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Application of Plyometric Training in Injury Prevention among Kabaddi Players

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Abstract:

Kabaddi is a physically demanding contact sport involving explosive movements, rapid acceleration and deceleration, tackling, jumping, lunging and multidirectional body actions. Such repeated high intensity movements expose athletes to a high incidence of musculoskeletal injuries especially among the school level players who often lack scientifically designed conditioning programs. Plyometric training has been shown to be an effective neuromuscular conditioning method to increase muscular power, joint stability, agility, balance, proprioception, and movement efficiency. The present study was aimed to investigate the application of plyometric training in injury prevention among school level Kabaddi players. Sixty male Kabaddi players of age group 12-16 years were randomly distributed in experimental group (n=30) and control group (n=30). The experimental group underwent a structured plyometric training program for 24 weeks in addition to their normal practice sessions and the control group experienced conventional training only. Variables concerning injury prevention were measured before and after the intervention including muscle strength, agility, balance, fatigue resistance, movement control and heart rate recovery. Statistical analysis with mean, standard deviation, independent t-test and repeated measures ANOVA showed significant improvement in all the selected variables in the experimental group ($p < 0.05$). The experimental group demonstrated higher percentage improvements for balance (32.7%), joint stability (24.8%), agility (13.1%) and fatigue resistance (25.0%) than the control group. The results suggest plyometric training improves neuromuscular coordination, dynamic balance and lower body stability and therefore reduces the injury risk factors in Kabaddi players. The study concludes that plyometric training must be systematically embraced in the school-level Kabaddi conditioning programs, to enhance the athletic safety and long-term development of performance.

Keywords: Plyometric Training, Injury Prevention, Kabaddi Players, Neuromuscular Coordination, Dynamic Balance, Agility Enhancement, Athletic Conditioning

1. Introduction

Kabaddi is a physically demanding indigenous team sport which requires speed, strength, agility, balance, endurance and tactical awareness. Repeated bouts of explosive activities like sprinting, lunging, jumping, dodging, diving and forceful tackling, that impose substantial physiological and biomechanical stress on athletes, are part of the sport (Ramachandran & Chowdhury, 2016). Kabaddi is a high intensity contact sport and therefore its players are prone to musculoskeletal injuries like ankle sprains, anterior cruciate ligament (ACL) strains, hamstring injuries, shoulder instability and lower back pain. These injuries often occur during sudden change of direction, rapid acceleration and deceleration, improper landing and physical contact during play.

Injury prevention has become a major component of modern sports training, especially for athletes at the school level whose neuromuscular and musculoskeletal systems are still developing. Traditional training programs have mainly focused on skill development and performance enhancement while providing little attention to scientifically structured injury prevention strategies. Recent developments in sports science have revealed the importance of neuromuscular conditioning programs to improve the efficiency of movement, balance, joint stability and biomechanical control (Thomas et al., 2009).

Jump training or plyometric training is a well-known conditioning method to increase explosive muscular power and neuromuscular efficiency. It is based on the stretch-shortening cycle (SSC), which consists of a rapid eccentric muscle action followed immediately by a powerful concentric contraction. This mechanism improves elastic energy utilisation, motor unit recruitment, reactive strength, and movement coordination (Arazi & Asadi, 2011). Previous studies have reported that plyometric training significantly improves agility, balance, speed and athletic performance while reducing injury-related risk factors (Miller et al., 2006; Slimani et al., 2016). Hence, the present study attempts to study the effectiveness of plyometric training on injury prevention of school level Kabaddi players.

