International Journal of Physical Education, Sports and Health 2025; 12(5): 455-458

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIF): 5.93
IJPESH 2025; 12(5): 455-458

https://www.kheljournal.com
Received: 12-06-2025
Accepted: 14-07-2025

Kothapalli Prasanna Kumar
Research Scholar, University College of Physical Education & Sports Sciences, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India

PPS Paul Kumar
Research Scholar, University College of Physical Education & Sports Sciences, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India

Corresponding Author:
Kothapalli Prasanna Kumar
Research Scholar, University College of Physical Education & Sports Sciences, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India

Comparative Efficacy of Ladder and Drop Jump Training on Performance-Related Fitness Variables in Intercollegiate Kabaddi Players

Kothapalli Prasanna Kumar and PPS Paul Kumar

DOI: https://doi.org/10.22271/kheljournal.2025.v12.i5g.4017

Abstract
Introduction: Kabaddi is a dynamic, high-intensity sport requiring a complex combination of speed, agility, strength, and explosive power. While various training methods exist, the specific and comparative effects of ladder training and drop jump training on the performance metrics of Kabaddi players are not well-documented.
Objective: This study aimed to compare the effects of 12-week ladder training and drop jump training programs on selected performance-related fitness variables among intercollegiate male Kabaddi players.
Methods: Sixty male intercollegiate Kabaddi players (age 19-25 years) were randomly assigned to one of three groups: a ladder training group (LTG, n=20), a drop jump training group (DJG, n=20), or a control group (CG, n=20). The experimental groups underwent their respective training protocols for 12 weeks, whereas the control group received no specialized training. Seven performance-related fitness variables were assessed before and after the intervention: speed (50-meter dash), strength (push-ups), agility (4x10m shuttle run), explosive power (vertical jump), flexibility (sit and reach test), balance (stork stand test), and coordination (Scott Motor Ability Test). Data were analyzed using Analysis of Covariance (ANCOVA), with pre-test scores as the covariate.
Results: Both the LTG and DJG demonstrated significant improvements across all seven variables compared to the CG ($p < 0.05$). When comparing the two experimental groups, no significant differences were found in the improvements for speed, strength, agility, or explosive power. However, the LTG showed significantly greater improvement in flexibility than the DJG. Conversely, the DJG showed significantly greater improvements in balance and coordination compared to the LTG.
Conclusion: Both ladder training and drop jump training are highly effective modalities for enhancing performance-related physical fitness in Kabaddi players. However, they elicit specific adaptations. Ladder training is superior for developing flexibility, while drop jump training is more effective for improving balance and coordination. A combination of both methods is recommended for the holistic development of Kabaddi athletes.

Keywords: Kabaddi, Ladder Training, Drop Jump Training, Physical Fitness, Performance Enhancement

Introduction
Kabaddi, a game of "struggle," has evolved from a traditional combative sport into a professional discipline demanding peak physical conditioning. The game involves intermittent bursts of high-intensity activity, including raiding, tackling, and evading opponents, which require a sophisticated blend of physical attributes. Key performance-related fitness variables such as speed, agility, explosive power, strength, flexibility, balance, and coordination are critical for success on the mat Kabaddi.

To enhance these variables, coaches employ various scientific training methods. Among these, ladder training and plyometric training (such as drop jumps) are prominent.

- **Ladder Training** involves a series of agility drills designed to improve foot speed, body control, and neuromuscular coordination by requiring rapid and precise foot movements

- **Drop Jump Training** is a plyometric exercise that utilizes the stretch-shortening cycle (SSC) to develop explosive power, muscular stiffness, and reactive strength, crucial for jumping and rapid changes of direction.

While the benefits of these training methods are independently established in various sports, there is a lack of research directly comparing their efficacy within the specific context of Kabaddi. This gap makes it challenging for coaches to design optimal training programs tailored to the unique demands of the sport. Therefore, the purpose of this study was to determine and compare the effects of 12-week ladder training and drop jump training programs on selected performance-related fitness variables among intercollegiate Kabaddi players.

Methods

Study Participants: Sixty male intercollegiate Kabaddi players from various colleges in Andhra Pradesh, India, with an age range of 19 to 25 years, were selected for this study. All participants provided informed consent before the commencement of the study.

