test and Poole backhand clear test were used to collect data. The data was collected before and after six weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the influence of Swiss ball training programme. The level of significance was set at 0.05. The findings of the present study have strongly indicates that Swiss ball training of six weeks has significant impact on selected physical, physiological and performance related variables namely maximum strength, core strength, leg explosive power, breath holding time, peak expiratory flow rate, resting heart rate, maximum heart rate, systolic blood pressure, diastolic blood pressure, forehand clear and backhand clear of Badminton players.

Keywords: Badminton, Physical, Physiological, Performance, Swiss ball.

Introduction

The Swiss ball training was developed in 1963 by Aquilino cosani, an Italian plastics manufacturer. He perfected a process for large puncture-resistant plastic balls. Swiss ball are large, heavy-duty inflatable balls with a diameter of 45 to 75 cm (18 to 30 inches). Swiss ball offer one a fun, safe and highly effective way to exercise. Swiss ball is also know by a different names, including balance ball, body ball, fitness ball, gym ball, pilates ball, stability ball and yoga ball. **Sekendiz (2010)** investigated the effects of Swiss ball core strength training on trunk extensor (abdominal)/flexor (lower back) and lower limb extensor (quadriceps)/flexor (hamstring) muscular strength, abdominal, lower back and leg endurance, flexibility and dynamic balance in sedentary women and found that Swiss ball core strength training exercises can be used to provide improvement in the aforementioned measures in sedentary women.

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Badminton is a one of the most popular game played in more than 170 counties around the world. Badminton has more than 150 year's history. Among the indoor games, Badminton occupies a place of pride both as an individual as well as team sport in spite of frequent changes that have occurred in various aspects of competition pertained to the game including, fitness level, skills, strategies and tactics. Scientific pedagogies and innovative approach have made the game more performance oriented than ever before. Concerning Badminton athletes' physical characteristics, several factors contribute to the success in the sport, including technique and tactics, psychological preparation and game strategy **(Chint et al., 1995).** Physical characteristics and body composition have been known to be fundamental to excellence in athletic performance **(Mathur, 1985).**

Objective of the Study

The objective of the study was to design Swiss ball training and to see its impact on selected physical, physiological and performance related variables among

Badminton players.

Methodology

Twenty male Badminton players from Bharathidasan University, affiliated college, Tiruchirappalli, Tamil nadu State, India, were selected at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group (CG) and experimental group (STG) was used. The subjects were randomly assigned to two equal groups of ten each and named as Group 'A' and Group 'B'. Group 'A' underwent Swiss ball training and Group 'B' acted as control and not exposed any specific training / conditioning. The physical, physiological and performance related variables namely maximum strength, core strength, leg explosive power, breath holding time, peak expiratory flow rate, maximum heart rate, resting heart rate, systolic blood pressure, diastolic blood pressure, forehand clear, and backhand clear. The standardized tests / equipments were used to collect relevant data namely 1RM bench press, plank test, sergeant vertical jump, digital stop watch, peak flow meter, tread mill, digital heart rate / blood pressure monitor, Poole forehand clear test and Poole backhand clear test. The data was collected before and after six weeks of training. The data was analyzed by applying analysis of Co-Variance (ANCOVA) technique to find out the influence of Swiss ball training programme. The level of significance was set at 0.05.

Results

Table I. Pre, post and adjusted post tests, mean and standard deviation scores of experimental and control groups on selected physical, physiological and performance related variables of among Badminton players

Variables	Group	Descriptive statistics	Pre Test	Post Test	Adjusted post
Maximum Strength (Kilograms)	STG	Mean	40.60	46.00	45.86
		SD(±)	2.55	2.83	
	CG	Mean	40.10	40.50	40.63
		SD(±)	3.87	3.25	
Core Strength (Seconds)	STG	Mean	1.57	2.06	2.06
		SD(±)	0.184	.186	
	CG	Mean	1.59	1.60	1.59
		SD(±)	0.152	0.157	
Leg Explosive Power (Centimetres)	STG	Mean	0.43	0.44	0.43
		SD(±)	0.08	0.12	
	CG	Mean	0.41	0.38	0.39
		SD(±)	0.08	0.07	
Breath Holding Time (Seconds)	STG	Mean	0.43	0.44	48.96
		SD(±)	0.08	0.12	
	CG	Mean	0.41	0.38	39.93
		SD(±)	0.08	0.069	
Peak Expiratory Flow Rate (Liters per minute)	STG	Mean	152.00	23.47	180.87
		SD(±)	23.47	16.46	
	CG	Mean	166.00	159.00	154.13
		SD(±)	19.55	16.63	
Maximum heart rate (Beat per minute)	STG	Mean	173.90	164.70	164.85
		SD(±)	2.0790	1.34	
	CG	Mean	172.80	174.20	174.05
		SD(±)	2.70	2.94	
Resting Heart Rate (Beats per minute)	STG	Mean	77.20	70.30	72.80
		SD(±)	11.22	9.53	
	CG	Mean	82.90	82.60	80.09

