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Effect of plyometric training on endurance of female Kho-Kho players

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Abstract

The purpose of the study was to evaluate the effectiveness of plyometric training in developing cardiovascular endurance of Kho-Kho players. For this purpose, thirty regular practicing female Kho-Kho players (age 19.41 ± 1.32 years; height 160.41 ± 3.53 cm and weight 53.18 ± 3.23 kg) randomly divided into two groups- Experimental and Control. Six weeks plyometric training with 2-day sessions per week was employed on Experimental group along with their regular Kho-Kho practice. Control group took part only in their regular Kho-Kho practice. Cardiovascular endurance was measured by 600 m Run-walk test prior to and after 6 weeks intervention period. Collected data were analyzed through Pair t-Test with level of significance fixed at 0.05 level. According to the result, improvement of cardiovascular endurance of experimental group was statistically significant; where as no significant improvement was observed in Control group.

Keywords: Plyometric training, Cardiovascular endurance, female Kho-Kho players

1. Introduction

Kho-Kho is one of the popular indigenous games. Though it is a team game, but high level individual motor fitness and mental alertness are key aspects for preparation and winning matches in Kho-Kho. Agility, speed, explosive power, cardiovascular endurance etc. are the most essential motor abilities for playing Kho-Kho.

Sports training is a scientific and pedagogic process of attaining performance ability and performance readiness through a planned and systematic schedule (Rajan and Faiz, 2018) [1]. Plyometric training is composed of exercises that enable muscles to reach maximal strength in a shortest possible time by eliciting the stretch shortening cycle of a muscle fiber. Plyometric exercise involves a rapid eccentric movement, immediately followed by an explosive concentric movement and a very short electro-mechanical delay in between two phases, enabling the synergistic muscles to use the myotatic-stretch reflex during the stretch-shortening process (Lum *et al.*, 2016) [7]. It is a well-known exercise to develop explosiveness of muscle. Plyometric is generally used to develop the agility, speed and explosiveness of the athletes. Few studies have shown the effectiveness of plyometric training for developing cardiovascular endurance. Most of them employed plyometric training for 12 weeks with 3 days per week sessions. If plyometric training for a shorter period can elicit the cardiovascular endurance development of Kho-Kho players, then within a short period all the essential motor qualities of a Kho-Kho player could be developed by using plyometric exercises.

Therefore, the purpose of the study was to access the effectiveness of plyometric exercise in developing cardiovascular endurance of regular practicing Kho-Kho players. So that, within a short period the Kho-Kho players can develop the most essential motor abilities to play the game efficiently.

2. Methodology

2.1 Participants

Thirty female Kho Kho players from Manikpara, Jhargram, West Bengal, India volunteered as subjects in this study. Participants had no plyometric training experience before taking part in this experiment.

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The mean and standard deviation of age, height and weight of the subjects were respectively 19.41 ± 1.32 years, 160.41 ± 3.53 cm, and 53.18 ± 3.23 kg. Before starting the training programme medical test of each subject was done and they were declared 'fit' to take part in this study. Subjects were briefed about the requirements, risks and the procedure of the experiment. Written consent from each subject was taken before the commencement of the study.

2.2 Experimental Design

Pre-test post-test randomised group design was used for the study. Subjects were randomly distributed into two groups. Both the groups namely 'Experimental group' and 'Control group' have 15 subjects each. One week before commencement of the training a baseline test on cardiovascular endurance was conducted for both the groups. Experimental group continued their regular Kho-Kho practice in addition to plyometric training for six weeks. Control group continued their regular Kho-Kho practice only. One week after completion of six weeks intervention, final test on cardiovascular endurance was conducted. Subjects were restricted to participate in any form of exercise within 24 hours prior to cardiovascular endurance test. Test was conducted by the same testers and at the same time of day before and after the intervention.

2.3 Test and Data Collection

Cardiovascular endurance was measured by 600 m Run-walk test and conducted according to the procedure of AAPER 600 yard Run-walk test (Barrow & Mcgee, 1979) [1]. For the convenient of arrangement 600m Run-Walk test was conducted instead of 600 yard Run-Walk test. A 200m track

was used as the course of the running. Two subjects ran at a time. Subjects stood behind the starting line. On the signal "Ready - Go" subjects started running. They may have walked for a short space of time, but subjects were encouraged to run as fast as possible, preferably in a constant pace. Two trained testers for operating stopwatch and an assistant to record the score were employed for taking time of both the subjects at a time. Score was elapsed time to cover 600 m distance in minutes and seconds. Later, the scores were converted in seconds.