Study Design

A three-group, pre-test/post-test randomized controlled design was employed. The sixty subjects were randomly assigned to one of three groups of twenty

- **Experimental Group I (LTG):** Underwent a structured ladder training program.
- **Experimental Group II (DJG):** Underwent a structured drop jump training program.
- **Control Group (CG):** Did not participate in any specialized training but continued their regular activities.
-

The intervention period for the experimental groups was 12 weeks. All participants were tested on the selected variables before (pre-test) and after (post-test) the 12-week period.

Training Interventions

- **Ladder Training Program (LTG):** The LTG performed a series of drills, including the Hop Scotch, In-Out, Lateral Feet, Tango, and Five Count drills. The program followed principles of progressive overload over the 12 weeks.
- **Drop Jump Training Program (DJG):** The DJG performed drop jumps, a plyometric exercise focusing on minimizing ground contact time and maximizing rebound height. The intensity and volume of the jumps were progressively increased throughout the 12-week intervention.

Testing Procedures

The following seven performance-related fitness variables were measured using standardized tests

1. **Speed:** 50-meter dash (time recorded to the nearest hundredth of a second).
2. **Agility:** 4 x 10-meter shuttle run (time recorded to the nearest tenth of a second).
3. **Strength:** Push-ups (maximum number of repetitions).
4. **Explosive Power:** Vertical jump test (distance in centimetres).
5. **Flexibility:** Sit and reach test (distance in centimetres).
6. **Balance:** Stork stand test (time in seconds).
7. **Coordination:** Scott Motor Ability Test (time recorded to the nearest tenth of a second).

Statistical Analysis

The collected data were analyzed using Analysis of Covariance (ANCOVA) to determine the significant differences among the groups on the post-test means, using the pre-test means as the covariate. When the F-ratio was found to be significant, Scheffe's post-hoc test was used to identify paired mean differences. The level of significance was set at $p < 0.05$ for all tests.

Results

The ANCOVA results showed that both ladder training and drop jump training led to significant improvements in all seven measured variables when compared to the control group ($p < 0.05$). The adjusted post-test means for all groups are presented below.

Table 1: Comparison of Performance-Related Fitness Variables Among Ladder Training, Drop Jump Training, and Control Groups in Male Intercollegiate Kabaddi Players

Variable	Ladder Training Group (LTG)	Drop Jump Training Group (DJG)	Control Group (CG)	F-value
Speed (s)	6.91Kabaddi-	6.90Kabaddi-	7.14Kabaddi-	28.63*
Agility (s)	10.65Kabaddi-	10.77Kabaddi-	10.91Kabaddi-	12.59*
Strength (reps)	32.55Kabaddi-	33.35Kabaddi-	29.01Kabaddi-	38.94*
Explosive Power (cm)	59.47Kabaddi-	61.42Kabaddi-	55.05Kabaddi-	10.42*
Flexibility (cm)	19.86Kabaddi-	18.06Kabaddi-	17.27Kabaddi-	22.01*
Balance (s)	48.06Kabaddi-	48.88Kabaddi-	43.83Kabaddi-	24.36*
Coordination (s)	14.58Kabaddi-	17.30Kabaddi-	19.53Kabaddi-	117.18*
Significant at $p < 0.05$ level.				

Post-hoc analysis using Scheffe's test revealed the following comparisons between the two training groups:

- There were no significant differences between the LTG and DJG for speed, agility, strength, or explosive power.
- For flexibility, the LTG showed significantly greater improvement than the DJG.
- For balance and coordination, the DJG showed significantly greater improvement than the LTG.

Discussion

The results of this study confirm that both 12-week ladder training and drop jump training are effective methods for improving a wide range of performance-related fitness attributes in intercollegiate Kabaddi players, with both groups outperforming the control group significantly. The more nuanced finding, however, lies in the differential effects of the two training modalities. The lack of a significant difference between the groups for speed, agility, and explosive power suggests that both training methods effectively stimulate the neuromuscular systems responsible for these qualities, albeit likely through different mechanisms. Ladder training enhances neuromuscular coordination and rapid footwork,

while drop jumps improve the stretch-shortening cycle and reactive strength. For the general development of these qualities in Kabaddi players, both methods appear equally viable.

The study's most complex finding is the specific superiority of each training method for certain variables.

