

Effects of Weight Training, Ladder Training and Combined Weight and Ladder Training on Speed and Hand Touch Ability among Women Kabaddi Players

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Abstract

This study compared the effects of weight training, ladder training and combined weight and ladder training on speed and hand touch ability among women kabaddi players. Sixty women players (N = 60) aged 18 to 25 years selected drawn 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. Every participant had a minimum of two years of kabaddi experience and had played for a college and club team. Using a pre-test and post-test randomized group design the players were divided to four groups of fifteen weight training group (WTG), ladder training group (LTG), combined weight and ladder training group (CTG) and control group (CG) that continued on with its usual practice sessions. The three experimental groups trained on alternate days for twelve weeks. Speed and hand touch ability were measured before the programme and again after it. Within group changes were examined with the paired t-test and between-group differences in adjusted post-test means with analysis of covariance, Scheffé's post hoc test was applied wherever the F-ratio was significant. The significance level was set at 0.05. The results revealed that weight training, ladder training and combined weight and ladder training produced significant improvements in speed and hand touch ability 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.

Keywords: *Kabaddi, Weight Training, Ladder Training, Speed and Hand Touch Ability.*

I. INTRODUCTION

Kabaddi is a physically demanding contact team sport in which raiders and defenders repeat short, intense efforts, change direction rapidly and carry out technically precise offensive and defensive actions. Laboratory profiling of Indian national kabaddi players has long documented the morphological and physiological characteristics that accompany these demands (Dey *et al.*, 1993). Successful performance therefore depends on physical fitness as well as on the ability to execute sport specific skills. Among the physical qualities involved, speed and muscular strength endurance are especially important because players must close in on opponents quickly carry out attacking moves, recover and produce force again and again during a match. A recent systematic review of randomized controlled trials in kabaddi concluded that structured training may improve physical fitness and sport specific performance but it located only ten trials just two of which enrolled women, and rated most of them as being of fair methodological quality (González-Devesa *et al.*, 2026). Within that evidence women college players trained with interval or continuous programmes performed better than non training controls in speed, hand touch and toe touch (Sureshkumar *et al.*, 2023) and Tabata and resistance training improved speed in school level players (Thinakaran *et al.*, 2024). In female team sport athletes more broadly, strength training has been shown to improve sprint performance (Hughes *et al.*, 2023).

Weight training applies progressive resistance to develop muscular fitness and the neuromuscular adaptations it produces can raise the capacity to generate and sustain force which may carry over to sporting performance. A meta analysis restricted to women reported large strength gains after resistance training with training volume and frequency emerging as important influences (Hagstrom *et al.*, 2020). Increases in lower body strength transfer positively to sprint performance (Seitz *et al.*, 2014), and a comparison of weightlifting, traditional resistance training and plyometrics found that all three can improve strength, power and speed with weightlifting and plyometrics giving similar gains (Morris *et al.*, 2022). These adaptations are relevant to kabaddi because repeated raiding and defensive actions require effective force production and movement control. In elite kabaddi players

eight weeks of strength, plyometric or combined strength and plyometric training each improved leg explosive power, speed and agility more than no training (Irandoost & Taheri, 2014) and strength training improved speed, agility and muscular endurance in young adult players (Tandel, 2018). Ladder training emphasises quick foot placement, coordination, rhythm and changes in body position which makes ladder drills suitable for sports that demand fast and controlled movement. Its benefits are not uniform. A systematic review of randomized trials concluded that claims about the benefits of agility ladders for agility and other physical skills are premature given the quality of the existing research (Afonso *et al.*, 2020) and youth soccer players who trained with an agility ladder did not outperform a control group in sprint, agility or dribbling tests (Padrón-Cabo *et al.*, 2020). In kabaddi ladder based training has been reported to improve agility (Prakash *et al.*, 2021), including among female players (Pawar & Borkar, 2018) and speed, agility and quickness programmes which commonly include ladder drills, improved speed, agility and power in college kabaddi players (Upadhyay, 2023). A recent meta analysis likewise found that speed, agility and quickness training improves sprint and change of direction performance (Sun *et al.*, 2025). The effect of ladder training therefore appears to depend on the protocol used and the outcome measured.

In kabaddi, physical abilities must also be transferred into sport specific actions. The hand touch requires speed, coordination, balance, timing, body control and accurate execution while approaching and escaping from an opponent. Weight training and ladder training load the neuromuscular system in different ways: the former develops muscular force whereas the latter stresses rapid footwork and coordination. Their combination may therefore supply complementary stimuli in line with evidence that combined programmes can outperform single mode training. Combined squat and sprint training improved short sprint performance more than either training alone (Marques *et al.*, 2015), and game specific unilateral, bilateral and complex training was followed by improved speed in college men kabaddi players (Shanmugam *et al.*, 2024).

