



Effects of Isolated and Combined Weight and Ladder Training on Selected Physical Performance Variables among Women Kabaddi Players

Dr. P. Sridar

Director of Physical Education, Centre for Distance and Online Education
Bharathiar University, Coimbatore (psridarperumal@gmail.com)

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ABSTRACT

The present study aimed to determine the comparative effects of isolated and combined weight and ladder training on selected physical performance variables among women kabaddi players. For this purpose sixty (N = 60) women kabaddi players aged between 18 and 25 years were selected from Dr. Sivanthi Aditanar College of Engineering, Tiruchendur, Govindammal Aditanar College for Women, Tiruchendur, and Wavoo Wajeeha Women's College of Arts and Science, Kayalpatnam, Thoothukudi, Tamil Nadu, India. The subjects had at least two years of playing experience in kabaddi and only those who had represented their respective college and club teams were included in the study. A randomized pre-test and post-test group design was employed and the subjects were randomly assigned into four equal groups of fifteen each. Group I underwent weight training (WTG), Group II underwent ladder training (LTG), Group III underwent combined weight and ladder training (CTG) and Group IV served as the control group (CG), which continued with its regular training routine without any specific intervention. The experimental groups underwent their respective structured training programmes for a period of twelve weeks with training sessions conducted on alternate days whereas the control

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group continued with its regular traditional training. Data on the selected physical performance variables namely leg explosive power and muscular strength endurance were collected before and after the training period. The collected data were analyzed using the paired t-test and analysis of covariance. The level of significance was fixed at 0.05. The results revealed that weight training, ladder training and combined weight and ladder training brought about significant improvements in leg explosive power and muscular strength endurance among women kabaddi players. It was further observed that the combined training programme produced greater improvements than the individual training programmes and the control group.

Introduction

Kabaddi is a physically demanding team sport that requires players to perform repeated high intensity movements, rapid changes in body position, forceful actions and short duration efforts throughout a match. The physical demands of the game require an adequate level of muscular strength, power, endurance and speed to perform offensive and defensive actions effectively. Recent evidence indicates that structured training interventions can improve important physical fitness characteristics in kabaddi players although the magnitude of improvement depends on the type and design of the training programme (González *et al.*, 2026). Physical preparation is therefore an essential component of kabaddi training. Among the various physical qualities required for competitive performance, lower-limb explosive power enables athletes to produce force rapidly during jumping, pushing, sudden acceleration and other dynamic movements. Muscular endurance is also important because players must repeatedly perform physically demanding actions without a substantial decline in performance. Consequently, training programmes that simultaneously address power and muscular endurance may provide important benefits for kabaddi players.

Weight training is widely used in sports conditioning to develop muscular fitness through progressive resistance exercise. Regular resistance training can promote improvements in muscular strength and power and can also contribute to better functional performance. Evidence from a systematic review of elite female athletes showed that resistance training, either alone or combined with other strength oriented methods produced improvements in muscle power, strength, speed and jump performance (Zouita *et al.*, 2023). These adaptations are particularly relevant to kabaddi players for whom lower limb force production is required during repeated movements and sport-specific actions. The development of explosive power is



also influenced by the ability of the neuromuscular system to generate force rapidly. Resistance-based training can provide an appropriate stimulus for improving lower limb power when exercise selection intensity and progression are systematically prescribed. A recent meta analysis reported positive effects of resistance training with blood flow restriction on lower limb explosive power further demonstrating the potential of resistance-based exercise to enhance power-related performance (Wang *et al.*, 2023).

Ladder training represents another conditioning approach involving repeated footwork patterns, rapid stepping and coordinated lower limb movements. It is commonly incorporated into athletic training because of its potential to improve movement control and performance related physical qualities. However, evidence concerning ladder training should be interpreted carefully as a systematic review noted that the available research on agility ladder interventions remains limited and that protocols and outcome measures have varied considerably across studies (Afonso *et al.*, 2020). This highlights the need for well structured investigations examining the contribution of ladder based training within sport specific populations. Combining different training modalities may provide a broader stimulus than relying on a single training method. Research involving elite athletes has shown that resistance training can have substantial positive effects on sport specific performance although the magnitude of the response may differ according to the athlete's competitive level sport and performance outcome (Makaruk *et al.*, 2024). Team sport athletes indicates that systematic training can positively influence strength and explosive performance, supporting the importance of appropriately designed physical conditioning programmes for female athletes (Zeng *et al.*, 2026).

