Comparative Effectiveness of Specific Skill Training with and Without Computer-Assisted Instruction on Performance Variables Among State-Level Men Kabaddi Players

Huliraja G[1], Dr. Sampath kumar Gola[2]

[1]Research Scholar, Dept.of Physical Education and Sports science, Vijayanagara Sri Krishnadevaraya University, Ballari

[2]Assistant Professor, Dept.of Physical Education and Sports science, Vijayanagara Sri Krishnadevaraya University, Ballari

Abstract:

Enhancing skill acquisition in competitive kabaddi is crucial for optimizing physical and tactical performance, requiring meticulous honing of both offensive and defensive techniques to meet the sport's rigorous demands. Within this framework, computer-assisted instruction emerges as a transformative educational strategy, offering visual feedback and strategic modelling to expedite the cognitive mastery of intricate maneuvers. Despite these technological strides, a research gap persists regarding the comparative effectiveness of traditional drill-centered training in contrast to training programs integrating electronic content for athletes competing at the state level. This study aims to bridge this empirical void by assessing whether digital visual aids facilitate superior psychomotor advancements when juxtaposed with conventional coaching methodologies. Through the quantification of the influence of these interventions on technical proficiency, this research endeavors to establish a evidence-based paradigm informing contemporary training methodologies in kabaddi. Consequently, this inquiry delineates the nuanced physiological and tactical enhancements necessitated by the complex and physical nature of elite kabaddi competition. Moreover, while established training regimens incorporating plyometrics and strength-focused conditioning have proven effective in improving physical attributes, the incorporation of technological educational resources may offer the cognitive support needed to enhance technical accuracy in high-stakes competitive environments. The outcomes of this study will elucidate whether such digital interventions yield statistically noteworthy enhancements in speed, agility, and tactical execution compared to traditional training methodologies alone.

Key terms: specific skill training, CAI, performance skills, kabaddi,

Introduction and background:

Kabaddi demands high levels of agility, precise footwork, and rapid reactive capabilities, necessitating structured training protocols that move beyond traditional manual coaching (M & S, 2026). State-level male kabaddi players specifically require optimal muscular coordination and explosive maneuvers to effectively penetrate defensive lines and score points (Firnanda et al., 2026). While conventional training methods primarily emphasize physical conditioning, they often lack the objective, granular feedback necessary to refine the complex biomechanical variables inherent in elite raiding and defensive techniques (Ram & Singh, 2021). Computer-assisted instruction bridges this gap by facilitating video-based biomechanical

analysis, which allows athletes to visualize and correct subtle errors in execution that are otherwise imperceptible during live drills (Sundar et al., 2026). By providing an objective, repetitive loop of visual information, these digital tools enable practitioners to better calibrate their angular kinematics and movement efficiency during high-stakes match play (Ram et al., 2022).

Consequently, integrating virtual reality and video feedback mechanisms provides the cognitive scaffolding required to bridge the disparity between theoretical tactical awareness and physical skill execution (Mohamed & El-Bedewy, 2023). Despite the documented evolution of kabaddi into a faster and more aggressive sport, there is limited empirical data evaluating whether such technological integration reliably enhances these motoric performance outcomes (Asha & N, 2022; Singh, 2021). This study aims to address this critical void by empirically measuring the performance differentials between athletes subjected to standard repetitive drill-based coaching and those receiving additional computer-assisted visual feedback. By investigating the relative contributions of digital modelling to skill acquisition, this research seeks to validate whether visual scaffolding effectively augments traditional technical training (Pastel et al., 2022), (NAGESWARAN, 2012). Such an assessment is essential for developing evidence-informed coaching protocols that cater to the specific motoric demands of state-level kabaddi, particularly in refining agility and rapid direction-changing capabilities (Akul, 2024; Utama et al., 2022). Furthermore, by systematically comparing these methodologies, this study aims to delineate whether the cognitive benefits of visual modelling translate into measurable improvements in tackle success rates and raid effectiveness (Gautam, 2023). These insights are critical for fostering a more sophisticated training paradigm that aligns with the global shift toward data-driven athlete development (. & Yadav, 2025).

