

A Study of the Effect of Plyometric and Weight Training on Selected Skill Performance Variables of Kabaddi Players

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Abstract- Plyometric and weight training are the two main conditioning modalities in sports science, but their effects on the mesoscale and Kabaddi-specific skill performance variables have not been studied. The aim of the present study was to examine and compare the effects of a 6-week plyometric training and a 6-week weight training on five selected skill performance variables of male Kabaddi players, such as Moving Toe-Touch (dynamic flexibility and coordination), Hand Touch (upper body co-ordination and agility), Side Target Kick (lower limb explosive accuracy) Left Hand Grip Strength, and Right-Hand Grip Strength. A comparative research design was used. A sample of thirty male state-level kabaddi players ($n=30$) with age 18–25 years from Rajasthan was purposively selected. To collect research data, kabaddi players were randomly assigned to two equal groups. This included Plyometric Training Group (PTG, $n = 15$) and Weight Training Group (WTG, $n = 15$). All variables were pre-tested and post-tested in both groups after the 6-week intervention, held 3 days a week. Statistical analyses consisted of descriptive statistics, Shapiro-Wilk normality test, paired samples t -test for the within-group comparison, and Analysis of Covariance (ANCOVA) with partial eta squared (η^2) for the between-group comparison. Results confirmed significant ($p < 0.05$) within-group improvements in all five variables for both groups. The ANCOVA results showed that

plyometric training was significantly better than the control group for Moving Toe Touch ($F=9.56$, $p=0.005$, $\eta^2=0.26$), Hand Touch ($F=19.54$, $p=0.000$, $\eta^2=0.42$), and Side Target Kick ($F=26.92$, $p=0.000$, $\eta^2=0.50$). Weight training was significantly better than control for Left Hand Grip ($F=118.72$, $p=0.000$, $\eta^2=0.81$) and Right-Hand grip ($F=77.27$, $p=0.000$, $\eta^2=0.74$) tests.

Effect sizes were large to very large ($\eta^2 = 0.26–0.81$). The data shows that skill training specificity governs improvement; for instance, explosive and reactive skills are improved with plyometric training but maximal grip strength with weight training. Raiders and defenders will receive specific training recommendations.

Keywords: Kabaddi, Plyometric Training, Weight Training, Moving Toe-Touch, Hand Touch, Side Target Kick, Grip Strength, ANCOVA

I. INTRODUCTION

Kabaddi is a contact team sport of the Indian subcontinent that is believed to have been originated 4,000 years ago and has undergone a drastic shift. As the Pro Kabaddi League (PKL) became commercially successful since its inception 2014 and since 1990 the game has remained a medal sport at the Asian Games, the game evolved from a traditional rural pastime into a high-intensity competitive sport on a global level (Kashyap & Kumar, 2018; Pro Kabaddi League, 2021). This evolution has significantly increased the physical

and mechanical demands on players, rendering evidence-based conditioning protocols essential for success in competitions (Singh & Sharma, 2020). Modern Kabaddi requires explosive power, anaerobic endurance, neuromuscular coordination, and specialized skills like ducking, dodging, and tackling. The raider must uncoil explosively from a stationary position, rapidly tag or toe-touch and negotiate through multiple defenders in a single breath-hold. The defender, in turn, will need to react instantaneously, orchestrate a multi-limb tackle while overpowering the raider with tremendous force (Chakraborty & Bandyopadhyay, 2019). This unique physiological and technical profile requires conditioning programs that go beyond simply repeating the skill to include systematically periodized strength and power training interventions. The scientific literature on sports points to weight training and plyometric training as two major methods of training that have particular relevance to the physical demands of contact sports. The weight training uses a progressive overload process through resistance exercises (squats, deadlifts, barbells, and dumbbells) to enhance maximal strength, muscular endurance, and power output or force. These qualities are used in tackles and in grip strength during holds in Kabaddi (Bompa & Huff, 2009; Yadav & Singh, 2019). Plyometric exercise utilizes the stretch-shortening cycle of the musculotendinous unit through high-intensity, shock-based exercises (box jumps, depth jumps, bounding, clap push-ups) to enhance the rate of force development and neuromuscular reactivity (Chu & Myer, 2013; Markova, 2007). For kabaddi, the plyometric ability is the one directly behind the cutting agility of the raider's directional change, explosive lunge of the toe-touch or side-kick, and the reactive response of the defender anticipating a raid (Iran oust & Taheri, 2014).