Methodology

To achieve the objectives formulated in the present study the investigator examined the effects of isolated and combined weight and ladder training on selected physical performance variables among women kabaddi players. It was hypothesized that twelve weeks of weight training, ladder training and combined weight and ladder training would produce significant improvements in the selected physical performance variables when compared with traditional training. A total of sixty (N = 60) women kabaddi players aged between 18 and 25 years were randomly selected from Dr. Sivanthi Aditanar College of Engineering, Tiruchendur, Govindammal Aditanar College for Women, Tiruchendur, and Wavoo Wajeetha Women's College of Arts and Science, Kayalpatnam, Thoothukudi, Tamil Nadu, India. The subjects had at least two years of playing experience in kabaddi and only those who had represented their respective college and club teams were included in the study. The subjects were randomly assigned to four groups of fifteen each namely the weight training group, ladder training group, combined training group and control group. The

experimental groups underwent their respective structured training programmes for a period of twelve weeks whereas the control group continued with their regular traditional training. A randomized pre-test and post-test group design was employed to assess changes in the selected variables. The selected physical performance variables included leg explosive power which was measured using the Standing Broad Jump Test and muscular strength endurance which was assessed using the Sit-Up Test. All measurements were obtained before and after the training period under standardized conditions. The data collected from the pre-test and post-test were analyzed using the paired t - test and analysis of covariance. The level of significance was fixed at 0.05.

Results

Table 1: Mean and Paired ‘T’ – ratio for the Pre and Post Tests on Weight Training Group, Ladder Training Group, Combined Training Group and Control Group on Physical Performance Variables.

Group	Variables	Pre -Test Mean	Post - Test Mean	t - Ratio
Weight Training Group	Leg Explosive Power	1.81	2.07	12.27*
	Muscular Strength Endurance	29.52	36.74	14.38*
Ladder Training Group	Leg Explosive Power	1.83	1.96	9.17*
	Muscular Strength Endurance	28.94	32.51	10.79*
Combined Training Group	Leg Explosive Power	1.79	2.16	13.94*
	Muscular Strength Endurance	29.64	39.41	9.65*
Control Group	Leg Explosive Power	1.79	1.83	0.99
	Muscular Strength Endurance	28.63	29.08	0.31

Significance at 0.05 level (df – 1, 14, 2.14)

Table - 1 presents the computation of the t-ratio comparing the pre-test and post-test mean scores of the selected physical performance variables among women kabaddi players. The mean values for the weight training group were 1.81 (pre-test) and 2.07 (post-test) for leg explosive power and 29.52 (pre-test) and 36.74 (post-test) for muscular strength endurance. The corresponding mean values for the ladder training group were 1.83 (pre-test) and 1.96 (post-test) for leg explosive power and 28.94 (pre-test) and 32.51 (post-test) for muscular strength endurance. In the combined training group, the mean values were 1.79 (pre-test) and 2.16 (post-test) for leg explosive power and 29.64 (pre-test) and 39.41 (post-test) for muscular strength endurance. The control group recorded mean values of 1.79 (pre-test) and 1.83 (post-test) for leg explosive power and 28.63 (pre-test) and 29.08 (post-test) for muscular strength endurance.

The calculated t-ratios for the weight training group were 12.27 for leg explosive power and 14.38 for muscular strength endurance. Similarly, the t-ratios for the ladder training group were 9.17 and 10.79 while those for the combined training group were 13.94 and 9.65 for leg explosive power and muscular strength endurance respectively. Since all these values exceeded the critical t-value of 2.14 required for significance at the 0.05 level with 1, 14 degrees of freedom, it was inferred that significant improvements occurred in both variables following the respective training programmes.

Conversely the computed t-ratios for the control group were 0.99 for leg explosive power and 0.31 for muscular strength endurance which were lower than the required critical value. Hence, no significant improvement was observed in either variable among the subjects in the control group. These findings indicate that weight training, ladder training and their combination produced significant improvements in the selected physical performance variables of women kabaddi players. However, the combined training programme appeared to yield greater improvements when compared with the individual training programmes whereas the control group did not exhibit any statistically significant changes.

Table -2 Computation of Analysis of Covariance on Agility and Toe Touch Ability

Variables	Adjusted Post – Test Means				Source Of Variance	Sum of Squares	DF	Mean Squares	F - Ratio
LEP	WTG	LTG	CTG	CG	Between Groups	0.87	3	0.29	41.87*
	2.11	2.02	2.21	1.82	Within Groups	0.38	55	0.01	

MSE	37.23	33.21	41.18	29.45	Between Groups	812.33	3	270.78	20.56*
					Within Groups	724.35	55	13.17	

Significance at 0.05 level (df – 3, 55, 3.24)

WTG – Weight Training Group, LTG – Ladder Training Group, CTG – Combined Training Group, CG – Control Group, LEP – Leg Explosive Power and MSE – Muscular Strength Endurance

Table - 2 reveals that the obtained F-values for the adjusted post-test means were 41.87 for leg explosive power and 20.56 for muscular strength endurance. Since these values were greater than the required critical F-value of 3.24 at the 0.05 level of significance for degrees of freedom 3 and 55, the differences among the adjusted means of the four groups on the selected physical performance variables were found to be statistically significant. Thus, it was concluded that significant differences existed among the weight training group, ladder training group, combined weight and ladder training group and control group with respect to leg explosive power and muscular strength endurance.