II. METHODOLOGY

The investigator designed the study to effects weight training, ladder training and their combination with regular kabaddi practice on selected speed and hand touch ability. It was hypothesised that twelve weeks of each experimental programme would improve these variables more than traditional training alone. Sixty women kabaddi players (N = 60) aged 18 to 25 years were randomly selected from Dr. Sivanthi Aditanar College of Engineering, Tiruchendur, Govindammal Aditanar College for Women, Tiruchendur and Wavoo Wajeetha Women College of Arts and Science, Kayalpatnam, Thoothukudi, Tamil Nadu, India. Only players who had at least two years of kabaddi experience and had represented their college and a club were eligible. The participants were randomly distributed into four groups of fifteen weight training group (WTG), ladder training group (LTG), combined weight and ladder training group (CTG) and control group (CG). The three experimental groups followed their assigned programmes for twelve weeks training on alternate days while the control group continued its regular training. A pre-test and post-test randomized group design was used. Speed was measured with the 50 mts dash and hand touch ability with the hand touch test and both were tested before and after the training period under standardised conditions. The collected data were subjected to statistical analysis using the paired t-test and analysis of covariance. In cases where significant differences were observed among the adjusted post-test means Scheffe's post hoc test was employed to determine the significant pairwise differences between the groups. The level of significance was fixed at 0.05.

III. RESULTS

Table - 1: Mean and Paired 'T' – ratio for the Pre and Post Tests on Speed of Weight Training Group, Ladder Training Group, Combined Training Group and Control Group

Groups	Pre -Test Mean	Post - Test Mean	t - Ratio
Weight Training Group	7.52	7.34	4.25*
Ladder Training Group	7.59	7.45	3.33*
Combined Training Group	7.56	7.12	6.17*
Control Group	7.61	7.57	0.77

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

Table - 1 presents the computed t-ratio comparing the pre-test and post-test mean scores for speed among women kabaddi players. The mean scores for the weight training group were 7.52 in the pre-test and 7.34 in the post-test while the ladder training group recorded mean scores of 7.59 and 7.45 and the combined training group showed mean scores of 7.56 in the pre-test and 7.12 in the post-test whereas the control group recorded mean scores of 7.61 and 7.57 respectively.

The obtained t-ratios were 4.25 for the weight training group 3.33 for the ladder training group and 6.17 for the combined training group. Since all the obtained values exceeded the critical t-value of 2.14 at the 0.05 level of significance with 1, 14 degrees of freedom significant improvements in speed were observed in all three experimental groups. Conversely the control group obtained a t-ratio of 0.77 which was lower than the required critical value indicating that the change in speed was not statistically significant.

Table -2 Computation of Analysis of Covariance on Speed

Variables	Adjusted Post – Test Means				Source Of Variance	Sum of Squares	DF	Mean Squares	F - Ratio
Speed	WTG	LTG	CTG	CG	Between Groups	0.29	3	0.09	19.46*
	7.31	7.43	7.09	7.56	Within Groups	0.27	55	0.01	

*Significance at 0.05 level (df – 3, 55, 2.77)

WTG – Weight Training Group, LTG – Ladder Training Group, CTG – Combined Training Group and CG – Control Group

Table 2 shows that the F-ratio for the adjusted post-test means of speed was 19.46. Since this value exceeded the critical F-value of 2.77 at the 0.05 level of significance for 3 and 55 degrees of freedom the adjusted post-test means of the four groups differed significantly. It was therefore concluded that significant differences existed in speed among the weight training group, ladder training group, combined weight and ladder training group and control group.