		SD(±)	12.63	12.86	
Systolic Blood Pressure (Mm / hg)	STG	Mean	117.40	115.80	118.07
		SD(±)	9.67	9.74	
	CG	Mean	121.90	121.20	118.93
		SD(±)	8.212	8.44	
Diastolic Blood Pressure (Mm / hg)	STG	Mean	75.30	74.60	77.55
		SD(±)	11.04	11.02	
	CG	Mean	81.20	80.80	77.85
		SD(±)	6.17	6.22	
Forehand Clear (Points)	STG	Mean	32.80	35.30	36.37
		SD(±)	2.62	2.63	
	CG	Mean	32.40	30.40	30.92
		SD(±)	1.65	1.57	
Backhand Clear (Points)	STG	Mean	32.00	36.40	36.37
		SD(±)	1.77	1.27	
	CG	Mean	31.80	30.90	30.93
		SD(±)	4.18	3.21	

The findings pertaining to analysis of co-variance between experimental group and control group on selected physical, physiological and performance related variables among Badminton players is presented in table No. II.

Table II. Analysis of covariance of the data on selected physical, physiological and performance related variables of pre, post and adjusted post test scores of experimental and control groups

Variables	Test	Source of Variance	Sum of Squares	df	Mean Square	F
Maximum strength (Kilograms)	Pre Test	BG	1.25	1	1.25	0.12
		WG	193.30	18	10.73	
	Post Test	BG	151.25	1	151.25	16.35*
		WG	166.50	18	9.25	
	Adjusted Post test	BS	136.00	1	136.00	20.82*
		WS	111.08	17	6.53	
Core strength (Seconds)	Pre Test	BG	0.00	1	0.00	0.051
		WG	0.50	18	.028	
	Post Test	BG	1.04	1	1.04	35.30*
		WG	0.53	18	.029	
	Adjusted Post test	BS	1.07	1	1.07	45.78*
		WS	0.40	17	.024	
Leg explosive power (Centimetres)	Pre Test	BG	0.00	1	0.001	0.17
		WG	0.12	18	0.006	
	Post Test	BG	0.02	1	0.02	1.62
		WG	0.17	18	0.009	

	Adjusted Post test	BS	0.007	1	.007	4.90*
		WS	0.03	17	0.001	
Breath holding time (Seconds)	Pre Test	BG	4.05	1	4.05	0.04
		WG	1796.50	18	99.81	
	Post Test	BG	490.05	1	490.05	4.95*
		WG	1780.90	18	98.94	
	Adjusted Post test	BG	406.96	1	406.96	63.16*
		WG	109.54	17	6.44	
Peak expiratory flow rate (Liters per minute)	Pre Test	BG	980.00	1	980.00	2.10
		WG	8400.00	18	466.67	
	Post Test Mean	BG	1445.00	1	1445.00	5.27*
		WG	4930.00	18	273.89	
	Adjusted Post test	BS	3200.02	1	3200.02	62.54*
		WS	869.81	17	51.16	
Maximum heart rate (Beat per minute)	Pre Test	BG	6.05	1	6.05	1.04
		WG	104.50	18	5.81	
	Post Test	BG	451.25	1	451.25	86.68*
		WG	93.70	18	5.21	
	Adjusted Post test	BS	400.59	1	400.59	78.96*
		WS	86.25	17	5.074	
Resting heart rate (Beats per minute)	Pre Test	BG	162.45	1	162.45	1.14
		WG	2566.50	18	142.58	
	Post Test	BG	756.45	1	756.45	5.91*
		WG	2304.50	18	128.03	
	Adjusted Post test	BS	250.48	1	250.48	12.96*
		WS	328.46	17	19.32	
Systolic blood pressure (Mm / hg)	Pre Test	BG	101.25	1	101.25	1.26
		WG	1447.30	18	80.41	
	Post Test	BG	145.80	1	145.80	1.76
		WG	1489.20	18	82.73	
	Adjusted Post test	BS	3.460	1	3.46	3.59
		WS	16.39	17	0.96	
Diastolic blood pressure (Mm / hg)	Pre Test	BG	174.05	1	174.05	2.18
		WG	1431.70	18	79.54	
	Post Test	BG	192.20	1	192.20	2.40
		WG	1440.00	18	80.00	
	Adjusted Post test	BS	0.391	1	0.391	1.02
		WS	6.50	17	0.38	
Forehand clear (Points)	Pre Test	BG	0.200	1	.20	0.02
		WG	185.60	18	10.31	
	Post Test	BG	151.25	1	151.25	25.37*
		WG	107.30	18	5.96	

