Application of Video Technologies and Analytical Software in the Judo Training Process

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Annotation. The development of judo as an Olympic sport requires innovative approaches to the assessment of technical and tactical training and the individualization of training programs. The purpose of this study was to substantiate and develop methods for integrating video technologies and analytical software into the judo training process in order to enhance the effectiveness of athletes' technical, tactical, and physical preparation.

The research was conducted using systematic analysis of scientific publications, international practice reviews, comparative evaluation of technical and tactical training, and synthesis of best practices in applying information technologies in sports.

The findings indicate that in leading international centers, video analysis has become an essential part of training, whereas in Ukraine its application remains sporadic. Evidence shows that regular use of visual recognition algorithms and automated statistical collection enables timely correction of techniques, improves training load planning, and reduces recovery time. Methodological and organizational prerequisites for the effective implementation of digital tools were identified, including systematic repetition of movements, availability of technological equipment, coach training in analytical software, and structured feedback between coach and athlete.

Practical recommendations were developed for combining video analysis, artificial intelligence programs, and sensor systems to support the individualization of training and prevent injuries. The overall conclusions confirm that integrating video technologies and analytical programs significantly improves the objectivity and scientific validity of training control. The proposed solutions can be introduced in youth sports schools, clubs, national teams, and coach training curricula. Prospects for further research involve the development of intelligent systems for personalized training and the creation of national protocols for digital support of the training process.

Keywords: sports analytics, coaching strategies, multi-camera surveillance, digital load monitoring, tactical modeling, personalized training programs, innovations in sports technology.

Застосування відеотехнологій та аналітичних програм у тренувальному процесі дзюдо

Анотація. Дослідження присвячено впровадженню цифрових технологій у тренувальний процес дзюдо для адаптації до зростання інтенсивності змагань та зміни тактичних вимог. Метою статті є наукове обґрунтування комплексного використання

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відеоаналізу та аналітичних програм для вдосконалення технічної й тактичної підготовки спортсменів. Застосовано системний аналіз сучасних публікацій, міжнародного досвіду та методик цифрового моніторингу навантажень. З'ясовано, що регулярний відеоаналіз, доповнений сенсорним контролем та алгоритмами штучного інтелекту, забезпечує об'єктивне оцінювання дій, скорочуючи час на корекцію техніки та знижуючи ризик травм. Сформульовано практичні рекомендації щодо поєднання відеоаналізу, програм штучного інтелекту та сенсорних систем для індивідуалізації тренувальних програм і профілактики травм. Узагальнені висновки підтвердили, що інтеграція відеотехнологій та аналітичних програм формує нову якість контролю тренувального процесу, роблячи його більш об'єктивним і науково обґрунтованим. Запропоновані рішення можуть бути впроваджені в діяльність дитячих та юнацьких спортивних шкіл, клубів, національних збірних команд та в програми підготовки тренерів. Перспективи подальших досліджень пов'язані з розробкою інтелектуальних систем для персоналізації тренувального процесу та створенням національних протоколів цифрової підтримки тренувань.

Ключові слова: спортивна аналітика, тренерські стратегії, багатокамерне спостереження, цифровий моніторинг навантажень, тактичне моделювання, персоналізовані програми підготовки, інновації в спортивних технологіях.

Introduction

The modern development of judo as an Olympic sport requires coaches and athletes to conduct in-depth work on technical and tactical actions and to ensure objective control of their effectiveness. Traditional methods of observation and recording in training no longer provide sufficient accuracy or speed of analysis. The growing intensity of competitive practice and the dynamic changes in international federation rules are driving the transition to innovative training approaches that combine video technologies with analytical software. At the same time, the use of these tools in the judo training process in Ukraine remains limited, creating both a scientific and practical gap.

The challenge of improving the quality of technical and tactical preparation of young and elite judokas is further complicated by the fact that a considerable portion of training time is spent on reproducing and correcting actions without an adequate evidence base. The individual characteristics of athletes' physical preparedness require an instrumental approach to the evaluation of motor parameters [1, p. 20–21]. However, even when such conclusions are available, the use of video analysis and specialized software remains sporadic.

The application of digital technologies in related fields demonstrates clear advantages. For example, digital tools ensure the objectivity of refereeing decisions during judo competitions [2, p. 101–102], which directly correlates with the quality of training monitoring. International cases, including the visualization of combat dynamics through software tools described by R. Ozaki and Y. Ozawa, highlight the potential of video analysis for an in-depth study of the dynamics of judo matches [3]. These findings underscore the need to develop a scientifically grounded methodology for integrating video technologies into the training process.