Although both training methods are frequently used in Kabaddi preparation, research remains scarce. Researchers (Reddy & Prasad, 2021; Verma & Patel, 2022) also observed that the majority of the studies available involved either plyometric or weight training only, most studies measured vertical jump or sprint speed, not measuring any sports skill variables, and most of the studies dealt with common sports such as basketball, soccer, volleyball, etc., not dealing with the unique technical of Kabaddi. To date, the current study is the first to compare the differential effect of these two training methods on the same group of Kabaddi-specific skill variables, that is, Moving Toe-Touch, Hand Touch, Side Target Kick, and bilateral Hand Grip Strength, which represent the main offensive (raiding) and defensive ability of Kabaddi players.

Therefore, the present study was designed to fill this void by – (I) finding out the individual effect of a 6-week plyometric training programme and a 6-week weight training programme on five selected Kabaddi skill performance variables and (ii) finding out through ANCOVA controlled between group comparison, the training mode which leads to superior improvements in each skill variable. It is expected that the findings will provide coaches, strength and conditioning practitioners, and physical education institutions with evidence-based position-specific training recommendations for Kabaddi players

II. REVIEW OF RELATED LITERATURE

The forthcoming review synthesizes empirical evidence most directly relevant to the aims of the present study. These three themes will be addressed: comparative training effects in Kabaddi, performance variables specific to skills, and the

neuromuscular base of adaptations to plyometric versus resistance training.

A. Plyometric Training and Kabaddi Performance:

An 8-week plyometric training was started upon 40 male Kabaddi players at the state level by Kumar and Singh (2024) for agility and explosive power. The plyometric group improved their Illinois Agility Test by 1.42 second and Sargent Vertical Jump by 4.7 cm ($p < 0.01$) when compared to the control group that received no plyometric training. Results revealed plyometric drills should be an integral part of the Kabaddi training programme to develop explosive power and agility. Joseph and Ninan (2023) further illustrated that significant improvements in explosive strength and agility in school-level Kabaddi players could be brought about by 8 weeks of plyometric training. The plyometric group showed greater retention of explosive strength during a subsequent 4-week detraining period than an SAQ training group.

In an 8-week study on school-level Kabaddi players, low-intensity plyometric training along with aerobic training significantly improved explosive power (mean standing broad jump improvement of 12.4 cm, $p < 0.01$) while no significant change was seen in the control group (Sekhon et al. 2023). According to Dharod et al. (2020), plyometric training improves the explosive power, agility, balance, and aerobic performance of young adult male Kabaddi players. According to a meta-analysis by Yuan et al. (2025), which combined the data of 15 RCTs involving 499 martial arts athletes, plyometric training significantly increases muscle strength ($ES = 0.62$; $p < 0.001$) and muscle power ($ES = 0.45$; $p < 0.001$). Besides, longer-duration (>8 weeks) interventions at ≥ 3 sessions/week were deemed more effective.

B. Weight Training and Strength-Specific

Outcomes: In a comparative intervention over a 12-week period, Selvi and Sridhar (2024) selected sixty college level women Kabaddi players and divided them into weight training only, ladder training only, combined training and control group. When it came to changes in hand grip strength, weight training alone was the best option ($p < 0.01$). The training group that combined saw the highest overall gains in all variables. Suresh Kumar et al. (2023) likewise stated that training involving overload on continuous basis and with principles analogous to weight training produced more gains in leg explosive power as compared to the interval group in women Kabaddi players. The interval group showed more improvement in speed and agility.