1.1 Need of the Study

It is seen that the Kabaddi players at the school level are often injured because of lack of proper physical preparation, scientific conditioning, improper movement mechanics and muscular imbalances. Adolescence is a time of rapid neuromuscular and physical development, and the use of evidence-based training methods is critical for safe sports participation and long-term athletic development. The current school level Kabaddi training program in India still heavily depends on the traditional approach which focus on a skill execution and fail to incorporate scientifically structured injury prevention strategies. This can therefore lead to poor landing mechanics, lack of joint stability, and lack of neuromuscular control in young athletes, making them more susceptible to injuries during training and competition. Plyometric exercise is widely known to enhance speed, agility and explosive power but there has been little research that has focused specifically on injury prevention in school level Kabaddi players. This study was conducted, therefore, to assess the effectiveness of plyometric training for enhancing physical and physiological parameters of injury prevention, efficiency of movement and athletic safety.

2. Objectives of the Study

- To examine the effect of plyometric training on muscular strength among school-level Kabaddi players.
- To assess the improvement in agility and balance following plyometric training.
- To evaluate changes in physiological variables such as heart rate recovery and fatigue resistance.
- To analyse the effectiveness of plyometric training in reducing injury-related risk factors.
- To compare injury-prevention variables between the experimental and control groups.

3. Hypotheses

- **H_{01}**: Plyometric training has no significant effect on muscular strength of Kabaddi players.
- **H_{02}**: Plyometric training does not improve agility and balance.
- **H_{03}**: Plyometric training has no significant role in injury prevention.
- **H_{04}**: There is no significant difference between experimental and control groups.

4. Methodology

4.1 Research Design

Randomized Controlled Trial (RCT)

4.2 Sample

- Total participants: 60 male Kabaddi players
- Age group: 12–16 years
- Groups:

- Experimental Group (n=30) – Plyometric Training
- Control Group (n=30) – Regular Training

4.3 Selection Criteria

Inclusion Criteria

- Players with a minimum of two years of Kabaddi playing experience.
- Regular participation in school-level competitions.
- Medically fit participants cleared for physical activity.
- Players attending at least 90% of training sessions.

Exclusion Criteria

- Players with recent musculoskeletal injuries.
- Participants undergoing medical rehabilitation.
- Athletes with neurological or cardiovascular disorders.
- Players absent from training sessions for prolonged periods.

4.4 Training Protocol

- Duration: 24 weeks
- Frequency: 3 sessions per week

- Exercises:

- Box jumps
- Squat jumps
- Depth jumps
- Lateral jumps

4.5 Variables

Table 1: Classification of Variables Selected for the Study

Category	**Variables**
Physical Variables	Muscular Strength, Agility, Balance
Physiological Variables	Heart Rate Recovery, Fatigue Resistance
Injury Prevention Indicators	Joint Stability, Movement Control

4.6 Tools and Tests

Table 2: Tools and Tests Used for Assessment of Selected Variables

Variable	**Tool/Test Used**
Muscular Strength	Hand Grip Dynamometer
Agility	Illinois Agility Test
Balance	Stork Balance Test
Heart Rate Recovery	Heart Rate Monitor
Fatigue Resistance	Yo-Yo Intermittent Recovery Test

4.7 Structure of Plyometric Training Sessions

The three phases of each plyometric training session were warm-up, main training and cool down. The warm-up (10-15 minutes) consisted of light jogging, dynamic stretching, mobility exercises and activation drills to get the body ready for high intensity. The main training session (30-40 minutes) consisted of progressive plyometric activities including box jumps, squat jumps, depth jumps, lateral bounds, and single leg hopping training activities designed to enhance explosive power, agility, balance, and neuromuscular efficiency. The cool down period (10 minutes) consisted of static stretching and recovery exercises to minimize muscle fatigue and increase flexibility. Proper rest intervals were used between sets and repetitions.

5. Analysis and Results

The gathered data were analysed using Mean and Standard Deviation to determine the central tendency and variability. Comparison of differences between the experimental and control groups was conducted using Independent t-test, while Repeated Measures ANOVA was used to examine changes across pre-test and post-test assessments.

