EFFECT OF CORE STABILITY TRAINING ON BALANCE AND CORE ABILITIES AMONG WOMEN SOCCER PLAYERS

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Abstract: *The purpose of the study was to find out the effect of core stability training on balance and core abilities among women soccer players. To achieve the purpose of this study, 24 women intercollegiate soccer players were selected as subjects from Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India. Their age ranged from 18 to 25 years. The selected participants were randomly divided into two groups such as group 'A' core stability training (n=12) and group 'B' acted as control group (n=12). Group 'A' underwent core stability training for four days per week and each session lasted for forty-five to one hour approximately for six weeks of period. Control group was not exposed to any specific training but they were participated in their regular activities. The selected variables on static balance was measured by stork balance test (seconds), dynamic balance was measured by Y-Balance Test (percentage) and core ability was measured by plank test (seconds). The pre and post-tests data were collected on selected criterion variables prior to and immediately after the training program. The pre and post-test scores were statistically examined by the dependent't' test and Analysis of co-variance (ANCOVA). The level of significant was fixed at 0.05 level. It was concluded that the core stability training group had shown significantly improved on balance and core abilities due to the effect of core stability training. However, the control group had not shown any significant improvement on balance and core abilities.*

Keywords*: core stability Training, Static Balance, Dynamic Balance, core ability, Soccer Players*

1. INTRODUCTION

Female's soccer is one of today's most popular sports, yet not so long ago, females were forbidden to play it. The popularity of women's soccer continues to grow as evidenced by the six to eight million female athletes between the ages of 6 and 24 years playing soccer [1] & [2].

Core stability, on the other hand, is a more ambiguous term. Perhaps more important than strength, core stability is the ability of passive and active stabilizers in the lumbopelvic region to maintain appropriate trunk and hip posture, balance and control during both static and dynamic movement [3] & [4].

The core strength training is a commonly used method that we should dwell on for athletic performance. The core training method differs from weight-lifting exercises in practice and it aims to improve core muscle strength [5].

It is theorized that a strong core region will ease the transfer of force from the lower body to the upper body while making the energy consumption in the body more efficient [6].

It was reported that there was a relationship between core strength training and endurance and core strength training provided development in balance ability [7], [8] & [9].

Core stability' (CS) is defined as the ability to control the position and motion of the trunk over the pelvis to allow optimum production, transfer and control of force and motion to the terminal segment in integrated athletic activities [10].

During a match in soccer, constantly changing sprints such as 10m-20m-30m, continuous high jumps in high-balls, and tackles based on muscles strength have been faced [11].

Core exercises are training exercise programs which soccer players practice through their own body weight or assistive tools and which aim the development of central muscles' strength that balance posture and Core practices include buttocks, back, and abdominal muscles [12].

Soccer is a team game popular around the world with participants of all ages. The increasing competition between teams and search for new stars has lowered the age of discovering new footballers. Core exercises may be chosen by trainers as they increase sporting performance, reduce the risk of injury and aid in more balanced development of sporting skills [13] & [14].

2. PURPOSE OF THE STUDY

The main purpose of the study was to find the effect of core stability training on balance ability such as static and dynamic balance abilities and core muscle ability among intercollegiate women soccer players.

3. METHODOLOGY

To achieve the purpose of this study, 24 women intercollegiate soccer players were randomly selected as subjects from the Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India. Their age ranged from 18 to 25 years. The selected participants were randomly divided into two groups such as group 'A' 'core stability training' (n=12) and group 'B' acted as control group (n=12). Group 'A' underwent core stability training for four days per week and each session lasted for forty-five to one hour approximately for six weeks of period. However, control group was not exposed to any specific training but they participated in their regular schedule. The static balance was measured by stork balance test (seconds), dynamic balance was measured by Y-Balance Test (percentage) and core ability was measured by plank test (seconds) were selected as criterion variables. The pre and post tests data were collected on selected criterion variables prior to and immediately after the training program. The pre and post-test selected criterion variable scores were statistically examined by the dependent 't' test and Analysis of Covariance (ANCOVA). The level of significance was fixed at .05 level of confidence, which was considered as appropriate.