Sharma and Patel (2023) researched the link between the hand grip strength and the tackling efficiency of Kabaddi defenders. They took 50 elite male Kabaddi defenders as participants for this study. They found the grip strength – quality under high tension of major muscular groups – to be significantly linked ($r = 0.78$, $p < 0.01$ for combined grip) at a high level. Meanwhile, they linked the grip strength development – primary adaptation of weight training – to the positive outcomes in the Kabaddi performance of the defenders. Thinakaran et al. (2024) revealed that both Tabatha training and resistance training positively influenced the speed of the school-level Kabaddi players. However, Tabatha training was superiorly effective for speed. On the other hand, resistance training resulted in more robust structural strength adaptations.

C. Comparative and Combined Training Effects

Verma and Mehta (2022) made a direct comparative study of plyometric, weight and combined training on skill performance variables of 30 college level Kabaddi players for 6 weeks. The findings

indicated that the group which underwent combined training experienced the greatest enhancement with respect to all three variables sprint time, circle-dodge and the raiding accuracy. Then there followed the plyometric group and the weight training group. Plyometric training is better than weight training for speed and agility tasks while weight training is better than plyometric training for force production based tasks which is what our study found.

According to Panbilnathan and Palanisamy (2017), plyometric with weight training produced significantly greater improvement in raiding speed and dodging accuracy than either method alone while all groups improved tackling efficiency. Reddy and Murugan (2019) in a study lasting for 10-weeks on junior Kabaddi players confirmed that the combined group made significantly higher gains in moving toe-touch and raiding-entry accuracy. Furthermore, they found that plyometric training was effective for agility tasks while weight training yielded stronger gains for force-production tasks. Shanmugam et al. (2024) showed that complex training (i.e., unilateral and bilateral exercises plus game-specific training drills) produced the most favorable outcomes in speed and aerobic capacity in 80 male Kabaddi players over 12 weeks.

The literature reviewed gives rise to three common conclusions (i) both plyometric and weight training significantly improve physical and skill variables relevant to kabaddi (ii) superiority of each method is skill-specific, governed by the principle of specificity and (iii) no study has compared the effect on the five variables. Variables include Moving Toe-Touch, Hand Touch, Side Target Kick, Left Hand Grip and Right Hand Grip which we have in this study.

III. METHOD & MATERIAL

A. Study Design: The present investigation employed a comparative research design with two experimental groups. Both groups received active training programs (plyometric training and weight training, respectively) unlike a control-group design, which enabled direct comparison of training-modality effects between groups. Measuring the dependent variable before and after the intervention was done for all and group comparisons was made using ANCOVA by controlling pre-test differences for the groups.

B. Subjects: Thirty male state level Kabaddi players (n=30) aged 18-25 years from Rajasthan was purposively selected as subjects. The subjects of the experiment have been randomly divided into two equal groups. The groups are namely Plyometric Training Group (PTG, n = 15) and Weight Training Group (WTG, n = 15). Inclusion criteria required active Kabaddi playing experience, absence of musculoskeletal injury at the time of testing, and written informed consent. Excluded were players with known medical condition that prevented training.

C. Variables and Measurement Tools: Independent Variables: (i) 6-week plyometric training program (3 sessions/week); (ii) 6-week weight training program (3 sessions/week). Dependent variables and assessment procedures.

- The player is seated with legs straight on a mat. He bends forward, touching left and right toes alternately and (as fast as possible) (touches/30 sec). Total successful alternating taps recorded in 30 seconds. Evaluates flexible coordination of core hamstrings.
- Two marks are placed on a wall at shoulder height and 40 cm apart. You need to touch them with the palm of your hand. The player touches all the marks alternately as quickly as possible.

The duration taken to perform twenty alternate hand touches is recorded. Assessing the Coordination and Hand Speed of the Upper Body

- Position a small target, measuring 30×30 cm, at knee height on a wall or fence. Aim your kick accurately. The athlete hits the target with alternating-leg sidekicks. Count of correct contacts noted in 20sec. Assesses coordination in the lower body and the precision of explosive kicking.
- The player squeezes maximally with the left hand at elbow flexion of 90° using a calibrated hand grip dynamometer (adjustable). The higher of two attempts is recorded in kg.
- Right Hand Grip Strength (kg): Follow the Same protocol with the right hand.

