IMPACT OF PLYOMETRIC TRAINING ON SELECTED PHYSICAL FITNESS VARIABLES AMONG KHO-KHO PLAYERS

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ABSTRACT

The purpose of the study was to analyze the impact of plyometric training on selected physical fitness variables among kho kho players. To achieve the purpose of this study, 60 male Kho-Kho players who has Played in the intercollegiate tournaments from different colleges of Bharathidasan University, Tiruchirappalli were selected as the subjects. The age of the subjects ranged between 18 to 23 years. The subjects were informed about the nature of the study and their consent were also taken before involving them as subjects of the study. The subjects were randomly divided into two groups of thirty subjects each. Group A acted as the experimental group and group B acted as the control group. Later, the Plyometric training programme was administered on the experimental group thrice in a week for a period of Six weeks. The selected Physical Fitness variables and test used for this study are speed, agility, static balance, dynamic balance, abdominal strength and endurance and it was measured by 50 mts. Dash, Shuttle Run, Stork Stand, Johnson's Modified Bass Test, Sit-ups, Cooper's 12 minute Run/Walk Test respectively. Later, the Plyometric training programme was administered on the experimental group thrice in a week for a period of six weeks. Data collected from the groups before and after the training programme were statistically examined for significant difference in means by applying analysis of co-variance (ANCOVA). Later wherever the F-ratio was found to be significant, LSD post-hoc test was applied, so as to test whether actual differences existed among the adjusted post-test means and the level of significance was set at 0.05. The results of the study indicate that there was significant difference on speed, agility, static balance, dynamic balance, abdominal strength and endurance among the Plyometric Training and control group of kho-kho players.

Key Words: Plyometric Training, Speed, Agility, Static Balance, Dynamic Balance, Abdominal Strength and Endurance.

INTRODUCTION

Plyometric training jumping, bounding, and hopping exercises that use the stretch shortening cycle of the muscle unit—have consistently been shown to improve the production of muscle force and power. In particular, the fast force production of the trained muscle improves, coupled with smaller increases in maximum isometric force **(Wagner and Kocak, 1997). Chaouachi et. al., (2014)** examined whether combined balance and plyometric training

compared to single-mode plyometric training produced greater performance improvements on measures of physical fitness in children. Although the combined program only involved half the volume of plyometric training as the single-mode plyometric program, the combined program resulted in better sprint and shuttle run performances as opposed to the single intervention plyometric program. These findings suggest that immature or a lack of optimal balance capabilities might compromise plyometric training adaptations.

Kho-Kho and Sports have an important place in India. Since Ancient times because of several reasons, Sports of many kinds are being played in our Country since a long time. Several kinds of exercises have been in vogue even today. Some sports are played for the growth of our body. Whereas some re played for the purpose of winner in Tournament and record in this game. The game of Kho-Kho can comprehensively be trailed by resolving the fundamental aptitudes and techniques of pursue and abilities and techniques of fleeing and avoiding the chasers and not permitting any of the chasing rivals contact your individual or the apparels worn by the sprinter. The pursuit could be effectively finished up by jumping at the sprinter and contacting his impact point of the rear foot while running. This is the most beyond any doubt and safe strategy to score a sprinter. Running was supported in three fundamental strategies. Running crisscross in the mid-line in single, twofold or triple chain is a conventional method **(Heyward, 2006).**

METHODOLOGY

The purpose of the study was to analyze the impact of plyometric training on selected physical fitness variables among kho kho players. To achieve the purpose of this study, 60 male Kho-Kho players who has Played in the intercollegiate tournaments from different colleges of Bharathidasan University, Tiruchirappalli were selected as the subjects. The age of the subjects ranged between 18 to 23 years. The subjects were informed about the nature of the study and their consent were also taken before involving them as subjects of the study. The subjects were randomly divided into two groups of thirty subjects each. Group A acted as the experimental group and group B acted as the control group. Later, the Plyometric training programme was administered on the experimental group thrice in a week for a period of Six weeks. The selected Physical Fitness variables and test used for this study are presented in Table 1.

Table 1: Physical Fitness Variables and Test Used

Sl. No.	Variable	Test	Measurements
1.	Speed	50 mts. Dash	Sec
2.	Agility 4x10 mts.	Shuttle Run	Sec
3.	Static Balance	Stork Stand	Sec
4.	Dynamic Balance	Johnson's Modified Bass Test	Numbers
5.	Abdominal Strength	Sit-ups	Numbers

6.	Endurance	Cooper's 12 minute Run/Walk Test	Meters

The pre-test and post-test datas of the selected variables namely speed, agility, static balance, dynamic balance, abdominal strength and endurance were statistically analyzed. Data collected from the groups before and after the training programme were statistically examined for significant difference in means by applying analysis of co-variance (ANCOVA). Later wherever the F-ratio was found to be significant, LSD post-hoc test was applied, so as to test whether actual differences existed among the adjusted post-test means and the level of significance was set at 0.05.