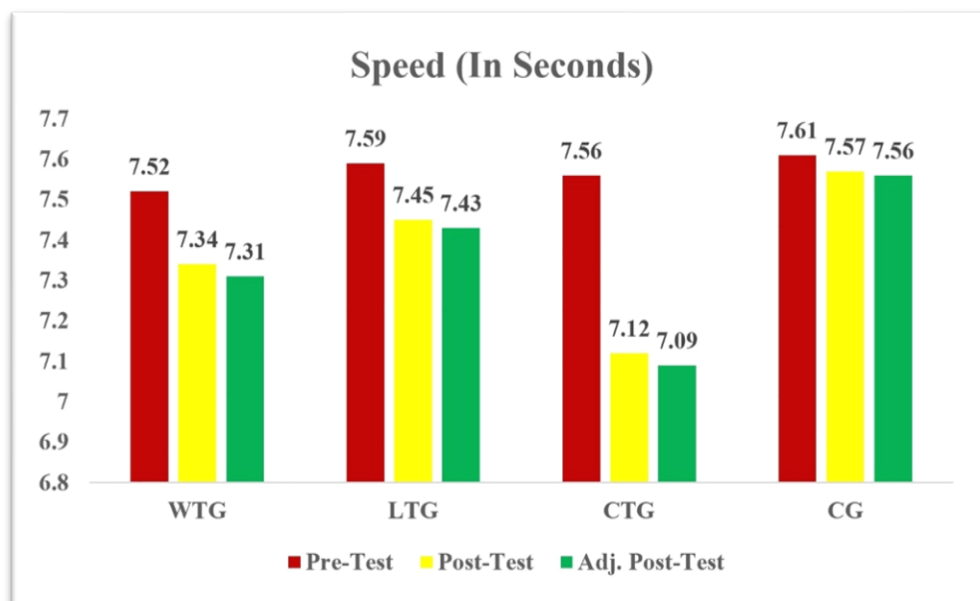
Table – 3 Scheffe's Post Hoc Test for the Differences Between the Paired Adjusted Post -Test Means of Speed

WTG	LTG	CTG	CG	MD	CIV
7.31	7.43	-	-	0.22*	0.07
7.31	-	7.09	-	0.34*	
7.31	-	-	7.56	0.47*	
-	7.43	7.09	-	0.12*	
-	7.43	-	7.56	0.25*	
-	-	7.09	7.56	0.13*	

*Significant at 0.05 level

WTG – Weight Training Group, LTG – Ladder Training Group, CTG – Combined Training Group, CG – Control Group, MD – Mean Difference and CIV – Critical Integral Value

Table - 3 shows the adjusted post-test mean differences in speed among the four groups. The mean differences between WTG and LTG (0.22), WTG and CTG (0.34), WTG and CG (0.47), LTG and CTG (0.12), LTG and CG (0.25) and CTG and CG (0.13) were all greater than the confidence interval value of 0.07 at the 0.05 level of significance. Therefore, significant differences were observed between all pairs of groups in speed. The results indicate that twelve weeks of combined weight and ladder training produced significantly greater improvement in speed compared with weight training, ladder training and the control group among women kabaddi players.



(Fig - 1: The bar diagram shows the mean values of Pre-Test and Post-Test and Adjusted Post -Test on Speed of Weight Training, Ladder Training, Combined Training and Control Group)

Table - 4: Mean and Paired ‘T’ – ratio for the Pre and Post Tests on Hand Touch Ability of Weight Training Group, Ladder Training Group, Combined Training Group and Control Group

Groups	Pre -Test Mean	Post - Test Mean	t - Ratio
Weight Training Group	18.13	16.27	13.75*
Ladder Training Group	17.99	16.84	8.55*
Combined Training Group	17.98	15.02	12.64*
Control Group	18.03	17.96	1.43

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

Table - 4 presents the computed t-ratio comparing the pre-test and post-test mean scores for hand touch ability among women kabaddi players. The mean scores for the weight training group were 18.13 in the pre-test and 16.27 in the post-test while the ladder training group recorded mean scores of 17.99 and 16.84 and the combined training group showed mean scores of 17.98 in the pre-test and 15.02 in the post-test whereas the control group recorded mean scores of 18.03 and 17.96 respectively.

The obtained t-ratios were 13.75 for the weight training group 8.55 for the ladder training group and 12.64 for the combined training group. Since all the obtained values exceeded the critical t-value of 2.14 at the 0.05 level of significance with 1, 14 degrees of freedom significant improvements in hand touch ability were observed in all three experimental groups. Conversely the control group obtained a t-ratio of 1.43 which was lower than the required critical value indicating that the change in hand touch ability was not statistically significant.

Table -5 Computation of Analysis of Covariance on Hand Touch Ability

Variables	Adjusted Post – Test Means				Source Of Variance	Sum of Squares	DF	Mean Squares	F - Ratio
HTA	WTG	LTG	CTG	CG	Between Groups	33.51	3	11.17	53.19*
	16.34	16.92	15.11	17.99	Within Groups	11.55	55	0.21	

*Significance at 0.05 level (df – 3, 55, 2.77)

HTA – Hand Touch Ability, WTG – Weight Training Group, LTG – Ladder Training Group, CTG – Combined Training Group and CG – Control Group

Table - 5 shows that the F-ratio for the adjusted post-test means of hand touch ability was 53.19 Since this value exceeded the critical F-value of 2.77 at the 0.05 level for 3 and 55 degrees of freedom the adjusted means of the four groups differed significantly. It was therefore concluded that the weight training group, ladder training group, combined weight and ladder training group and control group differed significantly in hand touch ability.