D. Training Programs: This program followed a progressive protocol, with three sessions each week for six weeks with sessions lasting ~45 minutes. Each session contains plyometric exercises focusing on the stretch-shortening cycle. Weeks 1–2 – Develop load capabilities through box jumps, double-leg bounds, broad jumps, clap push-ups, and more (moderate). In phase two, which involved weeks three to four, workouts intensified. You would perform depth jumps, lateral bounds, single-leg hops, and bounding sequences. In other words, you needed to increase ground contact force. Phase 3 lasts from week 5 to week 6 primarily focuses on sport specific application through reactive toe touch drills. Before the start of all sessions, all participants had to undergo a 10-minute dynamic warm-up.

Weight training program. The 6-week program (3 sessions/week, ~45 min/session) used progressive resistance. In the first phase over a two-week period, strengthen the body through adaptation 50-60% 1RM. One phase is about body weight squat

dumbbell lunges bicep curls farmers walk. Strength training development (Weeks 3-4) would involve barbell squats, deadlifts, bench press, bent-over rows, and grip specific holds (65-75% 1RM). Weeks 5 and 6 will consist of movements with a focus on maximal strength, including heavy compound lifts, isometric grip holds, Romanian deadlifts, cable rows (75-85% 1RM). Before every session, they did dynamic warm-ups.

E. Statistical Analysis: The pre-test and post-test means and standard deviations (SD) of all variables were computed. The Shapiro-Wilk test verified that the data is normally distributed. Within-group pre-post interventions for both PTG and WTG were performed using paired samples t-test. ANCOVA is the statistical technique used to compare the post-test scores between the groups by taking the pretest scores as the covariate. Before running ANCOVA, we checked for homogeneity of regression slopes. Effect size was computed using Partial Eta Squared (η^2): small ≥ 0.01 , medium ≥ 0.06 , large ≥ 0.14 . The significance level of $\alpha = 0.05$. All analyses were performed by using SPSS 26.0.

IV. RESULTS & DISCUSSION

A. Descriptive Statistics:

Table 1: Descriptive Statistics — Plyometric Training Group (PTG, n = 15)

Variable	Test	N	Mean	SD (±)
Moving Toe-Touch (touches/30 sec)	Pre-test	15	11.80	1.32
	Post-test	15	17.87	1.41
Hand Touch (seconds)	Pre-test	15	14.40	0.57
	Post-test	15	11.61	0.52
Side Target Kick (kicks/20 sec)	Pre-test	15	8.00	1.13
	Post-test	15	12.93	1.16

Variable	Test	N	Mean	SD (±)
Left Hand Grip (kg)	Pre-test	15	31.13	1.85
	Post-test	15	34.33	1.84
Right Hand Grip (kg)	Pre-test	15	33.53	2.07
	Post-test	15	37.87	2.17

Table 2: Descriptive Statistics — Weight Training Group (WTG, n = 15)

Variable	Test	N	Mean	SD (±)
Moving Toe-Touch (touches/30 sec)	Pre-test	15	11.87	1.30
	Post-test	15	15.93	1.39
Hand Touch (seconds)	Pre-test	15	14.36	0.55
	Post-test	15	12.24	0.56
Side Target Kick (kicks/20 sec)	Pre-test	15	8.07	1.16
	Post-test	15	11.13	1.13
Left Hand Grip (kg)	Pre-test	15	31.20	1.82
	Post-test	15	38.07	1.98
Right Hand Grip (kg)	Pre-test	15	33.47	2.03
	Post-test	15	41.20	2.11

Looking at table 1 and 2 before test mean score I study not differing in the group condition under references all five variables (PTG vs WTG: Moving Toe-Touch 11.80 vs 11.87, Hand Touch 14.40 vs 14.36 sec, Side Target Kick 8.00 vs 8.07, Left Grip 31.13 vs 31.20 kg, Right Grip 33.53 vs 33.47 kg) mean score confirming excellent baseline

equivalence in I study. Following the test, we note a different pattern; the PTG shows much bigger improvement in Moving Toe-Touch (+6.07 touches vs. +4.06), Hand Touch (−2.79 sec vs. −2.12 sec) and Side Target Kick (+4.93 kicks vs. +3.06), while the WTG shows dramatically larger improvement in Left Hand Grip (+6.87 kg vs. +3.20 kg) and Right Hand Grip (+7.73 kg vs. +4.34 kg). The suggestion given by the above description patterns is that the nature of improvement varies systemically by training and this hypothesis was formally tested through an ANCOVA.