	Adjusted Post test	BS	148.15	1	148.15	26.81*
		WS	93.94	17	5.53	
Backhand clear (Points)	Pre Test	BG	0.80	1	.80	0.16
		WG	86.00	18	4.78	
	Post Test	BG	120.05	1	120.05	25.57*
		WG	84.50	18	4.69	
	Adjusted Post test	BS	148.15	1	148.15	26.81*
		WS	93.94	17	5.53	

** Significant at 0.05 level.

The table value required for 0.05 level of significance with df 1 and 18 is 4.41 & 1 and 17 is 4.45. The above table reveals that the obtained 'F' value of post test scores 16.35, 35.30, 4.95, 5.27, 86.68, 5.91, 25.37 and 25.57 was found to be significant at 0.05 level with df 1, 18 as the table value of 4.41 was lesser than calculated value at 0.05 of confidence. The table also indicated that there was a significant difference in post test score of maximum strength, core strength, leg explosive power, breath holding time, peak expiratory flow rate, maximum heart rate, resting heart rate, forehand clear, and backhand clear of Badminton players between experimental group and control group. In case of variables leg explosive strength, systolic blood pressure, diastolic blood pressure no significant difference was observed.

The above table also reveals that the obtained 'F' value of adjusted post test means of 20.82, 45.78, 4.90, 63.16, 62.54, 78.96, 12.96, 26.81 and 26.81 was found to be significant at 0.05 levels with df 1, 17 as the table value of 4.45 was lesser than calculated value at 0.05 of confidence. The table also indicated that there was a significant difference in adjusted post test means of maximum strength, core strength, leg explosive power, breath holding time, peak expiratory flow rate, maximum heart rate, resting heart rate, forehand clear and backhand clear of Badminton players between experimental group and control group. In case of variables systolic blood pressure and diastolic blood pressure no significant difference was observed.

Figure I. The pre, post and adjusted post test mean values of experimental and control groups on selected physical variables among Badminton players