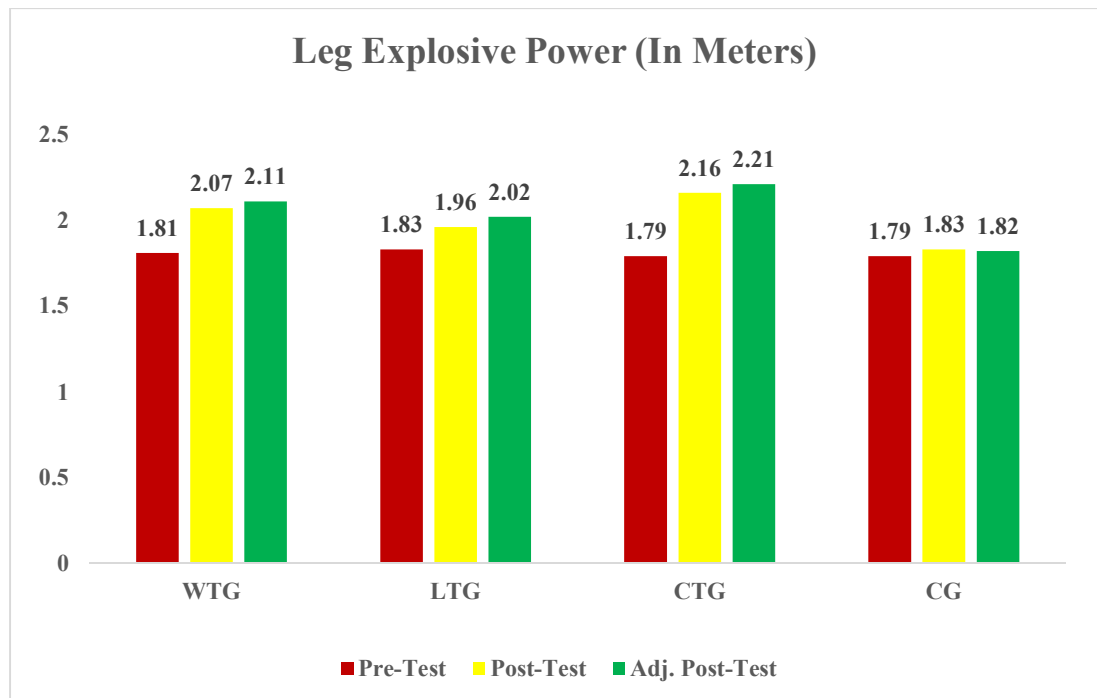


Fig - 1: The bar diagram shows the mean values of Pre-Test and Post-Test and Adjusted Post -Test on Leg Explosive Power of Weight Training, Ladder Training, Combined Training and Control Group.