Table II: Analysis of Co-Variance of Experimental and Control groups on Speed

	Test	Ex. G	CG	SOV	Sum of Squares	df	Means Squares	F-ratio	P-Value
Speed	Pre-Test Means	6.786	6.790	BG	0.000	1	0.000	0.001	0.971
				WG	12.541	58	0.216		
	Post-Test Means	6.477	6.657	BG	0.486	1	0.486	6.063*	0.017
				WG	4.649	58	0.080		
	Adjusted Post-Test Means	6.656	6.478	BG	0.477	1	0.477	9.629**	0.003 P<001
				WG	2.824	57	0.050		

* Significant at 0.05 level as the P-value is < 0.05

** Significant at 0.01 level as the P-value is < 0.01

The table II shows, the adjusted post test means on speed of plyometric training and control groups are 6.656, 6.478 respectively. While the pre-test variable was taken as the co-variate. The P-value of 0.971 associated with the pre-test scores indicates that there is no significant difference between the mean of the pre-scores of experimental and control group. Again a P-value of 0.017 associated with the post-test scores implies that the post mean scores are significantly different. Further, the said table do indicates an F-ratio of 9.629 on the adjusted post-test means and this do implies that there existed mean difference on the variable Speed between the experimental and control group, as the P-value obtained has been 0.003 which is much less than 0.05, the level of significance set for this study. Since, the F-ratio was found to be

significant the LSD post-hoc test was done, to find out whether there existed significant differences among the adjusted post-test means or not on the variable Speed and the details are presented in Table VIII.

Table III: Analysis of Co-Variance of Experimental and Control groups on Agility

	Test	Ex. G	CG	SOV	Sum of Squares	df	Means Squares	F-ratio	P-Value
Agility	Pre-Test Means	10.178	10.193	BG	0.004	1	0.004	0.099	0.754
				WG	2.066	58	0.036		
	Post-Test Means	9.943	10.153	BG	0.659	1	0.656	38.017*	0.017
				WG	1.006	58	0.017		
	Adjusted Post-Test Means	9.947	10.49	BG	1.610	1	0.610	75.028**	0.000 P<001
				WG	0.463	57	0.008		

* Significant at 0.05 level as the P-value is < 0.05

** Significant at 0.01 level as the P-value is < 0.01

The table III shows, the adjusted post test means on agility of plyometric training and control groups are 9.947, 10.49 respectively. While the pre-test variable was taken as the co-variate. The P-value of 0.754 associated with the pre-test scores indicates that there is no significant difference between the mean of the pre-scores of experimental and control group. Again a P-value of 0.017 associated with the post-test scores implies that the post mean scores are significantly different. Further, the said table do indicates an F-ratio of 75.028 on the adjusted post-test means and this do implies that there existed mean difference on the variable agility between the experimental and control group, as the P-value obtained has been 0.000 which is much less than 0.05, the level of significance set for this study. Since, the F-ratio was found to be significant the LSD post-hoc test was done, to find out whether there existed significant differences among the adjusted post-test means or not on the variable agility and the details are presented in Table VIII.

Table IV: Analysis of Co-Variance of Experimental and Control groups on Static Balance

	Test	Ex. G	CG	SOV	Sum of Squares	df	Means Squares	F-ratio	P-Value
Static Balance	Pre-Test Means	30.701	31.577	BG	11.50	1	11.502	0.264	0.609
				WG	2526.98	58	43.569		
	Post-Test Means	36.047	32.213	BG	220.49	1	220.493	7.938*	0.007
				WG	1610.96	58	27.775		
	Adjusted Post-Test Means	36.37	31.89	BG	299.13	1	299.134	67.287**	0.000 P<001
				WG	253.40	57	4.446		

* Significant at 0.05 level as the P-value is < 0.05

** Significant at 0.01 level as the P-value is < 0.01

The table IV shows, the adjusted post test means on static balance of plyometric training and control groups are 36.37, 31.89 respectively. While the pre-test variable was taken as the co-variate. The P-value of 0.609 associated with the pre-test scores indicates that there is no significant difference between the mean of the pre-scores of experimental and control group. Again a P-value of 0.007 associated with the post-test scores implies that the post mean scores are significantly different. Further, the said table do indicates an F-ratio of 67.287 on the adjusted post-test means and this do implies that there existed mean difference on the variable static balance between the experimental and control group, as the P-value obtained has been 0.000 which is much less than 0.05, the level of significance set for this study. Since, the F-ratio was found to be significant the LSD post-hoc test was done, to find out whether there existed significant differences among the adjusted post-test means or not on the variable static balance and the details are presented in Table VIII.

