Impact Of Ladder Training And Plyometric Training On Agility And Explosive Power Among School Level Kho-Kho Players

*Mohd Waseem Jan Padder¹, Dr.G. Ramesh²

¹Ph.D Research Scholar, Department of Physical Education, Annamalai University, Tamil Nadu, India.
²Assistant Professor, Department of Physical Education, Annamalai University, Tamil Nadu, India.

* Corresponding author’s e-mail:waseempadder982@gmail.com

Abstract

The main purpose of the study was to determine the impact of ladder training and plyometric training on agility and explosive power among school level Kho-Kho players. Forty-five male Kho-Kho players from Higher secondary school Vessu Anantnag, Higher secondary school Wanpoh Anantnag and Higher secondary school Kelam Kulgam in Kashmir, who had participated in interschool competition, were selected as subjects at randomly and their age ranged from 14 to 17 years. The selected subjects (N=45) were randomly assigned into three equal groups of fifteen Kho-Kho players each as experimental group-I, experimental group-II and control group. The experimental groups and control group underwent normal routine Kho-Kho practices and in addition the experimental group-I underwent ladder training and experimental group-II underwent plyometric training for one hour in the morning session. The control group was not given any special training apart from their normal daily exercises. The period of training was twelve weeks in a schedule of weekly three days for alternative days. The data was collected on selected dependent variables before and after the training period. The collected data were statistically analysed by using analysis of covariance (ANCOVA) to find the mean difference among the groups. The scheffe’s post hoc test was used to find the paired mean difference if any. The level of confidence was fixed at 0.05. Based on the study it was concluded that ladder training and plyometric training were significantly improved the agility and explosive power among school level Kho-Kho players.

Key words: ladder training, plyometric training, agility and explosive power

Introduction

The game of Kho-Kho is very interesting and exciting in nature and demands a high level of physical fitness, stamina, strength, agility, speed technique and self-control. Every
sport requires a special set of workouts to grow endurance and ability of players. Sports training have been an integral part of sportsperson success, trends in this domain is continuously changing as per demand of excellence in sports competitions [1]. To improve agility and speed, coach often uses the agility ladder to drills the athlete’s footwork in enhancing their performances. According to, it uses a piece of equipment that resembles a rope ladder that has been placed on the ground and players use it to do drills requiring them to quickly jump into and out of the squares of the ladder. These drills help players work on moving their feet quickly while maintaining their balance, which is critical for fielding and running down the base path. Ladder drills also increase neural connections with foot movements that mimic the quick thinking that players must do when hitting or fielding. In modern days, we can get the agility ladder from sport manufacturing. Agility ladder is made up of two nylon straps with plastic rungs spaced apart about 15-18 inches, depending upon the training purpose. Also, the agility ladder can be made at home using supplies from your local hardware store (rope and PVC pipe), or simply made by a tape by taping the floor accordingly like an agility ladder. This agility ladder is a very popular piece of equipment for coaches looking for ways of improving their speed, coordination, balance, and agility. Ladders can be used for variety of purposes. The two most obvious purposes are increased foot speed, agility and coordination [2]. By improving these qualities, athletes will develop better footwork and improve their overall athleticism. To get the most out of your ladder drills, it is important to progress from easy drills to more advances. Furthermore, compelling different moves through agility ladder simulators the movements required during competition Ladder training is active and indispensable to increase foot speed, agility, timing and coordination for the athlete. This training should be specific to game situations [3].

Plyometrics are exercises that involve the enhancement of muscle performance [4]. Most of the trainings in sports involve jumping, hopping, and skipping movements [5]. These exercises also facilitate sturdy muscle activities in energetic activities, during which the movement would come with a stretch of the muscle instantly by an explosive modification of the muscle [6].