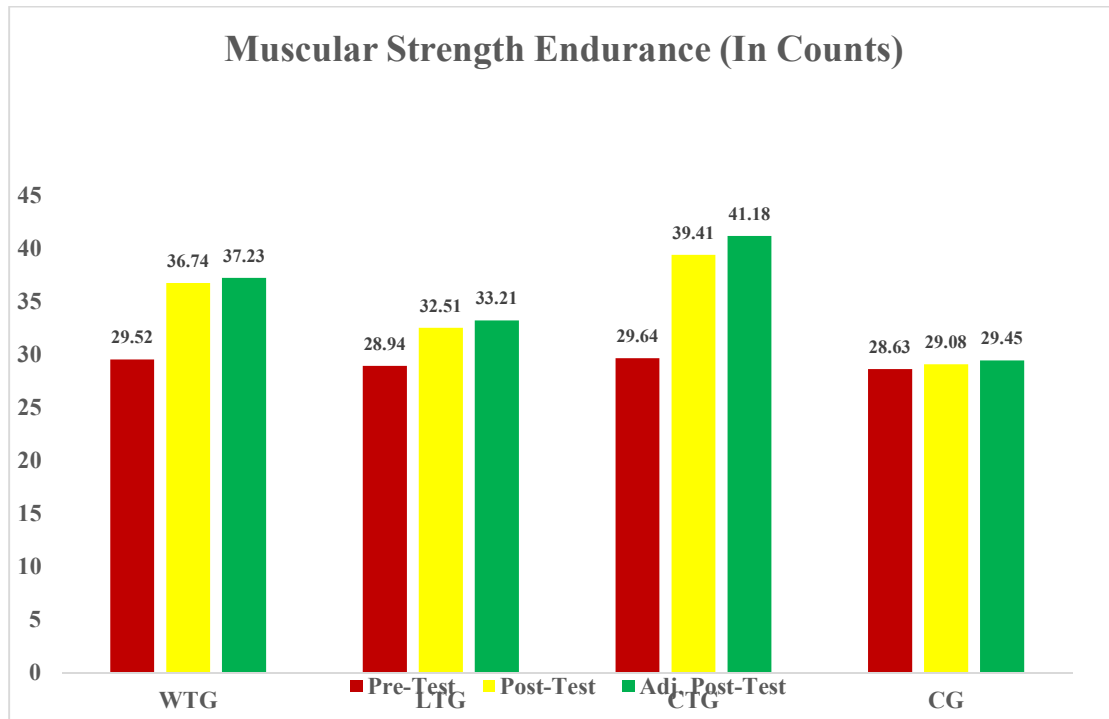


Fig - 2: The bar diagram shows the mean values of Pre-Test and Post-Test and Adjusted Post -Test on Muscular Strength Endurance of Weight Training, Ladder Training, Combined Training and Control Group.

Findings of the Study

The findings of the present study revealed that twelve weeks of weight training, ladder training and combined weight and ladder training significantly improved leg explosive power and muscular strength endurance among women kabaddi players. The paired t-test results showed significant improvements in both variables among the weight training, ladder training, and combined training groups whereas the control group did not show significant changes. These findings indicate that systematic training interventions provided a greater stimulus for improving the selected physical performance variables than regular traditional training. Similar evidence has demonstrated that structured resistance based training can produce meaningful improvements in strength and power related performance among athletes (Morris *et al.*, 2022).

The improvement in leg explosive power observed in the experimental groups may be attributed to adaptations in the neuromuscular system and an enhanced ability to produce force rapidly. In the present study, the weight training group improved from a pre-test mean of 1.81 m to a post-test mean of 2.07 while the ladder training group improved from 1.83 to 1.96. The combined training group demonstrated the greatest improvement, increasing from 1.79 to 2.16. These results are supported by Deng *et al.*, (2023)

whose meta analysis found that combined plyometric training produced significant improvements in lower body muscle power and strength among athletes.

The significant improvement in muscular strength endurance may be related to the repeated muscular loading and progressive training stimulus provided throughout the twelve week intervention. The weight training group increased from 29.52 to 36.74 while the ladder training group improved from 28.94 to 32.51. The combined training group showed the highest post-test mean increasing from 29.64 to 39.41. Evidence from resistance training research has shown that appropriately prescribed resistance exercise can improve muscular fitness and physical performance particularly when training is performed consistently over several weeks (Bright *et al.*, 2023). The greater improvement observed in the combined training group may be explained by the complementary nature of the two training modalities. Weight training provides a progressive resistance stimulus whereas ladder training involves repeated lower limb movements requiring rapid force production and coordinated movement. The combination of these stimuli may therefore provide a broader training effect than either method used independently. Supporting this interpretation, Ramírez *et al.*, (2022) reported that plyometric based training produced moderate improvements in lower body jumping and strength performance suggesting that training methods involving rapid force production can contribute to improvements in lower limb physical performance.

The adjusted post test means findings further confirmed significant differences among the four groups in both selected variables. The obtained F-values were 41.87 for leg explosive power and 20.56 for muscular strength endurance which were greater than the critical F-value of 3.24 at the 0.05 level of significance with 3 and 55 degrees of freedom. The adjusted post-test means also showed that the combined training group obtained the highest values for leg explosive power 2.21 and muscular strength endurance 41.18 followed by the weight training, ladder training and control groups. These findings are consistent with evidence indicating that combining different training stimuli can produce favourable adaptations in strength and power related performance (Cormier *et al.*, 2022).

The findings demonstrate that weight training, ladder training and combined weight and ladder training were effective in improving leg explosive power and muscular strength endurance among women kabaddi players. The higher adjusted post-test means observed in the combined training group suggest that integrating the two training modalities may provide a more comprehensive stimulus for developing the selected physical performance variables. This is particularly relevant to kabaddi, where repeated forceful lower limb actions require both the ability to produce force rapidly and the capacity to sustain muscular effort throughout play.



Conclusion

Based on the findings of the present study it was concluded that twelve weeks of weight training, ladder training and combined weight and ladder training significantly improved leg explosive power and muscular strength endurance among women kabaddi players. The paired t-test results demonstrated significant improvements in the selected variables among the experimental groups whereas no significant changes were observed in the control group. Further, the analysis of covariance revealed significant differences among the adjusted post-test means of the four groups for both leg explosive power and muscular strength endurance. The combined training group recorded the highest adjusted post-test means for both variables. Therefore, weight training, ladder training and their combination can be considered effective training approaches for developing selected physical performance variables among women kabaddi players.

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