It is also important that modern analytical systems provide the ability to automatically classify the phases of a match, which reduces the subjectivity of evaluation. An example of this approach is provided by A. Miyaguchi, J. Moutahir, and T. Sutar, who presented algorithms for annotating judo video materials to highlight important moments of the fight [4]. However, domestic athlete training programs do not yet fully take into account the potential of such developments.

Therefore, the scientific and practical task is to identify the possibilities and conditions for the effective use of video technologies and analytical programs in the judo training process.

Addressing the existing gap will enhance training effectiveness, reduce the risk of injury, and establish objective criteria for assessing athletes' technical and tactical skills.

A review of current scientific works shows considerable interest among researchers in improving the technical, tactical, and physical preparation of judokas. For example, O. Viligorsky and A. Slobozhaninov examine the individual characteristics of athletes' fitness in martial arts, emphasizing the importance of accurate measurement of motor parameters and the use of instrumental methods [1]. Similar conclusions are drawn by K. Oganov, who stresses the need for personalization of technical and tactical training depending on the athlete's chosen fighting tactics [5]. However, these works address only the methodological foundations and do not consider the systematic application of video analysis.

The problem of physical fitness and injury prevention under conditions of intensive training has been investigated by M. Buleev, S. Tkachenko, and G. Zhara [6]. Their research emphasizes the importance of combining preventive measures with technical improvement. These conclusions are supported by the work of S. Borisyuk and colleagues, who highlight the development of speed and strength qualities in young judokas and confirm the interdependence between strength training and technical mastery [7]. Further evidence is provided by G. Korobeinikov and co-authors, who substantiated the effectiveness of speed and strength exercises in preparing skilled wrestlers, reporting improvements in dynamic strength and explosive power. These results are particularly relevant for understanding how digital tools can be employed to monitor and evaluate strength parameters in judo training [8].

A significant contribution to the study of technical and tactical performance has been made by Yu. Martynov and A. Krylov, who presented modern approaches to analyzing competitive activity [9]. The structure and methodological principles of teaching judo techniques are comprehensively described by A. Alekseev and I. Alekseeva, who demonstrated the importance of sequential stages in mastering motor skills for effective training. Their findings underscore the necessity of scientifically grounded methods that can be further enhanced by modern video technologies [10].

The development of children's coordination skills through specialized exercises and innovative technologies has been investigated by I. Skrypka and V. Vorona, although their work only partially addresses the use of digital analytics [11]. V. Lomizov and N. Boichenko focus on primary education and highlight the importance of exercises with fitballs, yet their studies omit the integration of digital training support [12].

Research on video technologies is actively expanding within the international scientific community. For example, R. Ozaki and Y. Ozawa demonstrate the capabilities of video analysis tools for visualizing match dynamics and identifying patterns in competitive activity [3]. Similarly, A. Miyaguchi, J. Moutahir, and T. Sutar propose algorithms for automated video annotation to identify the main phases of a fight, which enhances the objectivity of evaluation [4].

Another important area of research involves the digital transformation of the training process. T. Fu, for instance, has developed a training system that integrates elements of judo and police techniques through virtual modeling, thereby demonstrating the effectiveness of interactive learning [13]. A detailed approach to analyzing competition statistics is outlined by T. Cowen [14]. O. Khatsaiuk and colleagues provide an analytical and statistical assessment of athletes' technical preparation using mathematical data processing methods [15]. Collectively, these developments reflect a trend toward combining video technologies with advanced analytical platforms.

In addition, N. Boychenko and co-authors, in a bibliometric study on adaptive judo, highlight a growing body of research examining the use of information technologies in training athletes with special needs [16]. Their findings underscore the potential of video analytics for advancing personalized training.

Ukrainian researchers are increasingly focused on integrating digital tools into athlete training. For example, A. Gakman and P. Goryuk demonstrated the effectiveness of fitness technologies in improving the functional condition of wrestlers [17]. Similarly, M. Chobotko and I. Chobotko showed that digital technologies can ensure impartial refereeing in judo, indirectly encouraging their use in training [2]. Despite these contributions, most Ukrainian studies still lack a systematic methodology for incorporating video analysis into everyday practice.