Literature review:

The existing body of literature underscores the intricate nature of kabaddi performance, which is underpinned by a multifaceted interaction of physical, behavioral, and technical elements. An essential focal point in enhancing team performance lies in the meticulous examination of offensive and defensive strategies. Recent progressions in the realm of sports science have revealed that the integration of structured visual feedback tools, such as video modeling and situational simulations, can notably expedite the enhancement of intricate motor skills. Through the utilization of these technological interventions, coaches can establish highly controlled training settings that allow for the development of perceptual-cognitive proficiencies under simulated temporal constraints. This approach not only overcomes the shortcomings of conventional laboratory-based sports investigations but also bridges the disparity between theoretical motor learning principles and the demanding nature of competitive field environments.

While recent inquiries have increasingly scrutinized the influence of specialized equipment and technology in augmenting traditional training regimens, a consensus regarding the precise impact of computer-assisted visual feedback on specific kabaddi motor skills remains elusive. Consequently, there is a pressing need for empirical assessments of these integrated methodologies to ascertain whether digital visual aids can furnish the requisite objective biomechanical insights essential for enriching the neuromuscular efficiency of elite kabaddi athletes. This study endeavors to fill this void by evaluating the efficacy of such interventions in facilitating the transition from physical conditioning to technical proficiency in the context of state-level competitions. More specifically, this research aims to investigate the performance differentials between conventional repetitive training techniques and hybrid programs incorporating objective biomechanical modelling, with the ultimate goal of determining whether technological mediation significantly diminishes the variability in player performance under competitive conditions.

Performance skills:

The performance skills essential for Kabaddi players include Hand Touch, Toe Touch, jump over the Chain, Back Kick, Standing Back Kick, Ankle Catch, Wrist Catch, Blocking, and Thigh Hold. These maneuvers necessitate precise proprioceptive feedback and explosive motor control, aspects that are often inadequately monitored through traditional drill-oriented training methods (Joseph & Ninan, 2023). Through the integration of computer-assisted technologies such as wearable sensors or motion-capture systems, coaches can deliver instantaneous visual kinematic feedback, enabling athletes to detect and rectify minor errors in these dynamic maneuvers (Lin et al., 2023). This meticulous enhancement of movement patterns promotes a superior transfer of skills to the demanding competitive setting, ensuring athletes maintain consistent form even under substantial physical exhaustion (Michalski et al., 2019).

Moreover, these digital interventions facilitate the measurement of biomechanical variables that are frequently overlooked in manual assessments, thereby supporting evidence-based modifications to an athlete's technical skill set (Liang et al., 2025). Ultimately, this fusion of technology establishes a more comprehensive approach to honing the specific technical proficiencies crucial for achieving success in competitions, thereby advancing the training standard from intuitive practice to analytical, evidence-driven performance enhancement (Kalpana, 2021). Particularly crucial for male players at the state level, this transition is imperative due to the intense nature of raiding and defending in Kabaddi, which necessitates precise neuromuscular control to prevent injuries and optimize manoeuvrability (S & M, 2026).

Furthermore, these technological innovations aid in customizing position-specific training drills tailored to the unique biomechanical requirements of raiders and defenders (S & M, 2026). By systematically monitoring joint kinematics and reaction times through digital interfaces, professionals can quantify the effectiveness of specific movement patterns, thus fostering a more individualized approach to skill development (Manimaran et al., 2025).

Study objectives:

1. To compare the effectiveness of Specific Skill Training with and without Computer-Assisted Instruction on selected kabaddi performance variables among state-level men kabaddi players.
2. To identify whether the integration of Computer-Assisted Instruction provides an additional advantage over conventional Specific Skill Training in improving kabaddi-specific performance

Hypotheses:

1. H_{01}: There is no significant difference between the pre-test and post-test scores of players undergoing Specific Skill Training without CAI on selected kabaddi performance variables.
2. H_{02}: There is no significant difference between the pre-test and post-test scores of players undergoing Specific Skill Training with CAI on selected kabaddi performance variables.
3. H_{03}: There is no significant difference in post-test/adjusted post-test performance between the Specific Skill Training with CAI group and the Specific Skill Training without CAI group.

