

EFFECT OF PLYOMETRIC TRAINING ON TAKE-OFF AND TOUCH-DOWN OF MALE HURLERS IN 400 METERS RACE

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Abstract

The present study was conducted to investigate the "Effect of plyometric training on take-off and touch-down of male hurdlers in 400 meters hurdle race". Fourteen male sports person between the age group of 25-28 were selected through purposive random sampling technique from Government Arts and Sports College, Jalandhar. Experimental design was applied in which the subjects were tested twice i.e. pre-test and post-test was conducted and recorded. Subjects were divided into two groups i.e. Experimental and Control group. Training of plyometric training was imparted for twelve weeks followed by post test data collection. Training program was not given to Control Group. Vertical jumps of plyometrics can change the values greatly, from 22 to 48 cm in female players and from 40 to 75 cm in male players. (Ziv G et al. 2010). John Shaji (2009) also studies to examine the effects of plyometric training following a four-week training program on vertical jump height, forty-yard dash and anaerobic power. The results of the study show that plyometric training significantly improves anaerobic power and single leg vertical jump height independent of one another. Distance from take-off to the hurdle, touch-down distance from the hurdle and timings from take-off to touch-down measured by standard measuring tape and stop watch. The results of the investigation showed insignificant difference in all variables except touch-down timings, suggesting that plyometric training can be used as effective tool for the hurdlers. Level of significance was tested at 0.05 level. By comparing the pre-test and post-test timings of the take-off till touch down signifies that plyometrics training is beneficial and effective tool to enhance the performance of the hurdlers.

Introduction

Speed and strength are integral components of fitness that can be found in varying degrees in all athletic movements. In scientific terms product or combination of speed and strength is power. For many years coaches and athletes have sought to improve power in order to enhance performance. In recent years this distinct method of training for power or explosiveness has been termed plyometrics. Whatever may be the origins of the word "plyometrics" but it is used to describe the method of training which seeks to enhance the explosive reaction of the individual through powerful muscular contractions.

Keeping this in mind researcher tried to find out the effect of the Plyometric training on the hurdle performance, therefore paper is entitled as "Effect of plyometric training on take-off and touch-down of male hurdlers in 400 meters hurdle race." Aim of the study was to record the effect of plyometric training on take-off and touch-down of male hurdlers and objective was to impart twelve weeks of training and analysing the results. There are many research conducted on plyometric research and few are here to highlight the effectiveness of this training. Kannas et al. (2012) examined the effects of incline plyometrics training on muscle activation and architecture during vertical jumping and maximum strength. Twenty male participants were divided in two training groups which followed after a 4 week training program. The incline plyometrics group (n = 10) trained by performing consecutive jumps on an inclined surface (15°) while the plane plyometrics (PP) group (n = 10) performed the same jumps on a plane surface. Both groups trained four times per week and performed 8 sets of 10 jumps in each session. Subjects performed squat jumps, counter movement jumps and drop jumps (DJ) prior to and immediately after the training period, while the electromyographic activity of the medial gastrocnemius (MGAS) and tibialis anterior muscles and the architecture of MGAS were recorded. Maximal isokinetic and isometric strength of the plantar flexors were performed. Analysis of variance showed that only the IP group improved fast DJ height performance by 17.4 and 14.4% (20 and 40 cm, $p < 0.05$). This was accompanied by a significantly higher MGAS activity during the propulsion phase (24% from 20 cm and 50% from 40 cm, $p < 0.05$) of the DJ and a longer working fascicle length (5.08%, $p < 0.05$) compared with the PP group. There were no significant changes in isokinetic and isometric strength of the plantar flexors after training for both groups. The increase of jumping performance, after incline plyometrics should be taken into consideration by coaches, when they apply hopping exercise to improve explosiveness of the plantar flexors. Marina et al. (2012) conducted research to compare the factors influencing plyometric jumping performance from different heights

between well-trained male and female gymnasts and a control group. Researchers evaluated 76 gymnasts and 91 subjects in a control group. They found that male gymnasts and control group subjects had similar flight times while female subjects had longer flight times and that the best performances were obtained between 40 and 60 centimeter drop height for both groups. Chu (1991) and Martino (2008) also conducted a study on a group and found that anaerobic power has significantly improved when there pre-test and post-test data were compared.

According to vertical jumps of plyometrics, it can change the values greatly, from 22 to 48 cm in female players and from 40 to 75 cm in male players. John Shaji (2009) also studies to examine the effects of plyometric training following a four-week training program on vertical jump height and concluded that plyometric training significantly improves anaerobic power.

Materials and Methods

Study was experimental in nature that comprises of fourteen male samples between the age group of 25 to 28 years from Govt. Arts and Sports College, Jalandhar. Selections of the samples were made through purposive sampling technique. Population of the study comprises of the youth from Jalandhar district. From fourteen selected youth were divided in two groups of seven each i.e. Control group (G1) of seven subjects and Experimental group (G2) of seven subjects. Plyometric training was imparted to the experimental group for twelve weeks. Sunday remained as a rest day whereas exercises of upper body and lower body were followed alternatively with medium Intensity: 65 to 75 percent and high Intensity: 75 to 85 percent. After the collection of data, mean score was calculated from the pre-test and the post-test value of two groups and t-test was applied to find about the significant difference between the groups.