Plyometric training is a form of training that is used to help develop and enhance explosive power, which is a vital component in a number of athletic performances. This training method is meant to be used with other power development methods in a complete training program to improve the relationship between maximum strength and explosive power. The modern history of Plyometrics is somewhat brief but not relatively new. This technique was originated in Russia and Eastern Europe in the middle of 1960. The Soviets
were very successful in the use of plyometrics in their training programmes, especially in
track and field. This technique was originally known as the “Shock Method of Training”.
Yuri Verhoshansky, a Russian coach whose success with jumpers is legendary, could very
well be called the "Father of Plyometrics". He had tried and succeeded in increasing his
athletes” reactive abilities by experimenting with exercises like the depth jump. He has been
the leading researcher and coach most recognized with the spread of Plyometrics. He also has
been credited with most of the forms of plyometric training that are still in use today.

Most researchers and practitioners share a common view that plyometric training is
one of the approaches in every field often used for athletes, notably those with the short-
shortening cycle (SSC). These training are designed to improve explosiveness and dynamic
efficiency [7]. Previous studies have shown that through plyometric training, jumping and
sprinting capabilities and specific trajectory activities could be improved. An effective
technique for boosting the running economy, joint stability and the severity of knee injuries
was also found [8].

Speed is defined as the ability to perform a movement within a short period of time
[9]. The game of kho-kho demands various aspects of human body depending on the level of
play. It requires agility, speed, quickness, stamina, explosive power, cardio respiratory
endurance, hand-eye coordination, flexibility, balance and many other aspects. Kho-Kho is a
game in which player must move from one position to other position but in less time. Kho-
Kho is very fast game in which your body should react very fast as well as your mind should
also think fast. You have to take decision on the spot as on time for the game is very less and
you have to deliver best in that short span of time. Within a fraction of second, you have to
decide and accordingly your body should move to get the point. The ability to maintain a
stable body position and change the direction quickly without loss of balance, body control or
speed is described as agility [10].

**Methodology**

The main purpose of the study was to determine the impact of ladder training and
plyometric training on speed and agility among school level Kho-Kho players. Forty-five
male Kho-Kho players from Higher secondary school Vessu Anantnag, Higher secondary
school Wanpoh Anantnag and Higher secondary school Kelam kulgam in Kashmir, who had
participated in interschool competition, were selected as subjects at randomly and their age
ranged from 14 to 17 years the selected subjects were medically examined by the qualified
physician and certified that they were medically and physically fit to undergo the selected
training programme.
The selected subjects randomly assigned into three equal groups of fifteen Kho-Kho players each as experimental group-I, experimental group-II and control group. The experimental groups and control group underwent normal routine kho-kho practices and in addition the experimental group-I underwent ladder training and experimental group-II underwent plyometric training for one hour in the morning session. The control group was not given any special training apart from their normal daily exercises. The period of training was twelve weeks in a schedule of weekly three days for alternative days. The data collected prior to and after experimentation from ladder training group, plyometric training group and Control group. Paired “t” test was applied to examine the change within the groups from pre test to post test on selected dependent variables. To find out the significant differences between the groups, Analysis of covariance (ANCOVA) was applied. When the F ratio of adjusted post test mean was found to be significant, Scheffe’s post hoc test was employed to find out paired mean differences. The level of the confidence was fixed, at 0.05 level of significance.

**Criterion Measures**

<table>
<thead>
<tr>
<th>variables</th>
<th>tests</th>
<th>Measures in units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agility</td>
<td>4×10m shuttle run</td>
<td>Seconds</td>
</tr>
<tr>
<td>Explosive Power</td>
<td>Standing Broad Jump</td>
<td>Meters</td>
</tr>
</tbody>
</table>

**Analysis of Data**

The data collected from the two experimental groups and control group during pre and post period were statistically analyzed to examine the changes on selected physical fitness variables of Kho-Kho players and the results of the study are presented in the table 1.1.