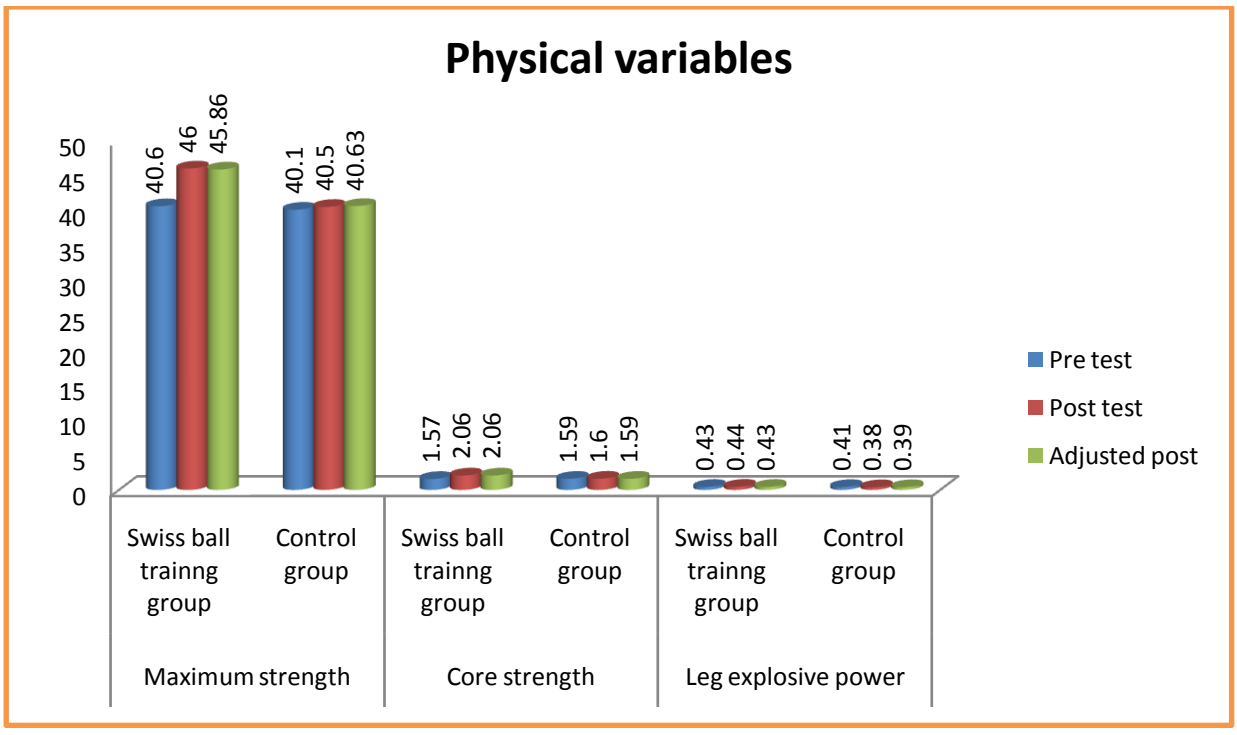


Figure II. The pre, post and adjusted post test mean values of experimental and control groups on selected physiological variables among Badminton players