3.1 Training Protocol

The core stability training programme performed four days a week and each session lasted about 60 minutes of duration for six-week period. The subjects began with the same standardized warm-up each day before the training session. The training programme was conducted during the morning sessions between 6.30 a.m. to 7.30 a.m. The following means were included in the core stability training, Bridge, Crunch, Plank, Supine Toe Tap, Bird dog, Mountain climber, Warrior crunch, Side plank with rotation, Bird dog with elbow to knee, Bicycle crunch with the intensity of 70-85% and also repetition of the exercise and sets of the work load also increased week by week during the six week of periods.

3.2 Determination of Dependent Variables

The selected dependent variables were static balance, dynamic balance and core ability. The selected variables were assessed by using standardized test items that was reviewed by various articles and published dissertations in and around the globe. To measure the selected variables such as static balance was assessed by using stork stand balance test

and the unit of measurement is in seconds and dynamic balance was assessed by using Y-balance test and the unit of measurement is in percentage and the core ability was measured by using plank test and the unit of measurement is in seconds.

4. ANALYSIS OF DATA

4.1 Static Balance

Table 1: Means and Dependent 'T' Test for the Pre and Post Tests on Static Balance of Experimental and Control Groups (seconds)

Criterion variables	Test	Experimental Group Mean	Control Group Mean
Static Balance	Pre test	27.84	27.41
	Post test	34.52	27.95
	't'test	**7.05***	1.42

*****Significant at .05 level. (Table value required for significance at .05 level for 't'-test with df 11 is 2.20)

The table-1 shows that the pre-test mean value of experimental and control groups on static balance are 27.84 and 27.41 respectively and the post test means are 34.52 and 27.95 respectively. The obtained dependent t-ratio values between the pre and post test means of experimental and control groups are 7.05 and 1.42 respectively. The table value required for significant difference with df 11 at .05 level is 2.20. From the above table the dependent't'-test value of static balance between pre and post tests means of experimental group was greater than the table value 2.20 with df 11 at .05 level of confidence, it was concluded that the experimental group had significant better improvement in the static balance when compared to control group.

Table 2: Computation of Mean and Analysis of Covariance on Static Balance of Experimental and Control Groups

	Experimental Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Square	F
Static Balance (Adjusted Post Mean)	35.01	28.15	BG	153.08	1	153.08	**14.20***
			WG	226.38	21	10.78	

* Significant at 0.05 level. Table value for df 1, 21 was 4.32

Table-2 shows that the adjusted post test means values on static balance of experimental and control groups 35.01 & 28.15 respectively. The obtained f- ratio of 14.20 for adjusted post-test mean is greater than the table value 4.32 with df 1 and 21 required for significance at 0.05 level of confidence. The results of the study indicated that there was a significant mean difference exist between the adjusted post test means of Experimental and control groups on static balance.

The bar diagram figure-1 shows that the mean values of pre, post and adjusted post tests on static balance of Experimental and control groups.

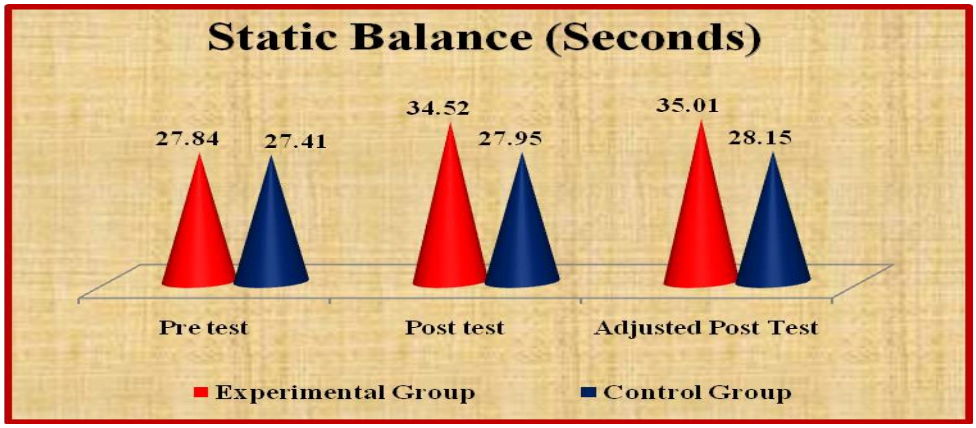

Figure-1: Mean values of pre, post and adjusted post tests on static balance of Experimental and control groups.

