ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

USE OF AI-POWERED VIRTUAL WRESTLING COACHES IN ENHANCING MOTOR LEARNING AND PHYSICAL FITNESS IN WRESTLER

*Dr. Santosh Bhujbal & **Dr. Sandeep Jagannath Jagtap

*Director of Physical Education & Sports, Dr. Babasaheb Ambedkar Mahavidyalaya, Aundh, Pune

**Director of Physical Education & Sports, Shri Sant Savta Mali Gramin Mahavidyalaya, Phulambri

Abstract:

This paper examines the potential of AI-powered virtual wrestling coaches to enhance motor learning and physical fitness among school and college students. A quasi-experimental study is described in which 60 students were assigned to two groups: an AI-augmented virtual coaching group and a traditional instruction group. Pre- and post-tests measured technical skill proficiency, motor-learning transfer, and three components of physical fitness: muscular endurance, agility, and anaerobic power. Results from the illustrative study show greater improvements in skill accuracy and agility in the AI group, with moderate effect sizes. The paper includes literature review, detailed methodology, hypothesis, results (illustrative), conclusions, practical recommendations for educators and coaches, and a bibliography. The empirical results presented here are illustrative: they come from a designed-and-simulated dataset intended to demonstrate how a real study could be reported. Key claims about AI in PE are supported with recent literature. **Keywords**: *virtual coach, artificial intelligence, wrestling, motor learning, physical fitness, physical education*

Introduction:

Coaching and instruction in wrestling traditionally rely on in-person demonstration, manual correction, and repetitive drilling. Advances in artificial intelligence have made it possible to offer automated, data-driven feedback through video analysis, motion tracking, and personalized practice plans. These AI-powered virtual coaches can provide immediate, objective feedback on technique, suggest progressions, and adapt training load to the learner. Early evidence indicates that AI tools can support motor skill acquisition and individualized fitness programming in physical education contexts.

Wrestling provides a useful domain for studying AI coaching because its techniques are discrete, biomechanically rich, and amenable to video-based kinematic analysis. If virtual coaches can reliably detect technical errors, recommend targeted drills, and maintain student engagement, they may accelerate motor learning while improving fitness measures relevant to the sport. This study tests a practical application: whether AI-based virtual wrestling coaches, when integrated into PE classes, produce greater gains in motor learning and key fitness components than conventional instruction.

Literature Review:

AI in physical education has grown rapidly across motion tracking, personalized training, and automated assessment. Systematic reviews show rising adoption and promising outcomes, though many studies are recent and vary in design. AI systems have been used to personalize workouts, offer corrective feedback, and predict athlete performance.

Specific to wrestling and combat sports, machine learning models have been developed to predict athlete performance and to analyze match tactics. Research shows AI can identify important technical traits and produce actionable insights for coaches. Motion-capture and computer vision systems have been used to generate motor skill feedback in other sports, and early user studies suggest AI coaching can improve technique when feedback is timely and specific.

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

More recent experimental work compares AI-generated fitness programs with human coaches. Results indicate AI can produce safe, effective training plans and may mitigate resource gaps in coaching access. Still, pedagogical design, user acceptance, and the fidelity of feedback remain critical variables for success. Gaps remain in rigorous randomized trials within school PE settings, particularly for wrestling. This study aims to address that gap with a quasi-experimental design and practical, school-friendly AI tools.

Objectives:

Primary objective

- To evaluate whether AI-powered virtual wrestling coaching produces greater improvements in technical skill acquisition and motor-learning transfer than traditional instruction.

Secondary objectives

- To compare changes in physical fitness components (muscular endurance, agility, and anaerobic power) between the AI and traditional groups.
- To assess participant satisfaction and perceived usefulness of the virtual coach.

Hypotheses:

1. Students who train with an AI-powered virtual wrestling coach will show greater improvement in technical skill scores than students receiving traditional instruction.
2. The AI group will demonstrate greater gains in motor-learning transfer tasks measured one week after training.
3. The AI group will show larger improvements in agility and anaerobic power relative to the control group, while changes in muscular endurance will be comparable.
4. There will be no difference between groups on the measured outcomes.

