AI AND VIDEO ANALYSIS FOR STUDENT-ATHLETE TECHNICAL-TACTICAL IMPROVEMENT

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Abstarct: This study examined the effectiveness of artificial intelligence (AI) and video analysis technologies in improving the technical and tactical performance of student-athletes. A total of 25 student-athletes participated in a 10-week training program. Their performance was recorded using video cameras and analyzed with AI-based software to evaluate technical accuracy, decision-making speed, and the number of tactical errors. The results showed significant improvements after the intervention. Technical accuracy increased from 72.3% to 85.1%, the average number of errors decreased from 4.8 to 2.9, and decision-making time improved from 1.2 to 0.9 seconds. The findings indicate that the combined use of AI and video analysis provides objective feedback, helps identify performance weaknesses, and supports more effective training. These technologies can be valuable tools for improving the technical and tactical skills of student-athletes and enhancing overall sports performance.

Key words: artificial intelligence, video analysis, student-athletes, technical-tactical actions.

The optimization of technical-tactical actions is paramount for competitive success in modern sports, particularly for student-athletes balancing rigorous academic and athletic demands. Traditional evaluation methods often lack the precision and objectivity required to provide actionable insights for performance enhancement, frequently relying on subjective observation [1]. The increasing complexity and intensity of contemporary sports necessitate advanced analytical tools to dissect performance intricacies and identify marginal gains [2]. While artificial intelligence (AI) and video analysis technologies offer unprecedented opportunities for detailed performance assessment and individualized feedback, their integrated application and systematic evaluation for improving student-athletes' technical-tactical actions, especially within specific regional contexts, remains insufficiently explored.

This study aimed to evaluate and improve the technical-tactical actions of student-athletes through the integrated application of artificial intelligence and video analysis technologies. A cohort of 25 student-athletes (15 male, 10 female) from various team and individual sports underwent a structured

training intervention over a 10-week period. Performance data were collected via high-resolution video recordings during simulated competitive scenarios and analyzed using AI-powered software for motion tracking, pattern recognition, and quantitative assessment of key technical-tactical indicators, including accuracy, decision-making speed, and error frequency, consistent with modern athlete monitoring frameworks [3].

Analysis revealed a significant improvement in the accuracy of critical technical skills, with an average increase of 18.5% ($p < 0.01$) in successful execution rates across the studied group. Tactical decision-making errors, as identified by AI algorithms, decreased by 25% on average, particularly in situations requiring rapid response and spatial awareness, such as defensive transitions or offensive plays under pressure. For instance, in basketball student-athletes, pass completion rates under pressure improved from 68% to 82%, while in track and field, AI-driven biomechanical analysis led to a 10% reduction in inefficient movement patterns during sprint starts. The objective and immediate feedback provided by the integrated system allowed for highly targeted adjustments in training protocols, leading to more efficient skill acquisition and a deeper tactical understanding among the athletes, aligning with principles of tactical periodisation [4]. The overall dynamics of key technical-tactical indicators are summarized in the table below.

1-jadval. Student-sportchilarning texnik-taktik ko'rsatkichlari dinamikasi (o'rtacha foiz)

Ko'rsatkich Boshlang'ich Yakuniy

Aniqlik (%) 72.3 85.1

Xatolar soni (o'rtacha) 4.8 2.9

Qaror qabul qilish tezligi (sekund) 1.2 0.9

The findings demonstrate that the integrated use of artificial intelligence and video analysis technologies provides a highly effective framework for objectively evaluating and significantly improving the technical-tactical actions of student-athletes. This approach not only enhances performance but also fosters a deeper understanding of individual strengths and weaknesses. Future research should focus on developing sport-specific AI models and integrating these tools into standardized long-term athlete development programs to maximize their impact across diverse sporting disciplines, leveraging insights from comprehensive athlete monitoring.

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