- **Flexibility:** The significantly greater improvement in flexibility in the LTG may be attributed to the dynamic, multi-planar movements required in drills like the 'Tango' and 'In-Out' exercises. These movements likely encourage a greater functional range of motion around the hips and ankles compared to the more sagittally-dominant, repetitive motion of drop jumps.
- **Balance and Coordination:** The superiority of the DJG in improving balance and coordination is compelling. Drop jumps demand high levels of neuromuscular control to rapidly absorb and reproduce force, which acutely challenges and develops the body's proprioceptive systems and dynamic stability. The Scott Motor Ability Test, used to measure coordination, involves jumping and changes in body level, making it a test that may favour adaptations from plyometric-style training.

These findings align with existing literature that supports ladder drills for agility and footwork and plyometrics for power development. This study contributes by directly comparing them in a Kabaddi-specific context and revealing their distinct advantages for flexibility versus balance and coordination.

Practical Implications

For Kabaddi coaches, this suggests that an integrated training program is optimal. To develop well-rounded athletes, a regimen should incorporate ladder drills to enhance flexibility and quickness, alongside drop jumps to build explosive power, balance, and coordination.

Conclusion

Twelve weeks of either ladder training or drop jump training can significantly enhance speed, strength, agility, explosive power, flexibility, balance, and coordination in intercollegiate male Kabaddi players compared to no specialized training. While both methods are equally effective for improving speed, strength, agility, and explosive power, they offer unique benefits: ladder training is superior for developing flexibility, whereas drop jump training is more effective for enhancing balance and coordination. Therefore, coaches should consider implementing a combined training approach to achieve comprehensive physical development in Kabaddi athletes.

References

1. Alcaraz PE, *et al*. Effects of three types of resisted sprint training devices on the kinematics of sprinting at maximum velocity. *J Strength Cond Res.* 2008;22(3):890-7.
2. Alcaraz PE, *et al*. Determining the optimal load for resisted sprint training with sled towing. *J Strength Cond Res.* 2009;23(2):480-5.
3. Padrón-Cabo A, *et al*. Effects of training with an agility ladder on sprint, agility, and dribbling performance in youth soccer players. *J Hum Kinet.* 2020;73:219-28.
4. Hamildon A. The drop depth jump: a plyometric exercise to increase vertical leap and improve jumping ability. *Sports Performance Bulletin*. 2020. Available from: https://www.sportsperformancebulletin.com/
5. Dello Iacono A, *et al*. Vertical- vs. horizontal-oriented drop jump training: Chronic effects on explosive performances of elite handball players. *J Strength Cond Res.* 2017;31(4):921-31.
6. Dello Iacono A, Martone D, Padulo J. Acute effects of drop-jump protocols on explosive performances of elite handball players. *J Strength Cond Res.* 2016;30(11):3122-33.
7. Balabins CP, Psaratis CN, Moukasm VM, Behrakis PK. Early phase changes by concurrent endurance and strength training. *J Strength Cond Res.* 2003;2:293-401.
8. Bobbert MF. Drop jumping as a training method for jumping ability. *Sports Med.* 1990;9(1):7-22.
9. Bobbert PA, Huijing FA, van Ingen Schenau GJ. Drop jumping. I. The influence of jumping technique on the biomechanics of jumping. *Med Sci Sports Exerc.* 1987;19(4):332-8.
10. Booth FW, Roberts CK, Laye MJ. Lack of exercise is a major cause of chronic diseases. *Compr Physiol.* 2012;2(2):1143-211.
11. Mackenzie B. Successful Coaching Newsletter. 1999.
12. Mackenzie B. Seven step model to develop speed. *J Med Sci Sports.* 2004.
13. Marshall BM, Moran KA. Which drop jump technique is most effective at enhancing countermovement jump ability, "countermovement" drop jump or "bounce" drop jump? *J Sports Sci.* 2013;31(12):1368-74.
14. Chandrasekar N, Ramesh C. Effect of ladder drill and SAQ training on speed and agility among sports club badminton players. *Int J Appl Res.* 2015;1(12):527-9.
15. Clark KP, *et al*. The longitudinal effects of resisted sprint training using weighted sleds vs. weighted vests. *J Strength Cond Res.* 2010;24(12):3287-95.
16. Clutch D, Witton M, McGown C, Bryce GR. Effect of depth jumps and weight training on leg strength and vertical jump. *Res Q.* 2001;54:5-10.
17. Fletcher IM, Hartwell M. Effect of 8-week combined weights and plyometrics training program on golf drive performance. *J Strength Cond Res.* 2002;18(1):54-62.
18. Girold S, *et al*. Effects of dry-land vs. resisted- and assisted-sprint exercises on swimming sprint performances. *J Strength Cond Res.* 2007;21(2):599-605.
19. Girold S, *et al*. Assisted and resisted sprint training in swimming. *J Strength Cond Res.* 2006;20(3):547-54.
20. Gnanachellam CJ. Elementary education. Online. 2021;20(4):2906-8.
21. Harrison AJ, Bourke G. The effect of resisted sprint training on speed and strength performance in male rugby players. *J Strength Cond Res.* 2009;23(1):275-83.
22. Hidayat A. Effect of ladder exercises on agility of participants extracurricular futsal at Bina Darma University. *J Phys Conf Ser.* 2019;1402:055003.
23. Hortobagyi T, Katch FI, Cacrance PE. Effects of simultaneous training for strength and endurance on upper and lower body strength and running performance. *J Sports Med Phys Fitness.* 1991;21:20-30.
24. International Kabaddi Federation. Origin, history and development of Kabaddi. 2012. Available from: http://www.kabaddiikf.com/history.htm
25. International Kabaddi Federation (IKF). Rules of Kabaddi. 2016. Archived from the original on 4 March 2016.
26. Hackney JM, Clay RL, James M. Force-displacement differences in the lower extremities of young healthy