**Analysis of Agility**

The statistical (descriptive) analysis of the collected data on agility of two experimental groups and control group are presented in the table 1.1
Table 1.1
Descriptive Statistical Analysis of the Data on Agility

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>Pre Test Mean</th>
<th>Post Test Mean</th>
<th>MD</th>
<th>%</th>
<th>“t”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agility</td>
<td>Ladder Training</td>
<td>11.63</td>
<td>11.15</td>
<td>0.48</td>
<td>4.12</td>
<td>14.97*</td>
</tr>
<tr>
<td></td>
<td>Plyometric Training</td>
<td>11.69</td>
<td>11.36</td>
<td>0.33</td>
<td>2.82</td>
<td>14.59*</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>11.61</td>
<td>11.58</td>
<td>0.03</td>
<td>0.25</td>
<td>0.58</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence. Table value for df of 1 and 14 is 4.60

It is clear from the table 1.1, that there was significant difference between pre-test and post test data on agility of ladder training group, because “t” ratio of 14.97 is greater than the required table value 4.60 at 0.05 level of significance for df of 1 and 14. Similarly there was also significant difference between pre-test and post test data on agility of plyometric training group, because “t” ratio of 14.59 is greater than the required table value 4.60 at 0.05 level of significance for df of 1 and 14.

However, there was no significant difference were found among pre and post-test of control group as obtained “t” ratio of 0.58 is less than the required table value of 4.60, at 0.05 level of significance for df of 1 and 14.

The percentage of change on agility of ladder training group, plyometric training group and control group are 4.12 %, 2.82 % and 0.25 % respectively.

The percentage of changes on agility of ladder training, plyometric training and control group are given in the figure 1.1
The data collected from three groups on agility was statistically analyzed by ANCOVA and the results are presented in the table – 1.2.

Table 1.2
Analysis of Covariance for the Pre and Post Tests on Agility of Ladder Training, Plyometric Training and Control Group

<table>
<thead>
<tr>
<th>Test</th>
<th>Ladder Training</th>
<th>Plyometric Training</th>
<th>Control Group</th>
<th>SoV</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Test</td>
<td>11.63 ± 0.36</td>
<td>11.69 ± 0.32</td>
<td>11.61 ± 0.27</td>
<td>BG</td>
<td>0.049</td>
<td>2</td>
<td>0.024</td>
<td>0.321</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD(±)</td>
<td>0.36</td>
<td>0.32</td>
<td>0.27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Test</td>
<td>11.15 ± 0.33</td>
<td>11.36 ± 0.34</td>
<td>11.58 ± 0.264</td>
<td>BG</td>
<td>1.387</td>
<td>2</td>
<td>0.693</td>
<td>7.003*</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD(±)</td>
<td>0.33</td>
<td>0.34</td>
<td>0.264</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted</td>
<td>11.83 ± 0.36</td>
<td>11.69 ± 0.34</td>
<td>11.41 ± 0.264</td>
<td>BG</td>
<td>1.009</td>
<td>2</td>
<td>0.505</td>
<td>22.164*</td>
</tr>
<tr>
<td>Post Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>11.63 ± 0.33</td>
<td>11.69 ± 0.34</td>
<td>11.41 ± 0.264</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.36</td>
<td>0.34</td>
<td>0.264</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence. Table value for df of 2 and 42; and 2 and 41 are 3.22 and 3.23
Table 1.2 shows that the pre-test mean values on agility of ladder training group, plyometric training group and control group were 11.63, 11.69 and 11.61 respectively. The obtained “F” ratio of 0.231 per test score was lesser than the required table value of 3.22 for df 2 and 42 for significance at 0.05 level of confidence on agility. The post-test mean values on agility of ladder training group, plyometric training group and control group, 11.15, 11.36 and 11.58 respectively. The obtained “F” ratio value of 7.003 for post test score was greater than the required table value 3.22 for df 2 and 42 for significance at 0.05 level of confidence on agility.

The adjusted post-test mean values on agility of ladder training group, plyometric training group and control group are, 11.83, 11.69 and 11.41 respectively. The obtained “F” ratio value of 35.770 per test score was greater than the required table value of 3.23 for df 2 and 41 for significance at 0.05 level of confidence on agility.