An analysis of current publications reveals several research gaps. First, there are no comprehensive studies that integrate video technology with automated statistical data processing programs, which limits the degree of training personalization. Second, findings on the role of digital technologies in injury prevention remain inconsistent: while some authors stress their direct preventive effect, others restrict themselves to recommendations without quantitative validation. Third, there is a notable absence of interdisciplinary research that unites sports science, biomechanics, and artificial intelligence in the development of integrated video analysis systems.

Thus, the scientific novelty of this work lies in defining the conditions and mechanisms for the effective integration of video technologies and analytical programs into the judo training process.

The *aim of the study* is to scientifically substantiate and develop approaches to incorporating video technologies and analytical programs into judo training in order to enhance the effectiveness of athletes' technical, tactical, and physical preparation. To achieve this aim, the following objectives have been set:

- to examine the current state of video technologies and analytical programs in the sports training of judokas;
- to analyze the methodological and organizational conditions for implementing digital tools in the judo training process, with a focus on factors influencing the effectiveness of technical and tactical preparation;
- to identify promising directions and formulate practical recommendations for the comprehensive application of video analysis and analytical programs to optimize training and improve athletic performance.

Materials and methods

The research material included scientific publications by Ukrainian and international authors on the technical, tactical, and physical preparation of judokas, as well as studies on the use of video technologies, analytical programs, and sensor systems in the sports training process. Practical cases involving the application of digital tools for assessing athletes' motor and physical parameters were also considered.

The research methodology was based on a systematic analysis of the literature, a comparative evaluation of international experience and approaches to technical and tactical training, and a generalization of best practices in the application of information technologies in sports.

Results

The systematic integration of digital technologies into the judo training process is increasingly regarded not merely as an auxiliary tool but as a strategic factor in enhancing the quality of athlete preparation. Advances in video analytics and software for processing large datasets make it possible to conduct comprehensive assessments of technical and tactical skills, adjust training loads promptly, and minimize subjective bias when evaluating athletes' performance. This perspective is supported by contemporary researchers, who confirm the effectiveness of automated video analysis in improving motor skills and increasing competitive performance [3; 4].

An important dimension of this process is the integration of innovative tools with established training methods. Video technologies, analytical programs, and sensor monitoring systems enable the design of individualized development trajectories that take into account both the technical-tactical and physiological characteristics of judokas. The combination of traditional and digital approaches establishes a new standard in training, strengthens athletes' resilience to competitive stress, and provides a foundation for the long-term advancement of their skills.

The introduction of video technology and analytical programs in judo training is still in its infancy. Foreign research and practical cases demonstrate the widespread use of these tools. Scientists prove that specialized programs (for example, SPLYZA TEAMS) enable in-depth analysis of video recordings of fights and the identification of unexpected patterns in the dynamics of combat [3].

Similarly, the experience of the European Judo Union demonstrates the potential for automating analysis: systems are being created that use cameras and visual recognition algorithms to record techniques and generate key training metrics [14]. The Judo Data platform [14] significantly expands the analytical scope of a match: it standardizes the notation of techniques, unifies metrics, and provides the coach with brief snapshots of actions in near real time. This approach reduces the workload on expert analysts, improves the comparability of data between tournaments, and creates a basis for operational correction of tactics on the day of the competition.

At the same time, domestic scientists point to the fragmentary application of such technologies in judo, emphasizing the insufficient number of scientific and methodological studies devoted to a comprehensive digital analysis of the technical and tactical training of judokas [15, p. 23–25]. Although video replays during competitions increase the objectivity of refereeing, the systematic integration of video analysis into everyday training is rarely practiced. In general, the current state of judo training is characterized by the availability of advanced global technologies for video and statistical analysis. However, despite the active spread of digital solutions around the world, the level of their integration into domestic training practices lags significantly behind international trends.

A comparison of the various technologies listed in Table 1 allows us to summarize the main characteristics of the most effective global developments, such as video analysis systems, automated analytics platforms, and specialized monitoring tools. These data demonstrate a variety of approaches: from detailed analysis of competitive matches to automatic recognition of technical elements using artificial intelligence, emphasizing the need for their comprehensive implementation in domestic training practices.