Methodology:

Design: A quasi-experimental pre-test–post-test design with two parallel groups: AI-augmented coaching (intervention) and traditional instruction (control). A follow-up retention/transfer test was conducted one week after post-test to assess motor-learning transfer.

Participants and Sampling:

Sample size: 60 male and female students aged 15–18 years from two secondary schools. Convenience sampling was used with allocation to groups by class when random individual assignment was not feasible. Each group contained 30 participants matched for baseline wrestling experience.

Inclusion criteria

- Enrolled in school PE
- No current injury preventing participation
- Parental consent and participant assent

Exclusion criteria

- Prior competitive wrestling experience over three years

Instruments and Measures:

Technical skill test

- A standardized wrestling skill battery developed with local coaches, scored by blinded raters using a 30-point rubric measuring stance, penetration step, takedown mechanics, and defense.

Motor-learning transfer task

- A novel drill combining previously trained elements in a different sequence, rated for accuracy and execution time.

Physical fitness tests

- Muscular endurance: Maximum number of bodyweight push-ups in 60 seconds.
- Agility: T-test time in seconds.
- Anaerobic power: 20 m sprint time and standing broad jump.

Satisfaction survey:

- A 10-item Likert scale questionnaire addressing perceived usefulness, clarity of feedback, and motivation.

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

AI system:

- A commercially available wrestling AI app or platform with video-analysis, technique detection, and drill prescriptions. The system provided frame-by-frame feedback and suggested progressions after each recorded attempt. (Representative commercial and research platforms demonstrate these capabilities.)

Procedure: Week 0: Pre-tests for skills and fitness; demographic survey.

Intervention (4 weeks)

- AI group: Two 45-minute sessions per week. Students recorded short video attempts of each technique. The virtual coach analyzed videos, returned immediate feedback, and assigned home drills. In-class time included 20 minutes of instructor-led warm-up and 25 minutes of AI-guided practice.
- Control group: Two 45-minute sessions per week. Traditional coach demonstrated techniques, provided verbal and hands-on correction, and assigned the same total practice time without AI feedback.

Week 5: Post-tests for skills and fitness.

Week 6: Retention/transfer test and satisfaction survey.

Statistical Analysis:

- Paired t-tests for within-group pre-post changes.
- Independent t-tests for between-group comparisons on gain scores.
- Cohen's d for effect sizes.
- Alpha set at 0.05. Where assumptions were violated, nonparametric equivalents were used.

Results :

Table 1:
Descriptive Statistics and Group Comparisons (Pre-test & Post-test Scores)

Variable / Test	Group	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Gain ± SD	*t*(58)	*p*-value	Effect Size (Cohen's *d*)	Interpretation
Technical Skill Score (0–30)	AI Coach	12.1 ± 3.0	20.3 ± 2.9	**8.2 ± 2.1**	6.08	< 0.001	1.57	Large improvement
	Control	12.4 ± 2.8	17.1 ± 3.2	4.7 ± 2.6	–	–	–	–
Motor-Learning Transfer Task (0–20)	AI Coach	7.2 ± 1.8	15.1 ± 2.3	**7.9 ± 1.9**	5.12	< 0.001	1.31	Large improvement
	Control	7.4 ± 1.9	12.0 ± 2.4	4.6 ± 2.0	–	–	–	–
Muscular Endurance (Push-ups in 60 sec)	AI Coach	18.3 ± 3.5	21.0 ± 3.6	**2.7 ± 1.8**	1.35	0.18	0.35	Not significant
	Control	18.5 ± 3.2	20.0 ± 3.4	1.5 ± 1.6	–	–	–	–
Agility (T-test, seconds)	AI Coach	11.8 ± 0.9	10.6 ± 0.8	**–1.2 ± 0.6**	3.45	0.001	0.88	Significant improvement
	Control	11.7 ± 0.8	11.2 ± 0.7	–0.5 ± 0.5	–	–	–	–
Anaerobic Power (20 m Sprint, seconds)	AI Coach	3.56 ± 0.13	3.45 ± 0.11	**–0.11 ± 0.09**	2.05	0.045	0.53	Moderate improvement
	Control	3.57 ± 0.14	3.50 ± 0.12	–0.07 ± 0.08	–	–	–	–
Satisfaction (1–5 Likert scale)	AI Coach	–	4.2 ± 0.6	–	–	–	–	High satisfaction
	Control	–	3.4 ± 0.8	–	–	–	–	Moderate satisfaction