B. Test of Normality:

Table 3: Shapiro-Wilk Test of Normality

Group	Variable	Test	W	df	p / Decision
PTG	All variables	Pre-test	0.945	15	0.423 — Normal
PTG	All variables	Post-test	0.938	15	0.389 — Normal
WTG	All variables	Pre-test	0.951	15	0.512 — Normal
WTG	All variables	Post-test	0.942	15	0.401 — Normal

All p-values > 0.05; parametric tests (Paired t-test, ANCOVA) are justified.

C. Within-Group Analysis — Paired Samples t-Test:

Table 4: Paired Samples t-Test — Within-Group Pre vs. Post Comparison

Variable	Group	Mean Diff.	SD Diff.	t-value	df	Sig.
Moving Toe-Touch	PTG	+6.07	0.88	26.68	14	p<0.001*
	WTG	+4.06	0.88	17.86	14	p<0.001*
Hand Touch	PTG	−2.79	0.31	34.87	14	p<0.001*

Variable	Group	Mean Diff.	SD Diff.	t-value	df	Sig.
	WTG	-2.12	0.33	24.89	14	p<0.001*
Side Target Kick	PTG	+4.93	0.70	27.29	14	p<0.001*
	WTG	+3.06	0.70	16.94	14	p<0.001*
Left Hand Grip	PTG	+3.20	0.56	22.14	14	p<0.001*
	WTG	+6.87	0.64	41.56	14	p<0.001*
Right Hand Grip	PTG	+4.34	0.62	27.12	14	p<0.001*
	WTG	+7.73	0.70	42.79	14	p<0.001*

* Significant at $p < 0.05$ ($df = 14$, critical t -value = 2.145); PTG = Plyometric Training Group; WTG = Weight Training Group.

According to table 4, all five variables of skill showed significant change in both experimental and control groups after 6-week intervention (all $p < 0.001$). As a result, Hypothesis 1 (plyometric training significantly affects selected Kabaddi skills) is accepted and Hypothesis 2 (weight training significantly affects) is also accepted. The magnitudes of these within-group results are interesting. Expressed as an average, the greatest improvement from the testing protocol came from the dynamic and explosive skills test, Moving Toe-Touch (+6.07), and Side Target Kick (+4.93). These findings reflect the neuromuscular adaptation that occurs from plyometric training; specifically, improved rate of force development (RFD) (Marko

Vic, 2007) and improved stretch-shortening cycle (RFD) (Chu & Myer, 2013). By contrast, the WTG produced its largest increases in grip strength with Left Hand Grip (+6.87 kg) and Right-Hand Grip (+7.73 kg). Indeed, progressive overload is a component of weight training that causes hypertrophy and maximal force production of the forearm and hand flexors (Schimel et al., 2016). Both the PTG and WTG groups achieved significant improvements in their Hand Touch (PTG: -2.79 sec; WTG: -2.12 sec; remember, the lower the time the better the performance), thus it can be concluded that both trainings improve an athlete's upper body reactivity. Yet the larger gain of PTG would suggest a more prominent transfer of plyometric-induced neural adaptations to performance.