2.4 Treatment Protocol

Plyometric training programme was conducted as per volume and intensity recommended by Miller *et al.* (2007) [9] using same drills, sets and repetitions. The plyometric training was performed in every Wednesday and Saturday in the morning for 6 weeks (Chimera *et al.*, 2004; Martel, 2005) [2, 8]. The training started with low volume plyometric drills and progressively increased in volume and intensity. The training volume started with 90 foot contacts and increased up to 140 foot contacts. The training was conducted under the direct supervision of the researcher.

2.5 Statistical Analysis

The collected data on cardiovascular endurance was analysed by Paired t-test using SPSS (version 21) to find out difference of mean between Baseline and Post training condition for both the groups. The level of confidence for statistical significance was set at 0.05 level.

3. Results

Table 1: Descriptive statistics of 600m Run-Walk Test of Experimental group

		Mean (s)	N	Std. Deviation	Std. Error Mean
Experimental Group	Pre Test	135.833	15	6.037	1.559
	Post Test	135.220	15	6.068	1.567

In Table-1, the mean, standard deviation and standard error of mean of 600m Run-Walk Test of experimental group at pre and post training conditions have been presented. The mean, standard deviation and standard error of mean of 600m Run-Walk test of experimental group in pre- experimental

condition were 135.833(s), 6.037 and 1.559 respectively. The mean, standard deviation and standard error of mean of 600m Run-Walk test of experimental group in post- experimental condition were 135.220(s), 6.068(s) and 1.567(s) respectively.

Table 2: Comparison of Pre and Post Test of 600m Run-Walk Test of Experimental group

	Paired differences			95% confidence interval of the difference		T	DF	Sig. (2-Tailed)
	Mean	SD	SE(M)	Lower	Upper			
Experimental Gr Pre-Test Post-Test	0.613	0.734	.189	.207	1.020	3.237	14	0.006*

* $p < 0.05$

Table-2 shows that the obtain *T* Value from the comparison of pre and post-test means of 600m Run-Walk test of Experimental group is 3.237 and *p* value is 0.006. This *t* value is significant at 0.05 level as the obtained *p* value 0.006 is less

than 0.05. So, there is significant difference between pre and post-test means of 600 m Run-Walk performance of Experimental group.

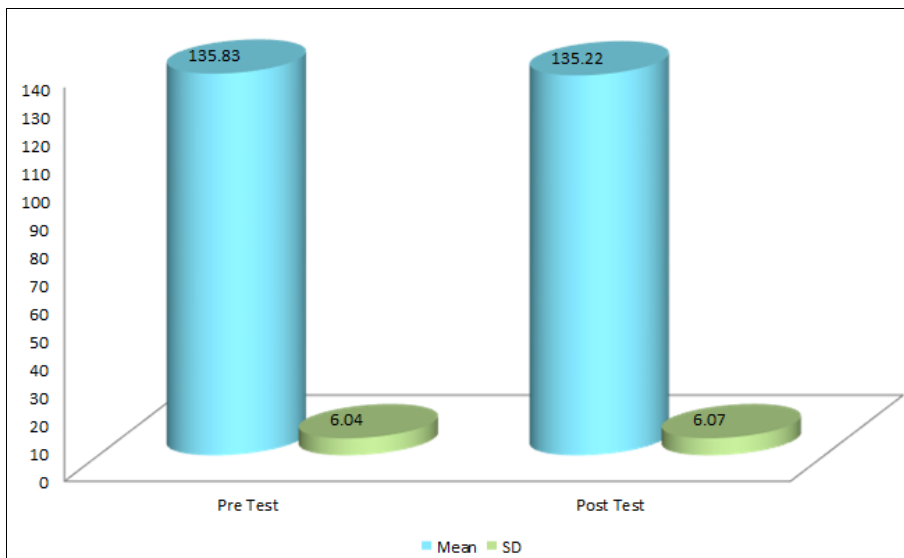


Fig 1: Comparison of pre and post-test of cardiovascular endurance of Experimental group

Table 3: Descriptive statistics of 600m Run-Walk Test of Control group

		Mean (s)	N	Std. Deviation	Std. Error Mean
Control Group	Pre Test	136.513	15	6.035	1.558
	Post Test	136.120	15	5.951	1.537

Table-3 shows the mean, standard deviation and standard error of mean of 600m Run-Walk test of Control group at pre and post training conditions. The mean, standard deviation and standard error of mean of 600m Run-Walk test of Control group in pre- experimental condition were 136.513(s), 6.035

and 1.558 respectively. The mean, standard deviation and standard error of mean of 600m Run-Walk test of Control group in post- experimental condition were 136.120(s), 5.951 and 1.537 respectively.