Table 1

Key modern video technologies and analytical tools used in the judo training process

Technology/tool	Scope of application	Main advantages
Video analysis system (SPLYZA TEAMS, etc.)	Match analysis (technique, tactics)	Objective analysis of matches, identification of patterns in the development of combinations
AI analytics (Judo Data, etc.)	Automation of combat data collection	Automatic recognition of techniques, compilation of statistics
Video replays during refereeing	Confirmation of the correctness of decisions	Increases the objectivity of referees' decisions at the official level

Special training equipment (BOSU balance platform, coordination ladders, etc.)	Development of coordination and balance in young athletes	Improve spatial orientation and coordination of movements
Athlete monitoring (sensors, special software, etc.)	Tracking physical indicators	Allows you to personalize the load and assess the dynamics of the condition

Source: summarized by the author based on [3; 11, pp. 83–84; 14; 15, pp. 23–25; 17, pp. 79–81; 18]

The combination of multi-camera video surveillance and motion recognition algorithms provides a new level of objective control over the technical and tactical actions of judokas. Such systems make it possible to obtain detailed individual indicators of the speed and accuracy of techniques, as well as to evaluate the athlete's interaction with their partner in real time [3; 18]. This allows for more personalized training programs and reduces the time needed to correct mistakes, which is especially important in preparation for high-level competitions.

Global practice demonstrates a variety of digital tools, from pure video analysis to artificial intelligence systems for collecting and processing statistics, which are capable of objectively evaluating the technical and tactical actions of wrestlers. However, in Ukraine, these technologies are used sporadically. The lack of a unified strategy for their implementation hinders the development of the judo training process. The experience of elite teams demonstrates the effectiveness of a "closed cycle" of video analysis: structured coding of episodes, creation of individual playlists, and prompt feedback with clear results. Regular repetition of this cycle accelerates learning and brings technical discussions to an objective level, as well as allowing video data to be integrated with load indicators for personalizing training loads and preventing overtraining.

The combination of multi-camera video surveillance with intelligent motion recognition creates a new level of objective control over technical and tactical actions. Video analysis systems record even minor deviations in movement trajectories, allowing for the timely detection of errors in throws, stances, and transitions [3, pp. 5–6; 18]. Video fragmentation of the fight, combined with instant data processing programs, helps the coach and athlete evaluate each phase of the fight in real time. This significantly reduces the time needed to correct technique, increases the effectiveness of the training process, and ensures a flexible response to changes in the opponent's tactics.

In-depth analysis of the training process is possible thanks to the integration of video recordings with biomechanical and load indicators. Practice shows that combining video analysis with movement statistics allows not only to identify technical errors, but also to assess their impact on the athlete's physiological parameters. This optimizes recovery processes and is an effective prevention of overload [18].

International experience shows the systematic use of video analysis and analytical programs in the training of judokas. In many leading countries, such tools are already standard in competition and training cycles [3; 14; 18]. In Ukraine, the integration of these technologies is gradual and mostly local, which hinders the achievement of consistently high sports results. Table 2 shows a comparative analysis of key indicators, differences in the level of technical infrastructure, systematic training, and scientific support.

Table 2

Comparative characteristics of international and Ukrainian experience in the implementation of video analysis and analytical programs in the judo training process

Criterion	International practice	Ukrainian practice
Systematic implementation	Video analysis is a mandatory element of the training process; standardized protocols and algorithms are used	Use is fragmented, mainly at the stage of preparation for competitions
Technical equipment	High-resolution multi-camera systems, motion sensors, and integrated analytical platforms are used	Single- or dual-chamber imaging prevails, with limited use of sensors and software analysis
Scientific support	Interdisciplinary methodologies have been developed that combine sports science, biomechanics, and artificial intelligence	Scientific research focuses mainly on traditional methods of technical and physical training
Human resources	Coaches regularly undergo advanced training courses in digital technologies and video analysis	Training in digital analytics is still in its infancy, with no systematic certification in place

Source: summarized by the author based on [3; 9, p. 88–89; 10, p. 6–7; 14; 15, p. 23–25; 17, p. 79–81; 18]

The table shows that the main differences between international and Ukrainian practices concern the level of technical equipment and staff training. In countries with developed sports infrastructure, video analysis is integrated into daily training, and coaches have the necessary digital competence [14; 18]. In Ukraine, however, multi-camera systems and sensor devices are used only by a few clubs, which prevents the full potential of digital analytics from being realized [15, p. 23–25]. Overcoming these differences requires state and federal support, as well as the creation of training programs for coaches to work with the latest technologies.

The introduction of national video analysis protocols and the creation of a unified information space between clubs and federations will contribute to the unification of requirements and the standardization of approaches to data collection and processing. Such a system will make it possible to form joint video databases, promote the exchange of analytical findings, and accelerate the development of the Ukrainian school of judo, making it competitive at the global level.