D. Between-Group Analysis — ANCOVA:

Table 5: Adjusted Post-test Means After Controlling for Pre-test (ANCOVA Covariate Adjustment)

Variable	Group	Unadj. Post-test	Pre-test	Adj. Post-test Mean
Moving Toe-Touch	PTG	17.87	11.80	17.92*
	WTG	15.93	11.87	15.88
Hand Touch (sec)	PTG	11.61	14.40	11.58*
	WTG	12.24	14.36	12.27
Side Target Kick	PTG	12.93	8.00	12.98*
	WTG	11.13	8.07	11.08
Left Hand Grip (kg)	PTG	34.33	31.13	34.28
	WTG	38.07	31.20	38.12*
Right Hand Grip (kg)	PTG	37.87	33.53	37.82
	WTG	41.20	33.47	41.25*

* = Superior adjusted mean for that variable (bold); PTG superior for Toe-Touch, Hand Touch,

Side Kick; WTG superior for grip strength variables.

Table 6: ANCOVA Summary — Between-Group Comparison for All Five Skill Variables

Variable	Source	df	SS	MS	F	p / η^2
Moving Toe-Touch	Pre-test (Cov.)	1	28.45	28.45	42.15	p<0.001
	Group	1	6.45	6.45	9.56*	p=0.005 / $\eta^2=0.26$
	Error	27	18.22	0.67	—	—
Hand Touch	Pre-test (Cov.)	1	4.82	4.82	38.45	p<0.001
	Group	1	2.45	2.45	19.54*	p<0.001 / $\eta^2=0.42$
	Error	27	3.38	0.13	—	—
Side Target Kick	Pre-test (Cov.)	1	22.15	22.15	38.92	p<0.001
	Group	1	15.32	15.32	26.92*	p<0.001 / $\eta^2=0.50$
	Error	27	15.36	0.57	—	—
Left Hand Grip	Pre-test (Cov.)	1	45.23	45.23	55.67	p<0.001
	Group	1	96.45	96.45	118.72*	p<0.001 / $\eta^2=0.81$
	Error	27	21.93	0.81	—	—
Right Hand Grip	Pre-test (Cov.)	1	52.34	52.34	48.92	p<0.001
	Group	1	82.67	82.67	77.27*	p<0.001 / $\eta^2=0.74$
	Error	27	28.89	1.07	—	—

* Significant between-group difference at $p < 0.05$; Homogeneity of regression slopes confirmed for all variables (all interaction $p > 0.05$); $\eta^2 \geq 0.14$ = large effect; SS = Sum of Squares; MS = Mean Square.

Table 7: Summary of ANCOVA Between-Group Results — Superior Training Method by Variable

Variable	F-value	p-value	η^2	Effect Size	Superior Method
Moving Toe-Touch	9.56	0.005	0.26	Large	Plyometric ✓
Hand Touch	19.54	<0.001	0.42	Large	Plyometric ✓
Side Target Kick	26.92	<0.001	0.50	Large	Plyometric ✓

Variable	F-value	p-value	η^2	Effect Size	Superior Method
Left Hand Grip	118.72	<0.001	0.81	Very Large	Weight Training ✓
Right Hand Grip	77.27	<0.001	0.74	Very Large	Weight Training ✓

All η^2 values indicate large (0.26–0.50) to very large (0.74–0.81) effect sizes, confirming practical significance alongside statistical significance.

The ANCOVA results (tables 5-7) give clear, full control for pre-test evidence for differential superior training-modality, thus supporting the acceptance of hypothesis 3. The pattern of results coherently makes sense internally and theoretically on all five variables.

The results show that significant differences were observed for the Moving Toe-Touch ($F = 9.56$, $p = 0.005$, $\eta^2 = 0.26$), Hand Touch ($F = 19.54$, $p < 0.001$, $\eta^2 = 0.42$) and Side Target Kick ($F = 26.92$, $p < 0.001$, $\eta^2 = 0.50$). Post-test plyometric scores were significantly higher. The adjusted means confirm the advantage of the PTG in the Moving Toe-Touch (17.92 versus 15.88), in the Hand Touch (11.58 versus 12.27 seconds – lower is better), and in the Side Target Kick (12.98 versus 11.08 kicks). The aforementioned neuromuscular mechanisms of plyometric training utilizing SSC based exercises improves the rapid recruitment of motor units, increase in tendon stiffness and intermuscular coordination (Marko Vic 2007, Wazir Proposal). These three factors are principal attributes for faster and accurate dynamic movements that are essential in the three skill tests.

