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# Effect of plyometric exercises and agility drills on leg explosive power performance among college level men kho-kho players

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**Abstract**
The study was to examine the isolated and combined plyometric exercises and agility drills on leg explosive power performance among college level men kho-kho players. Total N=48 (forty eighty) men college level men kho-kho players recruited randomly from various college of Andhra Pradesh and their age period ranged from 18 years to 25 years as per subject's school records and, who at least participated college level kho-kho games competitions. The chosen kho-kho players was randomly recruited into four groups each group n=12 kho-kho players i.e. empirical groups I kho-kho players underwent isolated plyometric exercises (PEG) = 12), empirical group II kho-kho players underwent isolated agility training (ATG = 12), empirical group III underwent combined plyometric exercises and agility training (CTG = 12) and control group kho-kho players (NTG = 12). NTG was practiced only their respective specialization game. The training period was fixed for 18-week's duration and four sessions in a week. The measurement of leg explosive power scores was collected through standing broad jump (In meters) before and after the completion of specific training. The collected scores were analyzed through ANCOVA and level of significant was restricted at 0.05 levels. The study found that isolated, combined plyometric exercises and agility drills program had positive significant impact in increasing explosive power performance of kho-kho players of three empirical group's players comparative to control group.

**Keywords:** Kho-kho, plyometric, exercises, agility, drill, power and skills

## Introduction
Kho-kho skills are mainly classified into chasing skills and running skills, chasing skills are offensive skills and running skills are defensive skills. Running techniques is to escape from the chaser. A runner should be good in speed, efficient and clever in changing his path and anticipation. The runner adopts single chain running and then double chain running. Dodging is one of the very important defensive skills in kho-kho. There are three types of dodging namely back dodge, front dodge and double round the post.

The aim of sports training is to improve rapidly the sports performance of a sports person particularly in sport competitions, which is mainly based on his physical psychological, intellectual and technical capacities and capabilities. In other words, sports training in competitive sports are to prepare the sportsperson for the attainment of highest possible sports performance in competitions. Explosive strength is the ability to overcome resistance with a high speed of contraction. This can be seen in explosive events such as sprinting, throwing and hitting, where a high percentage of fast glycolytic fibers are needed for a good performance.

## Statement of the Research Problem
To analyze the "Effect of plyometric exercises and agility drills on leg explosive power performance among college level men kho-kho players".

## Objectives of this research study
1. The primary objective of this research study is to evaluate the 18-weeks influence of plyometric exercises and agility drills on leg explosive power performance parameters among college level men kho-kho players.
2. The secondary objective of this research is
   - To compare the selected training methods between isolated and combined plyometric exercises and agility drills training method on leg explosive power performance among college level men kho-kho players.
   - To judge the best suitable training program among selected three treatments for enhancement of leg explosive power performance parameters of college level men kho-kho players.

## Research Hypothesis
- There will be a significant improvement of leg explosive power performance of empirical group's kho-kho players after the eighteen weeks impact of isolated and combined plyometric exercises and agility drills training when compared with control group kho-kho players.
- The combined plyometric exercises and agility drills will be more effective than the isolated training program.

## Methodology
The study was to examine the isolated and combined plyometric exercises and agility drills on leg explosive power performance among college level men kho-kho players. Total N=48 (forty eighty) men college level men kho-kho players recruited randomly from various college of Andhra Pradesh and their age period ranged from 18 years to 25 years as per subject's school records and, who at least participated college level kho-kho games competitions. The chosen kho-kho players was randomly recruited into four groups each group n=12 kho-kho players i.e. empirical groups I kho-kho players underwent isolated plyometric exercises (PEG) = 12), empirical group II kho-kho players underwent isolated agility training (ATG = 12), empirical

group III underwent combined plyometric exercises and agility training (CTG = 12) and control group kho-kho players (NTG = 12). NTG was practiced only their respective specialization game. The training period was fixed for 18- week's duration and four sessions in a week. The measurement of leg explosive power scores was collected through standing broad jump test (In meters) before and after the completion of specific training. The collected scores were analyzed through ANCOVA and level of significant was restricted at 0.05 levels.

**Table 1:** Analysis of Covariance for leg explosive power performance – standing broad jump test (In meters) of the PEG, ATG, CTG and NTG groups for Kho-kho players

| Groups | PEG | ATG | CTG | NTG | SOV | Sum of squares | df | Mean Square | F' Ratio |
|---|---|---|---|---|---|---|---|---|---|
| **Pre-test mean** | 2.005 | 2.078 | 2.040 | 2.019 | B | 0.037 | 3 | 0.012 | 0.888$^{NS}$ |
| **SD** | 0.103 | 0.122 | 0.128 | 0.112 | W | 0.605 | 44 | 0.014 | |
| **Post test mean** | 2.565 | 2.407 | 2.641 | 2.009 | B | 2.863 | 3 | 0.954 | 85.310* |
| **SD** | 0.124 | 0.089 | 0.070 | 0.127 | W | 0.492 | 44 | 0.011 | |
| **Adjusted mean** | 2.578 | 2.390 | 2.640 | 2.016 | B | 2.842 | 3 | 0.947 | 103.042* |
| | | | | | W | 0.395 | 43 | 0.009 | |
| **Mean difference** | +0.56 | +0.329 | +0.601 | -0.01 | - | - | - | - | - |

**Note:** Table F-ratio value at 0.05 level of confidence for 3 and 44 (df) =2.82, 3 and 43 (df) =2.82 *Significant & NS: Not significant

**PEG:** Plyometric exercises group.
**ATG**: Agility training group.
**CTG**: Combined plyometric exercises and agility training group.
**NTG**: Non-training group players.