Table V:Analysis of Co-Variance of Experimental and Control groups on Dynamic Balance

	Test	Ex. G	CG	SOV	Sum of Squares	df	Means Squares	F-ratio	P-Value
Dynamic Balance	Pre-Test Means	42.367	45.700	BG	166.667	1	166.667	1.248	0.268
				WG	7743.267	58	133.505		
	Post-Test Means	47.867	46.433	BG	30.817	1	30.817	0.271*	0.605
				WG	6600.833	58	113.807		
	Adjusted Post-Test Means	49.333	44.967	BG	279.951	1	279.951	26.345**	0.000 P<001
				WG	605.694	57	10.626		

* Significant at 0.05 level as the P-value is < 0.05

** Significant at 0.01 level as the P-value is < 0.01

The table V shows, the adjusted post test means on dynamic balance of plyometric training and control groups are 49.333, 44.967 respectively. While the pre-test variable was taken as the co-variate. The P-value of 0.268 associated with the pre-test scores indicates that there is no significant difference between the mean of the pre-scores of experimental and control group. Again a P-value of 0.605 associated with the post-test scores implies that the post mean scores are significantly different. Further, the said table do indicates an F-ratio of 26.345 on the adjusted post-test means and this do implies that there existed mean difference on the variable dynamic balance between the experimental and control group, as the P-value obtained has been 0.000 which is much less than 0.05, the level of significance set for this study. Since, the F-ratio was found to be significant the LSD post-hoc test was done, to find out whether there existed significant differences among the adjusted post-test means or not on the variable dynamic balance and the details are presented in Table VIII.

Table VI: Analysis of Co-Variance of Experimental and Control groups on Abdominal Strength

	Test	Ex. G	CG	SOV	Sum of Squares	df	Means Squares	F-ratio	P-Value
A		33.067	32.667	BG	2.4	1	2.4	0.080	0.799

bdominal Strength	**Pre-Test Means**			**WG**	1746.533	58	30.113		
	Post-Test Means	37.133	32.8	**BG**	281.667	1	281.667	13.936*	0.000
				WG	1172.267	58	20.211		
	Adjusted Post-Test Means	36.982	32.951	**BG**	243.354	1	243.354	80.641**	0.000 P<001
				WG	172.011	57	3.018		

The table VI shows, the adjusted post test means on abdominal strength of plyometric training and control groups are 36.982, 32.951 respectively. while the pre-test variable was taken as the co-variate. The P-value of 0.799 associated with the pre-test scores indicates that there is no significant difference between the mean of the pre-scores of experimental and control group. Again a P-value of 0.000 associated with the post-test scores implies that the post mean scores are significantly different. Further, the said table do indicates an F-ratio of 9.629 on the adjusted post-test means and this do implies that there existed mean difference on the variable abdominal strength between the experimental and control group, as the P-value obtained has been 0.000 which is much less than 0.05, the level of significance set for this study. Since, the F-ratio was found to be significant the LSD post-hoc test was done, to find out whether there existed significant differences among the adjusted post-test means or not on the variable abdominal strength and the details are presented in Table VIII.

Table VII: Analysis of Co-Variance of Experimental and Control groups on Endurance

	Test	**Ex. G**	**CG**	**SOV**	**Sum of Squares**	**df**	**Means Squares**	**F-ratio**	**P-Value**
Endur	**Pre-Test Means**	2012.50	2011.167	**BG**	26.667	1	26.667	0.000	0.982
				WG	3155721.7	58	54408.994		
	Post-Test	2070.00	2017.667	**BG**	41081.667	1	41081.667	0.933*	0.338

a n c e	**Means**			**W G**	2552536.7	58	44009.253		
	Adjusted Post-Test Means	2069.41	2018.257	**B G**	39249.107	1	39249.107	28.143**	0.000 P<001
				W G	79492.77	57	1394.61		

* Significant at 0.05 level as the P-value is < 0.05

** Significant at 0.01 level as the P-value is < 0.01

The table VII shows, the adjusted post test means on endurence of plyometric training and control groups are 2069.410, 2018.257 respectively. while the pre-test variable was taken as the co-variate. The P-value of 0.971 associated with the pre-test scores indicates that there is no significant difference between the mean of the pre-scores of experimental and control group. Again a P-value of 0.017 associated with the post-test scores implies that the post mean scores are significantly different. Further, the said table do indicates an F-ratio of 9.629 on the adjusted post-test means and this do implies that there existed mean difference on the variable endurance between the experimental and control group, as the P-value obtained has been 0.003 which is much less than 0.05, the level of significance set for this study. Since, the F-ratio was found to be significant the LSD post-hoc test was done, to find out whether there existed significant differences among the adjusted post-test means or not on the variable endurance and the details are presented in Table VII.