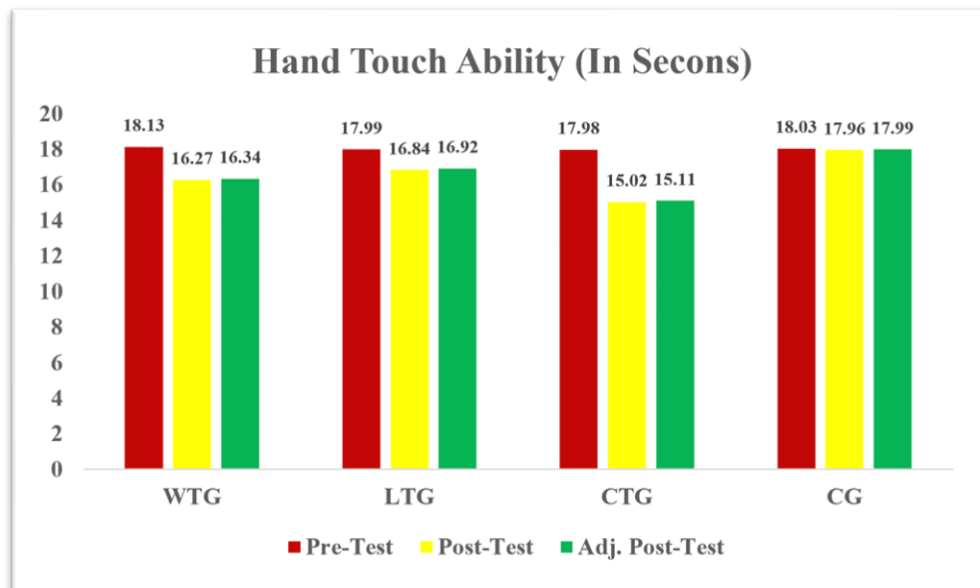
Table – 6 Scheffe’s Post Hoc Test for the Differences Between the Paired Adjusted Post -Test Means of Hand Touch Ability

WTG	LTG	CTG	CG	MD	CIV
16.34	16.92	-	-	1.23*	0.48
16.34	-	15.11	-	1.81*	
16.34	-	-	17.99	2.88*	
-	16.92	15.11	-	0.58*	
-	16.92	-	17.99	1.65*	
-	-	15.11	17.99	1.07*	

*Significant at 0.05 level

WTG – Weight Training Group, LTG – Ladder Training Group, CTG – Combined Training Group, CG – Control Group, MD – Mean Difference and CIV – Critical Integral Value

Table - 6 shows the adjusted post-test mean differences in hand touch ability among the four groups. The mean differences between WTG and LTG (1.23), WTG and CTG (1.81), WTG and CG (2.88), LTG and CTG (0.58), LTG and CG (1.65) and CTG and CG (1.07) were all greater than the confidence interval value of 0.48 at the 0.05 level of significance. Therefore, significant differences were observed between all pairs of groups in hand touch ability. The results indicate that twelve weeks of combined weight and ladder training produced significantly greater improvement in hand touch ability than weight training, ladder training and the control group among women kabaddi players.



(Fig - 2: The bar diagram shows the mean values of Pre-Test and Post-Test and Adjusted Post -Test on Hand Touch Ability of Weight Training, Ladder Training, Combined Training and Control Group)

IV. DISCUSSION ON FINDINGS

Twelve weeks of weight training, ladder training and combined weight and ladder training each produced significant gains in speed and hand touch ability in the women kabaddi players as shown by the paired t-test whereas the control group which only continued its regular practice showed no significant change in either variable. The analysis of covariance and Scheffe test further showed that the groups differed significantly with the combined group recording the best adjusted post-test means followed by the weight training group, the ladder training group and the control group. These results agree with a recent systematic review of randomized trials in kabaddi which concluded that structured training can improve physical fitness and sport specific performance (González-Devesa *et al.*, 2026) and with trials in which strength, plyometric or combined programmes outperformed no training in speed and agility (Irandoost & Taheri, 2014 and Tandel, 2018).