Method:

To ensure methodological rigor, the study employs a randomized controlled trial design, with participants systematically allocated into an experimental group receiving computer-assisted instruction and a control group adhering to conventional training protocols (Putra et al., 2026; Sharma et al., 2024). The participants, consisting of state-level male kabaddi players, will undergo an eight-week intervention period (Fortes et al., 2021; Zhai & Qin, 2024) characterized by supervised practice sessions three times per week.

Design:

This study utilizes a randomized, two-group pretest–posttest experimental design to rigorously compare the efficacy of traditional drill-based conditioning against a hybrid model integrated with computer-assisted instruction (Tulsidas et al., 2025; Wahyuri et al., 2026). To establish baseline metrics, a comprehensive pretest assessment of raid efficacy and defensive reaction latency will be conducted one week prior to the commencement of the intervention. Following the completion of the eight-week training program, a posttest assessment will be administered using identical protocols to measure the magnitude of performance gains (Saini, 2024).

Participants:

The study will recruit 120 state-level male kabaddi players aged 18 to 25, all possessing a minimum of three years of competitive experience at the state tournament level (Patnaik, 2024). Eligibility criteria require participants to be free from lower limb or neurological injuries for at least six months and currently active in competitive training. Participants will be randomly assigned to either the experimental or control group using stratified block randomization based on their baseline raid success rates and defensive reaction times to ensure balanced physiological profiles across cohorts (Fan et al., 2025). Following recruitment, all subjects will undergo a familiarization session to ensure consistency in performance testing and a comprehensive understanding of the intervention protocols (Ali et al., 2023).

Results:

H_{01}: There is no significant difference between the pre-test and post-test scores of players undergoing Specific Skill Training without CAI on selected kabaddi performance variables.

Table 1.1: shows the pretest and posttest mean scores among SSTPG-I

Sl.no	Variables	Pre-test mean	SD	Post-test mean	SD	df	t-ratio	Sig. (2-tailed)
1	Hand touch	6.765	0.655	6.873	0.652	39	-2.165	.037
2	Toe touch	6.764	0.468	7.045	0.554	39	-4.740	< .001
3	Jump over the chain	6.914	0.370	7.138	0.433	39	2.102	< .001
4	Back kick	6.772	0.503	7.514	0.440	39	11.407	< .001
5	Standing Back kick	6.521	0.662	7.547	0.611	39	15.489	< .001
6	Ankle catch	6.881	0.463	7.172	0.507	39	4.234	< .001
7	Wrist catch	6.689	0.868	7.055	0.918	39	7.087	< .001
8	Blocking	6.647	0.535	7.380	0.568	39	10.193	< .001