4.2 Dynamic Balance

Table 3: Means and Dependent 'T' Test for the Pre and Post Tests on Dynamic Balance of Experimental and Control Groups (percentage)

Criterion variables	Test	Experimental Group Mean	Control Group Mean
Dynamic Balance	Pre test	58.34	58.82
	Post test	64.07	59.16
	't'test	**10.44***	**1.12**

*****Significant at .05 level. (Table value required for significance at .05 level for 't'-test with df 11 is 2.20)

The table-3 shows that the pre-test mean value of experimental and control groups on dynamic balance are 58.34 and 58.82 respectively and the post test means are 64.07 and 59.16 respectively. The obtained dependent t-ratio values between the pre and post test means of experimental and control groups are 10.44 and 1.12 respectively. The table value required for significant difference with df 11 at .05 level is 2.20. From the above table the dependent't'-test value of dynamic balance between pre and post tests means of experimental group was greater than the table value 2.20 with df 11 at .05 level of confidence, it was concluded that the experimental group had significant improvement in the dynamic balance when compared to control group.

Table 4: Computation of Mean and Analysis of Covariance on Dynamic Balance of Experimental and Control Groups

	Experimental Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Square	F
Dynamic Balance (Adjusted Post Mean)	64.73	59.46	BG	270.31	1	270.31	**35.06***
			WG	161.91	21	7.71	

* Significant at 0.05 level. Table value for df 1, 21 was 4.32

Table-4 shows that the adjusted post test means values on dynamic balance of experimental and control groups 64.73 & 59.46 respectively. The obtained f- ratio of 35.06 for adjusted post-test mean is greater than the table value 4.32 with df 1 and 21 required for significance at 0.05 level of confidence. The results of the study indicated that there was a significant mean difference exist between the adjusted post test means of Experimental and control groups on dynamic balance.

The bar diagram figure-2 shows that the mean values of pre, post and adjusted post tests on dynamic balance of Experimental and control groups.

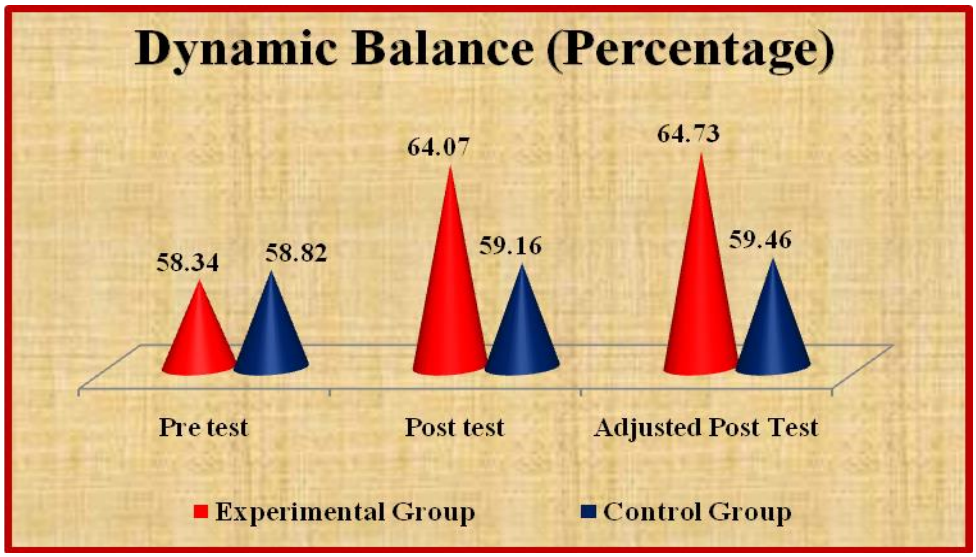

Figure-2: Mean values of pre, post and adjusted post tests on dynamic balance of Experimental and control groups.

4.3 Core Ability

Table 5: Means and Dependent 'T' Test for the Pre and Post Tests on Core Ability of Experimental and Control Groups (seconds)

Criterion variables	Test	Experimental Group Mean	Control Group Mean
Core Ability	Pre test	49.85	49.07
	Post test	60.93	50.85
	't'test	**9.42***	**1.71**

***Significant at .05 level. (Table value required for significance at .05 level for 't'-test with df 11 is 2.20)

The table-5 shows that the pre-test mean value o f experimental and control groups on core abilities are 49.85 and 49.07 respectively and the post test means are 60.93 and 50.85 respectively. The obtained dependent t-ratio values between the pre and post test means of experimental and control groups are 9.42 and 1.71 respectively. The table value required for significant difference with df 11 at .05 level is 2.20. From the above table the dependent't'-test value of core ability between pre and post tests means of experimental group was greater than the table value 2.20 with df 11 at .05 level of confidence, it was concluded that the experimental group had significant improvement in the core ability when compared to control group.