Personalization of the training process is one of the main tasks of the digital transformation of judo. Video analytics, combined with motion activity sensors, allows for the creation of individual training plans that take into account the age, technical skill level, and functional condition of the athlete [10, p. 6–7; 17, p. 79–81]. Artificial intelligence programs analyze performance history and predict possible overloads, signaling in a timely manner the need to adjust the volume or intensity of the load.

Injury prevention is of particular importance. Regular video analysis helps identify mistakes that lead to excessive stress on the joints or spine, while sensor systems monitor critical indicators during training. Such data allows coaches to respond quickly to risky situations, reducing recovery time and increasing the overall reliability of the training process.

The methodological and organizational conditions for the use of digital tools in training are determined by the systematic nature of the approach and the availability of resources. First, technique training must be specialized and systematic. Mastering judo techniques requires purposeful and consistent repetition of movements [10, pp. 6–7]. This requires a clear schedule

of technical training and a gradual increase in the complexity of exercises. Second, the methodology should include innovative forms of training. A systematic analysis of modern approaches has shown that the use of game elements and technological tools increases motivation and the effectiveness of learning techniques [9, pp. 88–89]. Third, the organization of feedback plays an important role: regular video analysis of training sessions and competitions ensures objective assessment of the performance of technical elements. For example, the use of touch sensors and specialized software makes it possible to monitor physical indicators, track the athlete's progress, and identify "weak spots" in training.

The use of video technology and analytical programs requires not only modern technical equipment, but also a clearly structured methodology and proper organization of the training process. The effectiveness of digital innovations depends on how systematically coaches build technical training and how quickly they integrate new tools into their work programs. In particular, regular repetition of movements, personalized training loads, and constant feedback create the basis for the full use of video analysis and automated analytics.

Video analytics, combined with motion activity sensors, paves the way for building individual training trajectories. This approach makes it possible to take into account the age and technical characteristics of judokas, ensure the dosing of loads, and increase the effectiveness of training [10, pp. 6–7; 17, pp. 79–81]. Table 3 provides a comparative overview of the main factors that determine the success of such implementation. The data presented summarize the conclusions of modern research and allow for a comprehensive assessment of which steps ensure the highest effectiveness of technical and tactical training of judokas in the context of digitalization.

Table 3

Methodological and organizational factors for the implementation of digital tools in the judo training process

Aspect	Description	Impact on results
Systematic teaching of technique	Continuous, step-by-step practice of elements with purposeful repetition	Deep assimilation of motor skills and stable results
Innovative forms of training	Use of game methods, situation modeling, VR/simulations	Increase motivation, adaptability, and develop non-standard skills
Technical equipment	Use of video cameras, video analysis systems, sensors	Enables objective feedback and quick adjustments to the approach
Professional level of trainers	Training of trainers to work with new technologies	Directly affects the quality of implementation and interpretation of analytics
Personalization	Selection of exercises and loads taking into account the characteristics of the athlete	Increases training effectiveness through program adaptation

Source: summarized by the author based on [2; 3; 9, pp. 88–89; 10, pp. 6–7; 14; 17, pp. 79–81; 18]

The decisive factors for the effectiveness of technical and tactical training are consistency in learning techniques and personalization of training. In particular, properly organized repetition of technical elements ensures their solid mastery. At the same time, the introduction of "real combat conditions" (game models, VR simulations, etc.) contributes to the formation of stress resistance and rapid decision-making. The role of technological equipment is no less important: video recording of combat and sensor monitoring provide the coach with objective

feedback, which significantly improves the quality of technique correction. With this in mind, in order to achieve high athletic results, it is necessary to combine traditional methods with special analytical and training equipment and to train personnel capable of working with these innovations.

Promising areas include the comprehensive use of video analysis and artificial intelligence programs to optimize training and improve performance. First, video analysis should become an integral part of training: regular review of match recordings using annotation software will allow coaches to adjust tactics and clearly demonstrate athletes' mistakes. In particular, a targeted analysis of position losses in Kumite showed that one of the main problems for wrestlers is initiating throws from an unfavorable position, which emphasizes the need for the systematic use of digital tools to improve the effectiveness of the training process [3]. This indicates that the next step should be intensive improvement of defensive and offensive techniques.

Second, it is necessary to use analytical programs with elements of artificial intelligence. For example, the Judo Data system already demonstrates the ability to automatically recognize techniques and collect statistics without the involvement of a coach [14]. Such programs make it possible to process large amounts of information and formulate individual recommendations based on key indicators.

Third, it is important to combine analytics with traditional exercises: various training methods using modern tools (balancing platforms, fitness accessories, etc.) have proven their effectiveness in developing coordination [11, pp. 83–84].