The result of the study indicated that there was significant difference among the adjusted post-test means of the ladder training group, plyometric training group and control group on agility. To determine the significance difference among the three paired means. The scheffe’s test was applied as post hoc test and the results are presented in table 1.3.

Table 1.3

<table>
<thead>
<tr>
<th>Ladder Training</th>
<th>Plyometric Training</th>
<th>Control Group</th>
<th>MD</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.83</td>
<td>11.69</td>
<td>11.41</td>
<td>0.14*</td>
<td>0.14</td>
</tr>
<tr>
<td>11.83</td>
<td>11.69</td>
<td>11.41</td>
<td>0.42*</td>
<td>0.14</td>
</tr>
<tr>
<td>11.69</td>
<td>11.41</td>
<td>11.41</td>
<td>0.28*</td>
<td>0.14</td>
</tr>
</tbody>
</table>

From table 1.3 it was imperative that both ladder training and plyometric training group differed significantly from control group on agility. There was also significant difference were found between ladder training group and plyometric training group in improving agility of kho-kho players. Therefore, twelve weeks of ladder training showed greater improvement than plyometric training on agility of kho-kho players.

The pre, post and adjusted post-test means of ladder training group, plyometric training group and control group on agility were graphically represented in the figure- 1.2
Table 1.4
Descriptive Statistical Analysis of the Data on Explosive Power

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>Pre Test Mean</th>
<th>Post Test Mean</th>
<th>MD</th>
<th>%</th>
<th>“t”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosive Power</td>
<td>Ladder Training</td>
<td>1.804</td>
<td>2.152</td>
<td>0.34</td>
<td>19.44</td>
<td>5.73*</td>
</tr>
<tr>
<td></td>
<td>Plyometric Training</td>
<td>1.838</td>
<td>2.238</td>
<td>0.40</td>
<td>21.85</td>
<td>11.34*</td>
</tr>
<tr>
<td></td>
<td>CG</td>
<td>1.861</td>
<td>1.861</td>
<td>0.02</td>
<td>1.08</td>
<td>0.55</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level of confidence. Table value for df of 1 and 14 is 4.60

It is clear from the table 1.4, that there was significant difference between pre-test and post test data on explosive power of ladder training group, because “t” ratio of 5.73 is greater than the required table value 4.60 at 0.05 level of significance for df of 1 and 14. Similarly there was also significant difference between pre-test and post test data on explosive power of plyometric training group, because “t” ratio of 11.34 is greater than the required table value 4.60 at 0.05 level of significance for df of 1 and 14.
However, there was no significant difference found among pre and post-test of control group as obtained “t” ratio of 0.55 is less than the required table value of 4.60, at 0.05 level of significance for df of 1 and 14.

The percentage of change on explosive power of ladder training group, plyometric training group and control group are 19.44 %, 21.85 % and 1.08 % respectively.

The percentage of changes on explosive power of ladder training, plyometric training and control group are given in the figure 4.6.

**Figure – 1.3**

*Pie Diagram Showing the Percentage of Changes on Explosive Power*

The data collected from three groups on explosive power was statistically analyzed by ANCOVA and the results are presented in the table – 1.5.
Table 1.5
Analysis of Covariance for the Pre and Post Tests on Explosive Power of Ladder Training, Plyometric Training and Control Group

<table>
<thead>
<tr>
<th>Test</th>
<th>Ladder Training</th>
<th>Plyometric Training</th>
<th>Control Group</th>
<th>SoV</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Test Mean</td>
<td>1.804</td>
<td>1.838</td>
<td>1.843</td>
<td>BG</td>
<td>0.013</td>
<td>2</td>
<td>0.007</td>
<td>0.305</td>
</tr>
<tr>
<td>SD(±)</td>
<td>0.215</td>
<td>0.113</td>
<td>0.075</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Test Mean</td>
<td>2.152</td>
<td>2.238</td>
<td>1.865</td>
<td>BG</td>
<td>1.145</td>
<td>2</td>
<td>0.573</td>
<td>24.982*</td>
</tr>
<tr>
<td>SD(±)</td>
<td>0.165</td>
<td>0.169</td>
<td>0.112</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted Post Test Mean</td>
<td>2.159</td>
<td>2.236</td>
<td>1.561</td>
<td>BG</td>
<td>1.171</td>
<td>2</td>
<td>0.586</td>
<td>26.864*</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
*Significant at 0.05 level of confidence. Table value for df of 2 and 42; and 2 and 41 are 3.22 and 3.23