The above table-I shows that there is a significant difference on leg explosive power performance among the four groups such as isolated plyometric training group (PEG), isolated agility training group (ATG), combined plyometric and agility training group (CTG) and control group kho-kho players (NTG). Since the 'F' value required being significant at 0.05 level for 3, 44 d/f and 3, 43 are 2.82, but the computation values of leg explosive power performance post and adjusted posttest 'F' values are 85.310 and 103.042 respectively. These values are greater than the tabulated value, it shows that training is effective for positive changes in leg explosive power performance. Since the obtained 'F' ratio is found significant.

**Table 2:** The leg explosive power performance – standing broad jump test (In meters) results of scheffe's method test mean differences between PEG, ATG, CTG and NTG groups for kho-kho players

| PEG | ATG | CTG | NTG | MD | CI |
|---|---|---|---|---|---|
| 2.578 | 2.390 | - | - | 0.188* | 0.005 |
| 2.578 | - | 2.640 | - | 0.062* | |
| 2.578 | - | - | 2.016 | 0.562* | |
| - | 2.390 | 2.640 | - | 0.250* | |
| - | 2.390 | - | 2.016 | 0.374* | |
| - | - | 2.640 | 2.016 | 0.624* | |

**Note:** * Significant & NS: No significant

**PEG:** Plyometric exercises group.
**ATG**: Agility training group.
**CTG**: Combined plyometric exercises and agility training group.
**NTG**: Non-training group players.

In above table 2 presented the adjusted final mean variations between the plyometric exercises group (PEG) and agility training group (ATG), plyometric exercise group (PEG) and agility training group (ATG), plyometric exercise group (PEG) and control group kho-kho player (NTG), agility training group (ATG) and combined plyometric and agility training group (CTG), agility training group (ATG) and control group kho-kho player (NTG), combined plyometric exercises and agility training group kho-kho players (CTG) and control group kho-kho players (NTG) are 0.188, 0.062, 0.562, 0.250, 0.374 and 0.624 were higher than CI value 0.005. Hence investigator recorded significant variations resulted between training groups and control groups.

The prior, final and adjusted post scores results mean of the PEG, ATG, CTG and NTG kho-kho player groups for leg explosive power performance (In meters) clearly represented in bar diagram figure: 1.

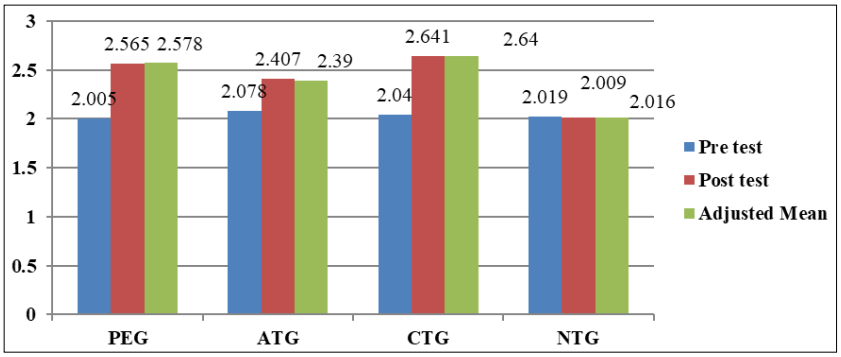


**Fig 1:** The leg explosive power performance – standing broad jump test (In meters) pre-post and adjusted post test mean numbers of PEG, ATG, CTG and NTG groups for kho-kho players presented in bar graph

**PTG:** Plyometric exercises group.
**ATG**: Agility training group.
**CTG**: Combined plyometric exercises and agility training group.
**NTG**: Non-training group players.

**Discussion on Hypothesis**

- The first hypotheses stated that will be a significant improvement of leg explosive power performance of empirical group's kho-kho players after the eighteen weeks impact of isolated and combined plyometric exercises and agility drills training when compared with control group kho-kho players. The statistical analysis proved that isolated, combined yoga practice and circuit training program significantly increased leg explosive power performance of kho-kho players. Hence research first hypothesis accepted.
- The second hypotheses stated that combined plyometric exercises and agility drills will be more effective than the isolated training program. The statistical analysis proved combined training is superior to isolated training method. Hence research second hypotheses accepted.

**Discussion and Findings**

The impact of isolated and combined plyometric exercises and agility drills are constructive for improving leg explosive power performance of kho-kho players comparative with non-training group kho-kho players. The studies connected with leg explosive power related parameters results are Ritty and Drashti (2022) concluded that ladder training shows significant effect on explosive power performance among sub-elite cricket players. Muneer *et al*., (2018) [2] found that circuit and plyometric training result significant impact for increasing leg explosive power performance of women kho-kho players. Rakesh *et al*., (2022) the result of the study indicates due to varied packages of aquatic plyometric training resulted significant improvement on leg explosive power max. Ravi (2021) concluded that plyometric training significantly improved speed among sprinters. Suwirman (2020) [5] concluded that plyometric exercises have a significant influence on increasing the explosive power of leg muscle ability of West Sumatran Pencak Silat PPLP athletes in 2019.

**Conclusions**

In the study found that combined plyometric exercises and agility drills are superior to isolated training for increasing legs muscular power in terms of standing broad jump of kho-kho players. Therefore, isolated plyometric exercises resulted more effective than isolated agility drills in terms of increasing legs muscular power of kho-kho players.

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