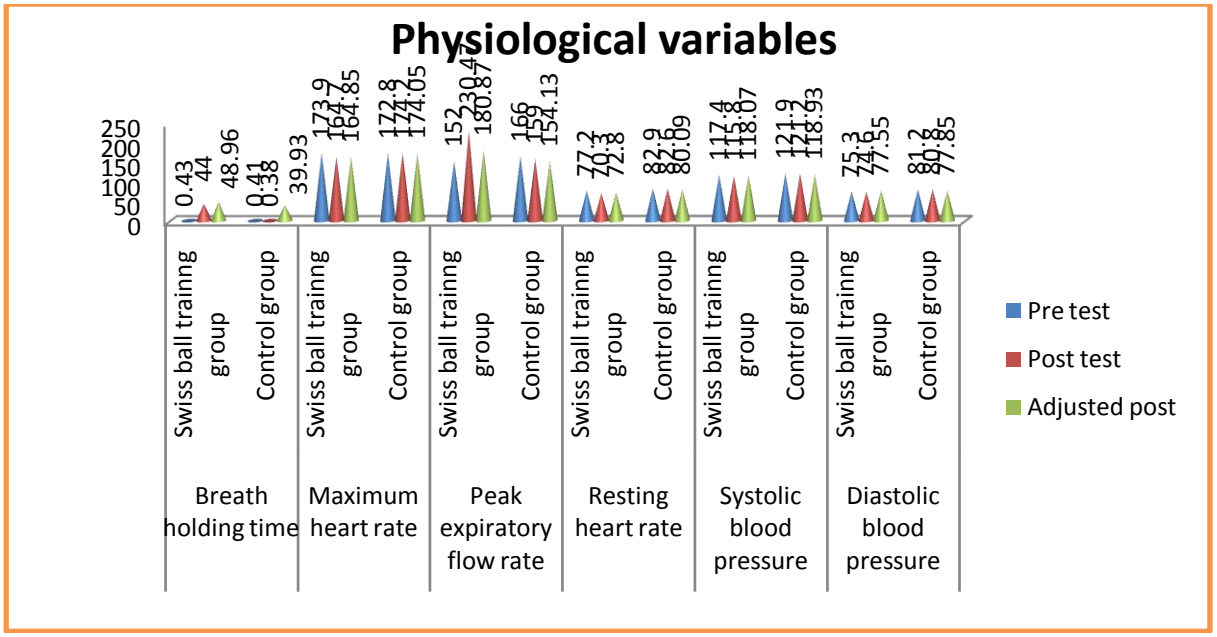
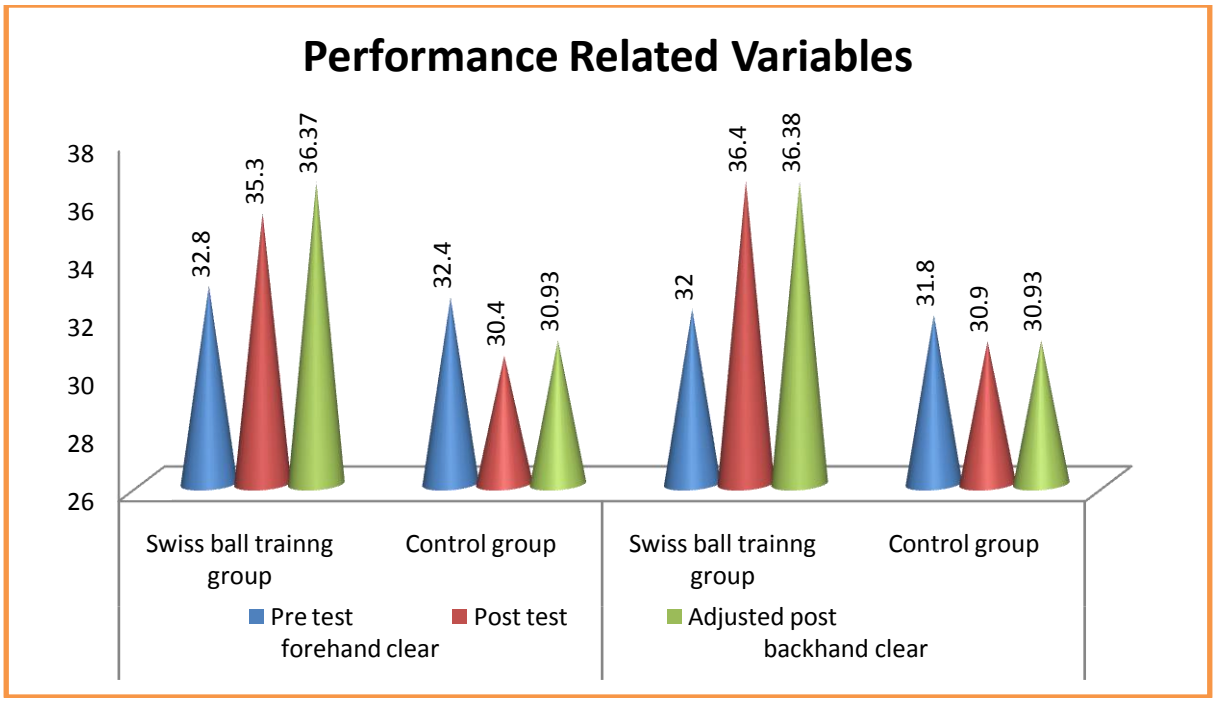


Figure III. The pre, post and adjusted post test mean values of experimental and control groups on selected performance related variables among Badminton players



Discussion and findings

The findings of the present study have strongly indicates that Swiss ball training of six weeks has shown significant improvement in all the selected physical, physiological and performance related variables namely maximum strength, core strength, leg explosive power, breath holding time, peak expiratory flow rate, maximum heart rate, resting heart rate, forehand clear and backhand clear except systolic blood pressure and diastolic blood pressure of Badminton players. The results of this investigation are also supported by the following studies of Bhuyan & Kumar (2013), Choi, et. al. (2012), Dharmendrakumar & Sakthignanavel (2014), Qiang (2011), Sekendiz,, Cug and Korkusuz (2010) and Seo,

et. al. (2012).

Conclusions

1. The experimental group showed significant improvement in the following physical, physiological and performance related variables such as maximum strength, core strength, leg explosive power, breath holding time, peak expiratory flow rate, maximum heart rate, resting heart rate, forehand clear and backhand clear after undergoing six weeks of Swiss ball training.
2. The experimental group showed no significant level difference on physiological variables of systolic blood pressure and diastolic blood pressure among Badminton players.
3. The control group did not show significant improvement in any of selected variables.

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