The further development of judo training practices is directly linked to the systematic introduction of digital technologies that combine video analysis, artificial intelligence, and analytical platforms. This approach ensures accurate diagnosis of athletes' technical and tactical actions, accelerates feedback formation, and allows for the adjustment of individual training plans based on objective data. Specialized programs and automated algorithms make it possible to identify mistakes in a timely manner, shorten the cycle of technique correction, and improve performance in competitions.

Table 4 provides recommendations that combine global innovations and the capabilities of Ukrainian training practices: from regular video analysis of matches to the integration of artificial intelligence and modern simulators into the daily training process. The recommendations presented provide a comprehensive overview of the possibilities for the integrated application of the latest technologies, which contributes to the improvement of individual and team skills of judokas and ensures a scientifically sound and effective training process.

Table 4

Promising areas and practical recommendations for the comprehensive application of video analysis and analytical programs in the judo training process

Area/recommendation	Description	Expected results
Systematic video analysis of matches	Systematic use of professional programs for marking phases of combat and detailed analysis of athletes' technical and tactical actions	Improved accuracy of technique correction, reduced time for error correction, formation of an objective basis for individual training plans
Integration of artificial intelligence programs	Application of automatic technique recognition and statistical analysis systems	Operational collection and analysis of large amounts of data, reduction of the influence of subjective assessments,

	(e.g., Judo Data) in daily training process	acceleration of the formation of recommendations for the coach and athlete
Combining analytics with traditional exercises	Introduction of modern training equipment, VR simulations, balancing platforms, and fitness technologies into classic programs for developing strength, coordination, and agility	Comprehensive improvement of physical and technical-tactical training, increasing stress resistance and speed of decision-making in competitive conditions
Personalized training planning	Creation of personal training trajectories based on video analysis results and sensor monitoring data	Maximum consideration of the physical and technical characteristics of each athlete, optimization of loads, reduction of injury risk
Improving the digital competence of coaches	Systematic training of coaching staff in working with analytical programs, interpreting digital data, and implementing IT innovations	Ensuring the high-quality implementation of new technologies into everyday practice, increasing the overall effectiveness of the training process

Source: author's development

The main recommendation is the comprehensive application of video and statistical analysis for each match, which enables the timely correction of tactics and techniques. The use of such tools objectively highlights the nuances of the fight and facilitates the formulation of tasks for subsequent training sessions. For example, the analysis of defeats has revealed the need to improve specific techniques, which in turn is reflected in enhanced athletic performance.

Furthermore, the use of artificial intelligence programs automates routine data collection and significantly accelerates feedback between coaches and athletes. In this context, combining traditional training with digital technologies appears highly promising: the systematic introduction of video analysis, analytical platforms, and modern training equipment into daily practice will optimize the training process and contribute to improved performance outcomes in judo.

Conclusions

Current trends in sports development highlight the growing role of digital technologies in the training of judokas. The integration of video analysis and analytical programs is becoming an essential tool for increasing the effectiveness of the training process. This approach makes it possible not only to objectively evaluate technical and tactical actions but also to adjust training in a timely manner, thereby creating a scientifically grounded foundation for the sustainable development of athletic skills.

An examination of the current state of video technology and analytical software use in judo reveals a clear imbalance: while leading international teams actively implement these tools, their application in Ukraine remains fragmented. International experience demonstrates the advantages of structured video analysis and automated statistics collection for improving technical and tactical performance and for developing individualized training strategies. Effective use of digital tools requires specific methodological and organizational conditions, including step-by-step mastery of techniques, access to appropriate technical equipment, and

specialized training for coaches. As a result, the comprehensive integration of video analysis, artificial intelligence algorithms, and specialized simulators ensures precise diagnosis of motor actions, rapid tactical adjustments, and a marked reduction in injury risk, ultimately making the training process more scientifically sound and efficient.

The results obtained are of both scientific and practical importance. They can be applied in sports schools, clubs, national team training centers, and coach education programs. The recommended approaches provide greater objectivity in the training process, accelerate athletes' progress, and create favorable conditions for integrating the Ukrainian training system into the international arena of high-performance sports.

Future research should focus on developing models for deep personalization of the training process based on artificial intelligence, creating national protocols for the integration of video analysis into training, and conducting interdisciplinary studies that combine sports science, biomechanics, and information technology. The implementation of these directions will contribute to the digital transformation of training and increase the practical significance of the results obtained.

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