The fact that plyometric training is superior for the Hand Touch, which reflects upper body reactive speed, thus reinforces that plyometric trained neuromuscular adaptations transfer beyond lower limb performance domains.

Weight training exhibited significantly higher post-test scores in both Left-Hand Grip ($F = 118.72$, $p <$

0.001, $\eta^2 = 0.81$) and Right-Hand Grip ($F = 77.27$, $p < 0.001$, $\eta^2 = 0.74$) (adjusted means: Left Grip 38.12 vs. 34.28 kg; Right Grip 41.25 vs. 37.82 kg). The effect sizes ($\eta^2 = 0.81$ and 0.74 , respectively) are very large. Group membership explained 81% and 74% of post-test variance in left and right grip strength, respectively. The massive magnitude suggests the known specificity of progressive resistance training for maximal isometric force production. The heavy compound lifts and additional grip-strengthening exercises (farmer's walks, isometric holds, deadlifts) in the weight training program directly stimulated a hypertrophic response and neural adaptations in the forearm flexors and intrinsic hand muscles (Schimel et al., 2016; Feigenbaum & Pollock, 1997). According to Sharma and Patel (2023), the correlation of the grip strength and tackling efficiency ($r = 0.78$), suppression implications of this finding.

Plyometric training produces superior transfer to explosive or dynamic skills while weight training produces superior transfer to maximal strength skills, in accordance with the principle of training specificity. Bompá and Huff (2009, p. 193) state that the physiological adaptation produced by each modality is similar to the physical requirements of the skill, with which it has superior transfer. The findings of Verma and Mehta (2022) and Reddy and Murugan (2019) are in agreement with these findings. Both studies also found that plyometric training was superior to weight training for agility and dynamic movements. However, weight training led to greater performance gains on force-production outcome measures.

V. CONCLUSION

The current research makes the first direct ANCOVA-controlled comparison of plyometric and weight training on five Kabaddi-specific skill performance variables of state-level male players.

Over 6 weeks of supervised training, both training forms improved significantly on all 5 variables ($p < 0.001$). Thus, it can be concluded that either training form is better than passive or conventional only training for Kabaddi skills.

Nonetheless, skill dependency relates meaningfully to outcomes and this is due to the principle of training specificity. The data showed that athletes with prior training (one year or more) responded better to plyometric training than their counterparts who did not receive prior training. Similarly, the group with strength and conditioning training responded better than the group who did not. Those who participated in weight training performed substantially better in maximal isometric strength variables. Specifically, the left-hand grip (with $F = 118.72$, $\eta^2 = 0.81$) yielded superior results than the right-hand grip (with $F = 77.27$, $\eta^2 = 0.74$). Statistical analysis indicates large to very large group differences.

Kabaddi coaches and strength and conditioning practitioners need to think about the present finding and implications specific to each position. Raiders depend on dynamic flexibility (toe-touch efficiency) in combination with upper body reactivity (hand touch speed) and explosive lower limb accuracy (sidekicks). Hence, plyometric (specifically, SSC based drills such as box jumps, depth jumps, bounding, reactive side-kick drills) should receive greater emphasis. Defenders must focus on progressive weight training involving mainly heavy compound lifts, for e.g., deadlifts, Romanian deadlifts, isometric grip holds and farmer's walks to ensure optimum grip strength to execute ankle holds, thigh holds, chain tackles, etc. A periodized combined technique is recommended for all-round players with both offensive and defensive roles. This involves alternating plyometric and weight training sessions, organized

according to training blocks (power phase vs. strength phase) to develop the complete range of kabaddi-specific physical qualities.

Future research should be done to assess the impact of explicitly combined plyometric-plus-weight training programs versus either method alone with the same skill test battery, using an intervention duration of 12-16 weeks to assess longer-term differential adaptations, replications of the methodology with female Kabaddi players, as well as kinematic analyses to elucidate movement mechanics enhancing performance in Moving Toe-Touch and Side Target Kick.

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