The gains in speed among the experimental groups can be attributed to better neuromuscular coordination, force production and movement efficiency. Greater lower body strength transfers positively to sprint performance (Seitz *et al.*, 2014) and training that loads the lower limbs rapidly provokes neuromuscular adaptations that carry over to performance (Markovic & Mikulic, 2010) this may help to explain why the weight training group (adjusted mean 7.31) was faster than the ladder training group (7.43). Ladder training, in turn, requires fast foot placement and precise coordination between the lower limbs and the central nervous system while a steady rhythm is kept and these repeated demands may have improved movement efficiency. The evidence for ladders used alone should nevertheless be read with caution since a systematic review judged claims for their benefits to be premature (Afonso *et al.*, 2020) and youth soccer players trained with an agility ladder did not outperform controls (Padrón-Cabo *et al.*, 2020). The significant effect found here, together with earlier reports on female kabaddi players (Pawar & Borkar, 2018) and on kabaddi players following speed, agility and quickness training (Upadhyay, 2023), suggests that the response to ladder work depends on the protocol, the population and the outcome measured. This view is compatible with a meta analysis showing that speed, agility and quickness training can improve sprint and change-of-direction performance (Sun *et al.*, 2025).

The superior result of the combined programme probably reflects the complementary nature of its two components. Weight training supplies a resistance stimulus that develops muscular force while ladder training adds rapid footwork and coordination, so physical and movement related qualities can be developed together. This is consistent with research showing that combined training can outperform a single mode. Combined squat and sprint training improved short sprint performance more than either training alone (Marques *et al.*, 2015) and a meta analysis of team sport athletes found that combined strength, plyometric and sprint training improved repeated sprint ability more than single mode or routine training (Liu *et al.*, 2024). Combined approaches have also been examined in kabaddi, where game specific unilateral, bilateral and complex training was followed by improved speed (Shanmugam *et al.*, 2024) and Bulgarian bag training added to routine practice produced better bio motor fitness and playing ability than routine practice alone (Nithin *et al.*, 2024). A systematic review of combined training in soccer (Ribeiro *et al.*, 2021) and a meta analysis of complex and contrast training in team sports (Cormier *et al.*, 2020) likewise examined how combining training stimuli influences qualities such as strength, sprinting and change of direction.

Kabaddi also involves short bursts of rapid movement, acceleration, deceleration and recovery so the repeated high-intensity demands of the training programmes may have contributed to the speed improvements. Repeated sprint training is known to impose

substantial physiological, neuromuscular and performance demands on team sport athletes (Thurlow *et al.*, 2023). The type of sprint stimulus also matters a meta analysis found that resisted, assisted and combined sprint training did not differ significantly from normal sprinting overall, although assisted sprinting had moderate effects on step frequency and short distance times (Myrvang & van den Tillaar, 2024). Hand touch ability also improved significantly in every experimental group and most in the combined group. Executing a hand touch requires the raider to approach the opponent rapidly, choose the right moment make accurate contact and recover efficiently so gains in movement speed, coordination, balance and timing are likely to have been transferred to this offensive skill. Better hand touch and toe touch performance after structured training has also been reported in women kabaddi players (Sureshkumar *et al.*, 2023). The sample was limited to women players from three colleges in Tamil Nadu only two variables were assessed and most kabaddi trials including those cited here, have been of fair methodological quality (González-Devesa *et al.*, 2026). Studies with larger samples additional skill variables and follow-up testing would strengthen these findings. Overall, the combined programme gave the most favourable results, indicating that integrating resistance based and ladder based exercises is a useful approach for developing physical and offensive skill performance in women kabaddi players.

V. CONCLUSION

1. Based on the findings it was evident that twelve weeks of weight training, ladder training and combined weight and ladder training brought about significant improvements in the selected physical and offensive skill performance variables of women kabaddi players.
2. Ladder Training (LTG) demonstrated significant effects in improving speed among women kabaddi players when compared with the control group.
3. Weight Training (WTG) produced significant improvements in speed and hand touch ability indicating its effectiveness in developing physical capacity and supporting offensive skill performance.
4. Combined Weight and Ladder Training (CTG) produced the most favourable improvements in both speed and hand touch ability when compared with the individual training programmes and control group demonstrating the advantage of integrating both training modalities.
5. Therefore, it is concluded that incorporating weight training, ladder training and particularly their combined application into regular kabaddi training programmes can be considered an effective approach for enhancing speed, hand touch ability and overall physical and offensive skill performance among women kabaddi players.

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