Analysis

Table-1
Comparison of Pre-Test and Post-Test Means of Control and Experimental Group of Take-Off Distance of First Hurdle

Group		Mean	SD	DM	df	t-value
Control Group	Pre-test	1.09	0.18	0.10	13	2.22*
	Post-test	1.19	0.11			
Experimental Group	Pre-test	1.96	2.04	0.74		0.77
	Post-test	1.22	0.06			

*Significant at .05 level, $p < .05 = 2.16$, $N=07$

The table-1 revealed that the mean score of pre-test and post-test of take-off distance of first hurdle of control group is 1.09 and 1.19 respectively, signifying variation in the pre-test and post-test score of control group. The calculated t-value 2.22 is significant at 0.05 level of confidence. Pre-test and post-test mean scores of experimental group was also found 1.96 and 1.22 respectively and t-value 0.77 was not statistically significant at 0.05 level of confidence. By comparing the mean score of control group it can be concluded that post-test, take-off distance was increased by 10cms, suggesting that performance has been decreased or degraded significantly. While in experimental group, though the difference is not significant but by comparing the mean scores it can be concluded the timings are decreased by 74cms indicating increased performance by reducing the distance between the take-off mark and the hurdle thereby reducing the overall timings from take-off till landing, and improving the overall timing.

Table-2
Comparison of Pre-Test and Post-Test Means Of Control and Experimental Group of Touch-Down Distance of First Hurdle

Group		Mean	SD	DM	df	t-value
Control Group	Pre-test	1.47	0.11	0.13	13	2.93*
	Post-test	1.34	0.08			
Experimental Group	Pre-test	1.44	0.21	0.08		
	Post-test	1.52	0.02			

*Significant at .05 level, $p < .05 = 2.16$, $N=07$

The table-2 exposed that the mean scores of pre-test and post-test of touch-down distance of first hurdle of control group is 1.47 and 1.34 respectively and the standard deviation of the pre-test is 0.11 and the post-test value of standard deviation is 0.08 respectively, signifying the variation in the pre-test and post-test score of control group. The calculated-value 2.93 is significant at 0.05 level of confidence. When pre-test and post-test mean score of experimental group is compared, it was found 1.44 and 1.52 respectively. The calculated t-value 2.99 is statistically significant at 0.05 level of confidence.

Above table has suggested that both the t-values are statistically significant, but by the comparison of pre-test and post- test mean values of experimental group conclusion can be drawn that performance is enhanced by increasing the touch down distance, but the performance largely dependent on the time, whether it is reduced or it is increased, whereas at this point aim should be to maximize the distance and reduce the touch down time.

Table-3
Comparison of Pre-Test and Post-Test Means of Control and Experimental Group of Take-Off and Touch-Down Timings of First Hurdle

Group		Mean	SD	DM	df	t-value
Control Group	Pre-test	1.00	0.03	0.01	13	1.99
	Post-test	0.99	0.04			
Experimental Group	Pre-test	1.01	0.05	0.16		
	Post-test	0.86	0.34			

*Significant at .05 level, $p < .05 = 2.16$, $N=07$

The table-3 revealed that the mean scores of pre-test and post-test of take-off and touch-down timings of first hurdle of control group is 1.00 and 0.99 respectively. The calculated t-value 1.99 is insignificant at 0.05 level of confidence. When pre-test and post-test mean score of experimental group is compared, it was found that mean timings of pre-test is 1.01 and post-test timing was 0.86. The calculated t-value 4.39 is statistically significant at 0.05 level of confidence.

Role of table-3 is very essential in making the judgement that which group has performed better because it give us the overall timings of the athlete from take-off to touch down over the hurdle. And it is clearly indicated in the table and figure 3 that experimental group has significantly reduced the timing or in other words have improved the performance after twelve weeks of plyometric timing.

Conclusion

Owing to the analysis of the results of the present study, the following conclusions have been drawn.

- 1 There is no significant effect of plyometric training on take-off distance of first hurdle of experimental group though there is a difference in the mean. On the other side performance of control group is significantly affected but in a negative way.
- 2 There was significant effect of plyometric training on touch-down distance of first hurdle of experimental group, signifying the enhancement in the performance.
- 3 When take-off and touch-down timings of first hurdle of experimental group were analysed it was found that twelve weeks of plyometric training has significantly affected the overall timing. Thereby, indicating that plyometric training is an effective tool to improve the hurdle performance.

Plyometric training is very effective in improving the performance which is proved by this study and the study conducted by Abass & Ademola Olasupo. (2009) who determined the comparative effect of three modes of Plyometrics training [depth jumping, rebound jumping and horizontal jumping] on leg muscle strength of untrained University male students. Participants were forty untrained male University students within the age range of 18-27 years. The training programme consisted of twelve weeks of interval training administered three times a week. Findings revealed that only the depth jumping and rebound jumping training significantly altered leg muscle strength of subjects ($P < 0.05$). Based on the findings, it was concluded that plyometrics exercises with depth jumping and rebound jumping characteristics are best used in developing muscle strength of the lower extremities. So plyometric training can be very effective tool, which can be used by the coaches, sports trainer etc. to achieve high sports performance.

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