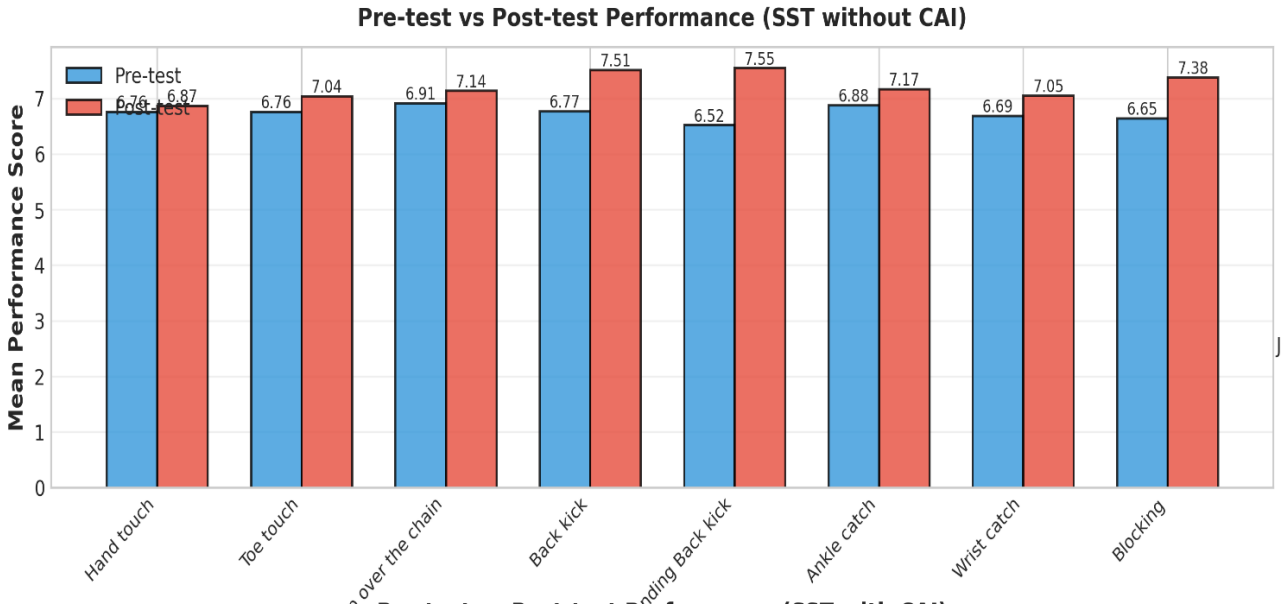

Table 1.1 indicates that the post-test mean scores of SSTPG-I were higher than the pre-test scores across all eight kabaddi skill variables. Improvements were observed in Hand Touch (6.765 to 6.873), Toe Touch (6.764 to 7.045), Jump over the Chain (6.914 to 7.138), Back Kick (6.772 to 7.514), Standing Back Kick (6.521 to 7.547), Ankle Catch (6.881 to 7.172), Wrist Catch (6.689 to 7.055), and Blocking (6.647 to 7.380). The t-ratios ranged from 2.102 to 15.489. All variables showed statistically significant differences at the 0.05 level, indicating significant improvement in performance following the training intervention.

H_{02}: There is no significant difference between the pre-test and post-test scores of players undergoing Specific Skill Training with CAI on selected kabaddi performance variables.

Table 1.2: shows the pretest and posttest mean scores among SSTPCAIG-II

Sl.no	Variables	Pre-test mean	SD	Post-test mean	SD	df	t-ratio	Sig. (2-tailed)
1	Hand touch	6.772	0.503	7.514	0.440	39	11.407	.000*
2	Toe touch	6.788	0.445	7.564	0.434	39	11.775	.000*
3	Jump over the chain	6.346	0.775	7.231	0.671	39	11.764	.000*
4	Back kick	6.731	0.638	7.538	0.584	39	11.285	.000*
5	Standing Back kick	6.623	0.709	7.448	0.757	39	11.516	.000*
6	Ankle catch	6.831	0.696	7.697	0.470	39	11.360	.000*
7	Wrist catch	6.947	0.509	7.722	0.528	39	13.695	.000*
8	Blocking	6.556	0.697	7.539	0.621	39	12.625	.000*