Table 6: Computation of Mean and Analysis of Covariance on Core Ability of Experimental and Control Groups

	Experimental Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Square	F
Core Ability (Adjusted Post Mean)	60.47	50.91	BG	44.94	1	44.94	**12.95***
			WG	72.87	21	3.47	

* Significant at 0.05 level. Table value for df 1, 21 was 4.32

Table-6 shows that the adjusted post test means values on core abilities of experimental and control groups 60.47 & 50.91 respectively. The obtained f- ratio of 12.95 for adjusted post-test mean is greater than the table value 4.32 with df 1 and 21 required for significance at 0.05 level of confidence. The results of the study indicated that there was a significant mean difference exist between the adjusted post test means of Experimental and control groups on core abilities. The bar diagram figure-3 shows that the mean values of pre, post and adjusted post tests on core abilities of Experimental and control groups.

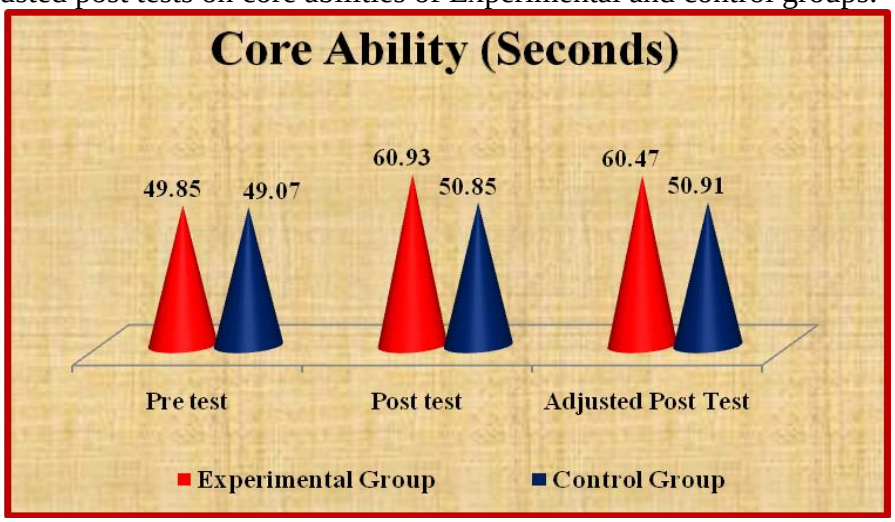

Figure-3: Mean values of pre, post and adjusted post tests on core ability of Experimental and control groups.

5. DISCUSSION ON FINDINGS

In this study core stability training the results between pre and post (6 weeks) test has been found significantly higher on balance and core abilities in comparison to control group. This is possible because due to regular core stability training which may also improvement on balance and core abilities in women soccer players. The findings of the present study have strongly indicated that core stability training of six weeks have significant improvement on selected balance and core abilities of women soccer players.

Also agreed with the findings of these studies of Kumar, & Arumugam, (2019) [15]; Kachanathu et al, (2014) [16]; Kumar, & Arumugam, (2018) [17]; Turna, (2020) [18]; Kumar, & Arumugam, (2018) [19]; Satiroglu, Arslan, & Atak, (2013) [20]; Hwang, & kim, (2017) [21]; Anuja, & Arumugam, (2017) [22]; Suriya & Arumugam, (2020) [23]; Kumar, & Arumugam, (2019) [24]; Arumugam, & Thanga Banu, (2019) [25]; Satheesh Kumar, & Arumugam, (2018) [26]; Arumugam, (2014) [27]; Selvaraja, & Arumugam, (2018) [28]; Arumugam, & Balmu N Sangma. (2019) [29]; Arumugam, (2018) [30]; Arumugam, (2015) [31]; Anuja, & Arumugam, (2018) [32]; Muthu Selvan, & Arumugam, (2018) [33].

6. CONCLUSIONS

1. There was significant better improvement on balance (static and dynamic) and core abilities due to the effect of core stability training among women soccer players.
2. However, the control group had no significant improvement on any of the selected variables.

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