Table 4: Comparison of Pre and Post Test of 600m run-walk of control group

	Paired differences			95% confidence interval of the difference				
	Mean	SD	SE(M)	Lower	Upper	T	DF	Sig. (2-Tailed)
Control Gr. Pre Test Post Test	0.393	0.798	0.206	-0.049	0.835	1.910	14	0.077

Table-4 shows that the obtained *t* value from the comparison of pre and post-test means of 600m Run-Walk test of Control group is 1.910 and *p* value is 0.077. The *t* value is not significant at 0.05 level as the obtained *p* value 0.077 is more

than 0.05. So, there is no significant difference between pre and post-test means of 600m Run-Walk performance of Control group.

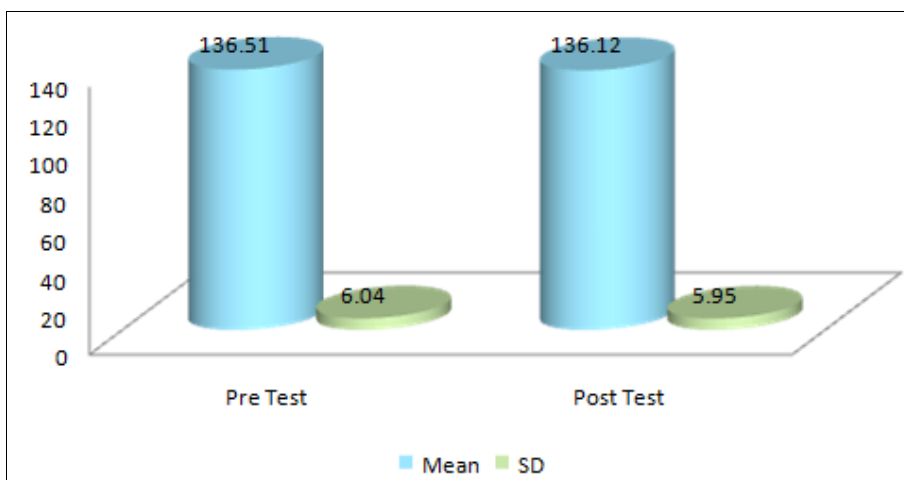


Fig 2: Comparison of pre and post-test of cardiovascular endurance of Control group.

4. Discussion

Purpose of the study was to assess the effects of six weeks plyometric training on 600m Run-Walk performance of

regular practicing Kho-Kho players. As per Table-2 and Table-4, after six weeks plyometric intervention, 600m Run-Walk performance of Experimental group improved

significantly ($p=0.006$). In case of Control group, the improvement of 600m Run-Walk performance was not significant ($p=0.077$). This result is accorded with the experiments of Rajan and Faiz, 2018; Debnath and Ezhilmaran, 2016; Kumar, 2016; Senthil, 2015^[11, 4, 6, 14].

In all these studies, plyometric training was practiced three days per week and experimental group showed significant improvement after plyometric intervention of their respective experimental period (6 to 12 weeks). The current study employed plyometric training two days per week for six weeks. The subjects of the current study did not have any experience of structured and organised plyometric training before. This might be a reason of significant improvement of cardiovascular endurance of Experimental group in comparison to Control group through two days per week plyometric sessions.

In most of the studies cardiovascular endurance was measured by 12 minute Run and Walk test but in the present study, 600m Run-Walk test was used to measure the cardiovascular endurance. Naturally, in 600m Run-Walk test, the average speed of the subjects was higher than that of 12 minute Run and Walk test. In plyometric exercise, concerned muscle follows a repeated eccentric movement followed by a quick concentric movement (Potash & Chu, 2008)^[10]. During eccentric phase potential elastic energy is stored. If it quickly followed by concentric phase, then the stored elastic energy is added to the concentric phase (Kobak *et al.*, 2015)^[5]. Stored elastic energy of muscle is reported to prevail better over concentric phase at higher speeds (Saunders *et al.*, 2006)^[13]. As the subjects ran at a higher speed in 600m Run-Walk test, potential electric energy was stored during foot contact and this energy was added with concentric movement during push off. This might be another reason of improvement of 600m Run-Walk performance through plyometric intervention. So, it is evident from the results of the study that six weeks of plyometric training with two days per week sessions can improve the cardiovascular endurance of regular practicing female Kho Kho players.

5. Conclusions

On the basis of results found in the study, it can be concluded that

1. Plyometric training improves cardio vascular endurance of female Kho Kho players.
2. Six weeks duration of plyometric training with 2-day sessions per week is sufficient to improve cardio vascular endurance.

6. References

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