Table 3: Descriptive Statistics of Post-Test Scores

Variable	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)
Strength	45.2 ± 3.1	39.5 ± 2.8
Agility (sec)	10.1 ± 0.7	11.4 ± 0.9
Balance (sec)	28.5 ± 3.2	22.1 ± 2.7
Heart Rate (bpm)	72 ± 4	78 ± 5

Table 3 shows that the experimental group performed better than the control group in the post-test in all the selected variables. Improvements in strength, agility, balance and heart rate recovery suggest the positive effect of plyometric training on physical and physiological performance.

Table 4: Post-test comparison of physical and physiological variables between experimental and control groups after 24 weeks of plyometric training

Variable	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)
Strength (kg)	47.8 ± 3.4	40.9 ± 3.0
Agility (sec)	9.8 ± 0.5	11.2 ± 0.8
Balance (sec)	31.6 ± 3.7	23.8 ± 2.9
Heart Rate Recovery (bpm)	69 ± 3	77 ± 5
Fatigue Resistance (min)	13.5 ± 1.2	10.8 ± 1.0
Joint Stability Score	8.9 ± 0.6	6.7 ± 0.7

As shown in Table 4, the experimental group had a better post-test performance than the control group in all selected variables. The experimental group showed improved neuromuscular and cardiovascular efficiency with higher values for muscular strength, balance, fatigue resistance and joint stability and lower values for agility time and heart rate recovery. The biggest change was in balance and joint stability, which means an improvement in proprioception and movement control." These adaptations are very important to decrease injury occurrence in rapid direction change, jumping and tackling situations seen in Kabaddi.

Table 5: Independent t-test analysis showing statistical significance between experimental and control groups

Variable	t-value	Significance Level
Strength	5.41	$p < 0.05$
Agility	4.98	$p < 0.05$
Balance	6.22	$p < 0.05$
Heart Rate Recovery	4.36	$p < 0.05$
Fatigue Resistance	5.14	$p < 0.05$
Joint Stability	6.01	$p < 0.05$

Independent t-test analysis showed that there were statistically significant differences between the experimental and control groups on all the selected variables at 0.05 level of significance. The higher the t-value, the higher the degree of influence of the plyometric training on the neuromuscular coordination and dynamic stabilization in balance and joint stability. Significant improvements in agility and fatigue resistance further suggest enhanced movement efficiency and delayed onset of fatigue. The results indicate that the null hypotheses are refuted and the plyometric training method was effective in reducing injury related risk factors among Kabaddi players.

Table 6: Percentage improvement in injury-prevention variables following plyometric intervention

Variable	Experimental Group (%)	Control Group (%)
Strength	18.6	6.4
Agility	13.1	3.5
Balance	32.7	8.2
Heart Rate Recovery	11.4	2.7
Fatigue Resistance	25.0	7.1
Joint Stability	24.8	5.1

Table 6 shows that the percentage improvement of the experimental group was significantly higher than that of the control group for all variables selected. Plyometric training was shown to improve joint stability and balance the most, which suggests that it is an effective method for improving proprioceptive control and lower-body stability. There are further improvements in fatigue resistance and agility, which are additional signs of greater neuromuscular efficiency and movement economy. The results showed that plyometric training is a crucial component in reducing biomechanical risk factors of sports injuries.

6. Discussion

The experimental group showed significantly better results than the control group ($p < 0.05$), suggesting a higher level of improvement for the experimental group after plyometric training. The repeated measures ANOVA also showed significant improvement over time on all variables selected. The results of the present study show that plyometric exercise training has a significant effect on enhancing neuromuscular efficiency, movement coordination, balance and dynamic stabilization in school level Kabaddi players. Efficient use of the stretch-shortening cycle led to better reactive strength and, therefore, motor unit recruitment and synchronization, which allowed athletes to make quick changes of direction and perform explosive movements more effectively. The improved balance and joint stability indicates better proprioceptive control and lower body stabilization, which will decrease the potential for injury during high impact sport actions. Better heart rate recovery and fatigue resistance further suggests better cardiovascular adaptation and delayed onset fatigue. The results are in line with the study conducted by Arazi & Asadi (2011), Miller et al. (2006), Slimani et al. (2016), and Stojanović et al. (2017) which suggests that plyometrics is an effective method for improving performance and preventing injuries in Kabaddi players.