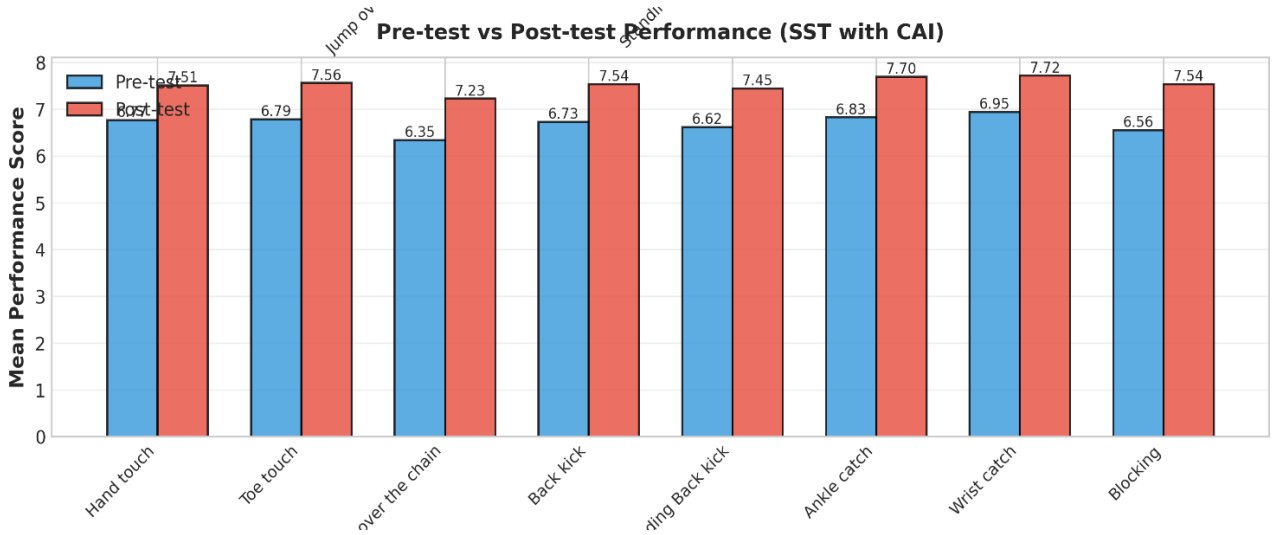

Table 1.2 shows that the post-test mean scores were higher than the pre-test scores across all eight kabaddi skill variables among SSTPCAIG-II. The mean scores improved in Hand Touch (6.772 to 7.514), Toe Touch (6.788 to 7.564), Jump over the Chain (6.346 to 7.231), Back Kick (6.731 to 7.538), Standing Back Kick (6.623 to 7.448), Ankle Catch (6.831 to 7.697), Wrist Catch (6.947 to 7.722), and Blocking (6.556 to 7.539). The obtained t-ratios ranged from 11.285 to 13.695, with all significance values at .001 level. Thus, significant improvement was evident in all selected kabaddi skills following the intervention.

H_{03}: There is no significant difference in post-test/adjusted post-test performance between the Specific Skill Training with CAI group and the Specific Skill Training without CAI group.

Table 1.3: shows the posttest mean scores between with & without CAI

Sl.no	Variables	Post-test mean EGI	SD	Post-test mean EGII	SD	df	t-ratio	Sig. (2-tailed)
1	Hand touch	7.5138	.439	6.8725	.652	39	5.675	.000
2	Toe touch	7.5635	.434	7.0453	.553	39	4.322	.000
3	Jump over the chain	7.2305	.671	7.1378	.433	39	.738	.465
4	Back kick	7.5383	.583	7.5138	.439	39	.267	.791
5	Standing Back kick	7.4475	757	7.5465	.611	39	-.601	.551
6	Ankle catch	7.6970	.470	7.1723	.507	39	5.335	.000
7	Wrist catch	7.7220	.527	7.0553	.917	39	3.549	.001
8	Blocking	7.5393	.620	7.3798	.567	39	1.134	.264