Table 4.11, shows that the pre-test mean values on explosive power of ladder training group, plyometric training group and control group were 1.804, 1.838 and 1.843 respectively. The obtained “F” ratio of 0.305 per test score was lesser than the required table value of 3.22 for df 2 and 42 for significance at 0.05 level of confidence on explosive power. The post-test mean values on explosive power of ladder training group, plyometric training group and control group, 2.152, 2.238 and 1.865 respectively. The obtained “F” ratio value of 24.982 for post test score was greater than the required table value 3.22 for df 2 and 42 for significance at 0.05 level of confidence on explosive power.

The adjusted post-test mean values on explosive power of ladder training group, plyometric training group and control group are, 2.159, 2.236 and 1.561 respectively. The obtained “F” ratio value of 26.864 per test score was greater than the required table value of 3.23 for df 2 and 41 for significance at 0.05 level of confidence on explosive power.

The result of the study indicated that there was significant difference among the adjusted post-test mean of the ladder training group, plyometric training group and control group on explosive power. To determine the significance difference among the three paired means. The scheffe’s test was applied as post hoc test and the results are presented in table 1.6.
Table 1.6
Scheffe’s Post Hoc Test for the Differences among Paired Means on Explosive power of Two Experimental Groups and Control Group

<table>
<thead>
<tr>
<th>Ladder Training</th>
<th>Plyometric Training</th>
<th>Control Group</th>
<th>MD</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.159</td>
<td>2.236</td>
<td>1.561</td>
<td>0.07</td>
<td>0.87</td>
</tr>
<tr>
<td>2.159</td>
<td>1.561</td>
<td>0.59</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>2.236</td>
<td>1.561</td>
<td>0.67</td>
<td>0.87</td>
<td></td>
</tr>
</tbody>
</table>

From table 1.6 it was imperative that both ladder training and plyometric training group differed significantly from control group on explosive power. There was also significant difference were found between ladder training group and plyometric training group in improving explosive power of kho-kho players. Therefore, twelve weeks of plyometric training showed greater improvement than ladder training on explosive power of kho-kho players.

The pre, post and adjusted post-test means of ladder training group, plyometric training group and control group on explosive power were graphically represented in the figure- 1.4

Figure 1.4
Discussion on Findings

The Ladder training group showed an improvement of 4.12% and 19.44% on agility and explosive power during twelve weeks of training programme. Similarly Plyometric training group showed an improvement of 2.82% and 21.85% on agility and explosive power during the same training programme of twelve weeks. Control group had not showed any improvement during the whole course of twelve weeks training programme. The improvement on agility and explosive power among Ladder training group and Plyometric training group was due to the different intensities in training of both the groups. The finding of the study is also in agreement with the finding of the previous study; Sethu (2014) conducted a study to find out the effects of eight week plyometric training and ladder training on speed, explosive power and agility of collegiate football players. Based on the result of their study it was revealed that plyometric training group was better in proved on sprinting speed and vertical explosive power of football players, ladder training group was better improved on agility performance of football players due to the effect of training. Pratama et al., (2018) in his study concluded that there is significant influence of ladder drills and rope jump exercises towards increasing speed and agility. The ladder training is a feasible method to enhance the agility performance. While rope jump exercise are more effective than ladder drills in increasing limb muscle power.

Conclusions

The result of the study indicates that there is significant improvement and significant difference due to the impact of adder training and plyometric training on agility and explosive power among school level male kho-kho players in Kashmir. Consequently both trainings can be used for improving agility and explosive power among school level male kho-kho players in Kashmir.

References