adults between drop jumps and drop landings. *Hum Mov Sci.* 2016;49:79-86.
27. Ambegaonkar JP, Shultz SJ, Perrin DH. A subsequent movement alters lower extremity muscle activity and kinetics in drop jumps vs. drop landings. *J Strength Cond Res.* 2011;25(10):2781-8.
28. Ortega JD, *et al*. The effects of ladder training on sprint and change of direction performance. *Top Exerc Sci Kinesiol*. 2022;3(1):7.
29. SportsAdda. Kabaddi: The origin, history and evolution of the sport. 2021 Apr 12.
30. Smith L. Is there a difference between a depth and drop jump? 2020. Available from: https://www.stack.com/a/
31. Mahaki MR, Mi'mar M, Mahaki B. On the relationship between lower extremity muscles activation and peak vertical and posterior ground reaction forces during single leg drop landing. *J Sports Med Phys Fitness.* 2015;55(10):1145-9.
32. Frey M. How to use an agility ladder. Verywell Fit. 2020. Available from: https://www.verywellfit.com/
33. Powerman M. Sports specific movements and about science worries. *Super Training.* 2003;31732.
34. Matthews MJ, *et al*. Complex training in ice hockey: the effects of a heavy resisted sprint on subsequent ice-hockey sprint performance. *J Strength Cond Res.* 2010;24(11):2883-7.
35. Merlino MJ. Building your own weight training work out. Merlino Fitness Service. 2003.
36. Niederhauser HU. Heart patient and sports. *Schweiz Rundsch Med Prax.* 1996;84(33):933-8.
37. Nawir N, *et al*. The effect of ladder exercises varies on the increase of athletes foot agility. In: *ICEST 3rd Int Conf.* 2021. p. 481.
38. Prieske O, *et al*. Effects of drop height on jump performance in male and female elite adolescent handball players. *Int J Sports Physiol Perform.* 2018;14(5):674-80.
39. Byrne PJ, *et al*. A comparison of methods used to identify 'optimal' drop height for early phase adaptations in depth jump training. *J Strength Cond Res.* 2010;24(8):2050-5.
40. Paulson S, Braun WA. The influence of parachute-resisted sprinting on running mechanics in collegiate track athletes. *J Strength Cond Res.* 2011;25(6):1680-5.
41. Pedley JS, *et al*. Drop jump: A technical model for scientific application. *Strength Cond J.* 2017;39(5):36-44.
42. Prieske O, *et al*. Sex-specific effects of surface instability on drop jump and landing biomechanics. *Int J Sports Med.* 2015;36(1):75-81.
43. Pramod RQ, Divya K. The effects of ladder training on speed of Egyptian high school boys student's in. *Int J Phys Educ Sports Health.* 2019;6(1):19-22.