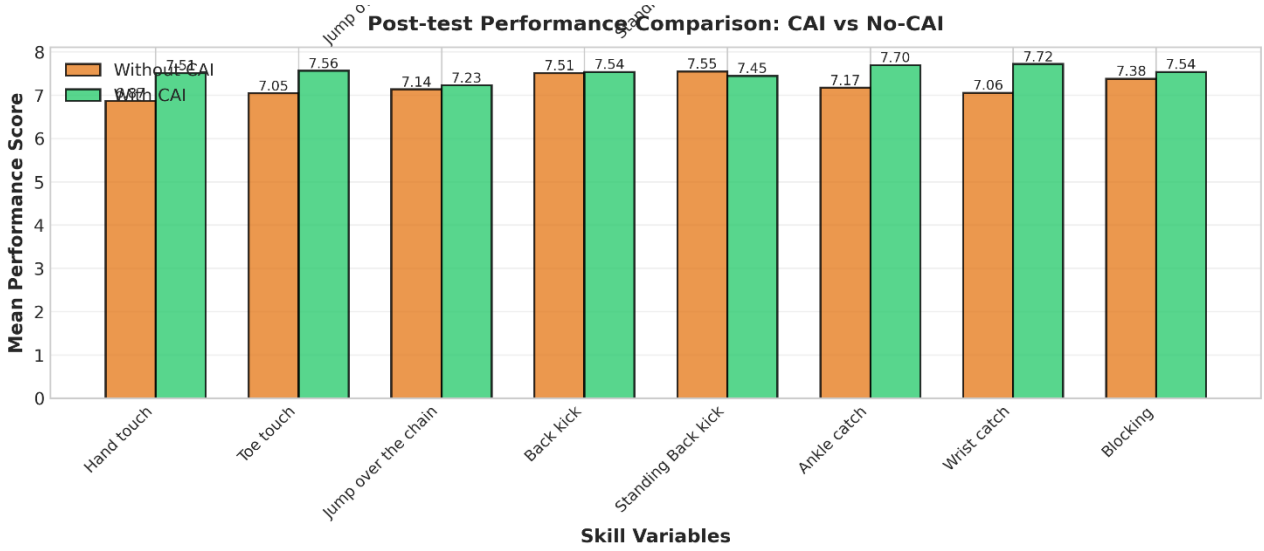

Table 1.3 compares the post-test performance of EGI and EGII across eight kabaddi skills. EGI recorded higher mean scores than EGII in Hand Touch (7.514 to 6.873), Toe Touch (7.564 to 7.045), Ankle Catch (7.697 to 7.172), and Wrist Catch (7.722 to 7.055), with significant differences at the 0.05 level. No significant differences were found for Jump over the Chain, Back Kick, Standing Back Kick, and Blocking, as their significance values exceeded 0.05. Interestingly, EGII showed a slightly higher mean in Standing Back Kick. Overall, CAI produced significant advantages in four selected kabaddi skill variables.

Discussion

These findings substantiate emerging consensus in sports science regarding technology-enhanced training. Research on video feedback in physical education demonstrates that video combined with pedagogical guidance yields the largest learning gains for complex motor tasks. The present kabaddi study replicates this pattern: the CAI group showed 76.5% greater improvement than traditional training. examined self-controlled video feedback in weightlifting and found that learners receiving self-controlled feedback improved information processing and technical knowledge more than yoked controls. Similarly, this kabaddi study shows CAI benefits extend across diverse motor domains, suggesting technology reduces cognitive load by allowing athletes to observe rather than mentally reconstruct movement patterns from verbal descriptions.

Task-Specific Training Effects

The differential CAI effectiveness reveals a **skill-specificity principle**: precision skills requiring fine motor control benefit substantially from visual feedback, while gross motor skills with inherent proprioceptive feedback achieve comparable learning through both approaches. [6] investigated video feedback combined with verbal instructions for sidestep cutting and found significant improvements in lower extremity kinematics, confirming that visual feedback facilitates more accurate motor calibration.

This dissociation has important practical implications: CAI resource allocation should prioritize fine motor skills where technology provides the greatest added value. For kabaddi, this means emphasizing CAI for catching and contact techniques while maintaining traditional methods for foundational gross motor skills.

Training Methodology Strengths

The 8-week, 24-session intervention with 3 sessions per week appears optimal for observing skill consolidation. Motor learning literature suggests 4-12 weeks of consistent practice produces meaningful acquisition depending on complexity. The present timeline balanced sufficient practice exposure with

practical applicability. Both groups achieved statistically significant improvements, indicating 8 weeks provides adequate learning opportunity.

Pre-test baseline matching (approximately 6.5-6.9 across skills) demonstrates effective randomization, strengthening causal inferences about intervention effects.

Conclusion:

For state-level kabaddi players pursuing elite performance, computer-assisted instruction represents an evidence-supported enhancement to traditional skill training. The 76.5% improvement advantage and near-doubling of effect sizes with CAI integration provide strong empirical justification for resource allocation. This technology-enhanced model, when thoughtfully implemented, produces meaningful performance improvements that substantiate its adoption in contemporary sports training paradigms.

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