Table VIII: LSD Post-Hoc Test of Experimental and Control groups for Difference Between Adjusted Post-Test Paired Means on Speed Agility Static Balance Dynamic Balance Abdominal Strength and Endurance

Variables	Adjusted Post-test Means		Mean Difference	Std. Error	P-value
	Experimental Group	Control Group			
Speed	6.66	6.48	0.18*	0.06	P<0.003**
Agility	10.15	9.94	0.21*	0.21*	P<0.000**
Static Balance	31.89	36.37	4.48*	0.546	P<0.000**
Dynamic Balance	44.97	49.33	4.36*	0.851	P<0.000**
Abdominal Strength	32.951	36.982	4.031 *	0.449	P<0.00l **
Endurance	2018.26	2069.41	50.72*	9.64	P<0.000**

***** The mean difference is significant at 0.05 level
**Based on estimated marginal means.
Adjustment for multiple comparisons least significant difference (equivalent to no adjustment)

The table VIII indicates that there are mean difference on speed are 0.18 and a P-value of 0.003; on agility are 0.21 and a P-value of 0.000; on static balance are 4.48 and a P-value of 0.000; on dynamic balance are 0.851and a P-value of 0.000; on abdominal strength are 0.4031 and a P-value of 0.001; on endurance are 0.50.72 and a P-value of 0.000 respectively. This do clearly indicates that, there existed significant differences in the adjusted post-hoc paired means among the experimental and control group on speed, agility, static balance, dynamic balance, abdominal strength and endurance of kho-kho players. The graphical representation of the adjusted post test means of the experimental and control groups are presented in Figure 1.

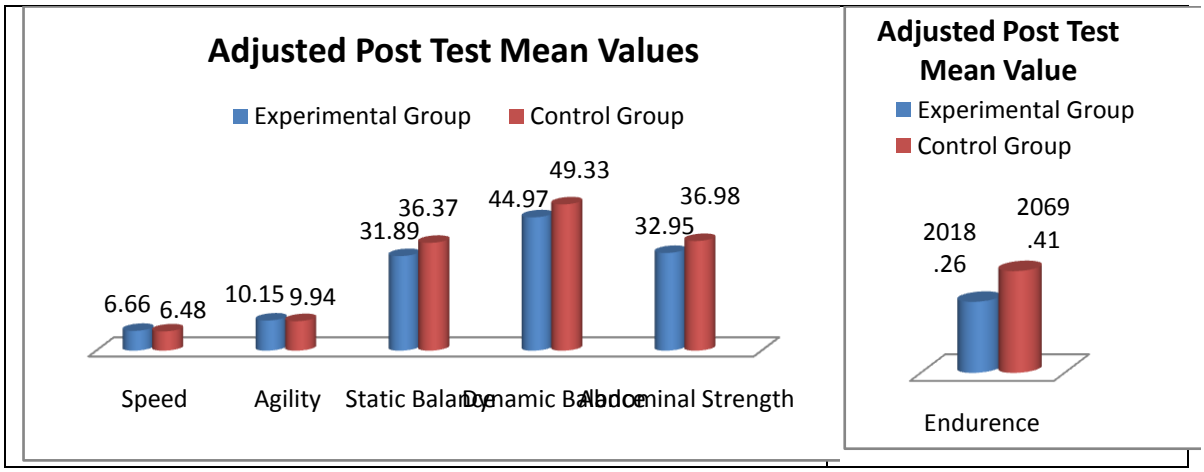

Figure – 1: Adjusted Post Test Mean Values of Experimental Groups and Control Group on Speed, Agility, Static Balance, Dynamic Balance, Abdominal Strength and Endurance of Kho-Kho Players

Discussions on Findings

There was significant improvement on speed, agility, static balance, dynamic balance, abdominal strength and endurance due to six weeks of plyometric training training programme among the kho-kho players. The results of the study in line with the studies of **De Villarreal et. al., (2008) and Ronnested et. al., (2008)**.

CONCLUSIONS

From the results of the study the following conclusions were drawn,

The results of the study indicate that there was significant improvement on speed, agility, static balance, dynamic balance, abdominal strength and endurance among the kho-kho players.

The results of the study also indicate that there was significant improvement among the experimental group due to six weeks of plyometric training programme.

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