7. Conclusion

The study concludes that plyometrics training is very effective in the reduction of injury related risk factors among school Kabaddi players. After 24 weeks of training, there was significant improvement in muscular strength, agility, balance, fatigue resistance, heart rate recovery, and joint stability. The neuromuscular and biomechanical changes that occur with plyometrics enhance movement efficiency, landing control, dynamic stabilization, and proprioceptive awareness, all of which help to prevent sports-related injuries. Improved cardiovascular efficiency and delayed onset fatigue also play a role in making athletes safer during a competition. Implementing plyometric conditioning into school-level Kabaddi programs could play a pivotal role in fostering long-term athlete development, injury resilience, and competitive readiness. Hence, plyometric exercises should be included as an integral part of contemporary Kabaddi conditioning systems.

8. Recommendations

1. The systematic integration of plyometric training in school level Kabaddi training program is required.
2. Coaches should encourage good landing mechanics and control of movement during training.
3. The flexibility and strength conditioning exercises should be combined with plyometric drills for total development of the athlete.
4. Adaptation must be progressive and training stress must be limited to ensure training is safe.
5. Adolescent athletes should have regular injury risk assessment and movement screening.
6. Coaches and physical education teachers should be provided with scientific training on how to prevent injuries.
7. Future research should involve female athletes as well as players of higher competitive levels.

References

1. Arazi, H., & Asadi, A. (2011). Effects of aquatic and land plyometric training on strength, sprint, and balance in young basketball players. *Journal of Human Sport and Exercise, 6*(1), 101–111.
2. Bompa, T. O., & Buzzichelli, C. (2019). *Periodization: Theory and methodology of training* (6th ed.). Human Kinetics.
3. Chu, D. A. (1998). *Jumping into plyometrics* (2nd ed.). Human Kinetics.
4. Hewett, T. E., Lindenfeld, T. N., Riccobene, J. V., & Noyes, F. R. (1999). The effect of neuromuscular training on the incidence of knee injury in female athletes. *The American Journal of Sports Medicine, 27*(6), 699–706.
5. Markovic, G. (2007). Does plyometric training improve vertical jump height? A meta-analytical review. *British Journal of Sports Medicine, 41*(6), 349–355.
6. Miller, M. G., Herniman, J. J., Ricard, M. D., Cheatham, C. C., & Michael, T. J. (2006). The effects of a 6-week plyometric training program on agility. *Journal of Sports Science and Medicine, 5*(3), 459–465.
7. Myer, G. D., Ford, K. R., McLean, S. G., & Hewett, T. E. (2006). The effects of plyometric versus dynamic stabilization and balance training on lower extremity biomechanics. *Journal of Strength and Conditioning Research, 20*(2), 345–353.
8. Ramachandran, R., & Chowdhury, S. (2016). Analysis of explosive power and agility in Kabaddi players. *International Journal of Physical Education, 1*(2), 177–179.
9. Slimani, M., Chamari, K., Miarka, B., Del Vecchio, F. B., & Chéour, F. (2016). Effects of plyometric training on physical fitness in team sport athletes: A systematic review. *Journal of Human Kinetics, 53*(1), 231–247.
10. Stojanović, E., Ristić, V., McMaster, D. T., & Milanović, Z. (2017). Effect of plyometric training on vertical jump performance in female athletes: A systematic review and meta-analysis. *Sports Medicine, 47*(5), 975–986.
11. Thomas, K., French, D., & Hayes, P. R. (2009). The effect of two plyometric training techniques on muscular power and agility in youth soccer players. *Journal of Strength and Conditioning Research, 23*(1), 332–335.