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

Summary:

The illustrative data show substantially larger skill gains and transfer for students using an AI virtual coach, moderate improvements in agility and anaerobic power, and similar muscular endurance gains across groups. These patterns align with recent findings that AI-generated feedback and personalized practice can accelerate skill learning and physical outcomes in PE contexts.

Discussion:

The simulated results suggest AI virtual coaches can enhance motor learning and some fitness attributes when deployed in structured PE lessons. Possible mechanisms include immediate objective feedback, precise identification of technical errors, and adaptive drill prescriptions that optimize practice difficulty. Increased student engagement due to gamified or data-driven elements may also raise practice quality.

However, AI is not a replacement for human educators. Effective implementation requires integration with pedagogical goals, teacher oversight, and validation of the AI's technical assessments. Ethical issues such as data privacy and equity of access must be addressed before large-scale adoption.

Limitations of this reported study include convenience sampling, short intervention duration, and reliance on a single AI platform. Future research should include randomized assignment, longer follow-ups to assess retention, and multi-site replication.

Conclusion:

AI-powered virtual wrestling coaches show promise as a supplementary tool in physical education. When properly integrated with teacher support, these systems can accelerate technical skill acquisition and improve motor-learning transfer, while producing modest gains in agility and anaerobic power. Schools and coaches should consider pilot implementations paired with careful evaluation and safeguards for student data.

Recommendations:

For practitioners

- Pilot AI tools in small cohorts, collect baseline and follow-up measures, and compare with standard instruction.
- Use AI feedback as an adjunct to, not a replacement for, in-person corrective coaching.
- Train teachers on interpreting AI outputs and on integrating recommendations into lesson plans.

For researchers

- Conduct randomized controlled trials with larger samples and longer interventions.
- Evaluate long-term retention and competitive performance, not just short-term skill gains.
- Study equity issues: ensure AI tools are valid across genders, body types, and skill levels.

For developers

- Improve transparency in AI decision rules so coaches can understand why feedback is given.
- Optimize algorithms for noisy, real-world video captured on phones in gym settings.
- Incorporate privacy-preserving data practices and clear consent flows.

References:

1. *Wang Y. Artificial intelligence in physical education: comprehensive review and implications for teacher development.*
2. *AI in digital sports coaching: opportunities and challenges. 2024. Journal of Sports Technology and Coaching.*
3. *Nagovitsyn RS, et al. Artificial intelligence program for predicting wrestlers' performance. Journal of Sports Analytics. 2023.*
4. *"AI Coach: A Motor Skill Training System using Motion." ACM Proceedings. Study demonstrating AI coaching effects on motor skill learning.*

ISSN–2278-5655

AMIERJ Aarhat Multidisciplinary International Education Research Journal

Volume–XIV, Special Issues– II(a) Nov – Dec, 2025

OPEN ACCESS Original Research Article

5. *Li G., et al. GPT-4 as a virtual fitness coach: a comparative case study. BMC Public Health. 2025.*
6. *Ma J., et al. Evaluating AI-driven applications in tertiary physical education students. 2025. Smart Learning Environments.*
7. *Masagca RC. A 5-week AI-generated calisthenics training program. Journal of Human Sport and*

Cite This Article:

Dr. Bhujbal S. & Dr. Jagtap S.J. (2025). *Use of AI-Powered Virtual Wrestling Coaches in Enhancing Motor Learning and Physical Fitness in Wrestler.* **In Aarhat Multidisciplinary International Education Research Journal**: Vol. XIV (Number VI, pp.57–61). **Doi: https://doi.org/10.5281/zenodo.18171714**