

THE USE OF ANALYTICAL PLATFORMS AND TRACKING SYSTEMS IN VOLLEYBALL: TRANSFORMING THE APPROACH TO THE TRAINING PROCESS

Namazova V.B.

Volleyball coach, USA, New York,

vbnamazova@gmail.com

<https://doi.org/10.5281/zenodo.16628623>

Abstract. *This article examines the impact of modern digital technologies, such as analytical platforms, GPS systems, and video tracking systems, on the training process of volleyball players. It provides an overview of leading solutions used in professional volleyball, including Catapult, Dartfish, and Hudl. The study analyzes key metrics employed to monitor players' physical condition and tactical performance. The findings show that implementing these technologies facilitates the individualization of training programs, reduces the risk of injuries, and enhances the team's overall performance. The article also highlights the need to integrate digital tools into educational programs for coaching staff development.*

Keywords: volleyball, tracking systems, analytics, Catapult, Hudl, physical load.

Introduction. In recent years, there has been a rapid adoption of digital technologies in athlete training, particularly in team sports. The use of wearable tracking devices, video platforms, and intelligent analytical systems provides coaching staff with objective data on the physical condition and actions of volleyball players during both training sessions and competitive matches [1]. These technologies make it possible to personalize training loads, monitor fatigue levels, promptly adjust training plans, and develop more precise recovery strategies.

Such tools are especially valuable in volleyball, where the efficiency of every movement, positioning, and game decision directly affects overall team performance. The relevance of digital solutions stems from the need for more accurate diagnostics of athletes' conditions and the optimization of training processes based on objective data.

The aim of this article is to analyze the impact of analytical platforms and tracking systems on transforming approaches to the training process in volleyball. The paper examines key technologies, methods of their application, and practical outcomes resulting from their integration into the work of professional teams.

Materials and Methods. This study is analytical and review-based, relying on a comprehensive examination of modern tracking systems and analytical platforms used in professional volleyball training. Data collection was conducted through an analysis of open sources, scientific publications, case studies from professional teams, and official documentation provided by developers of analytical solutions.

The empirical basis of the research included official reports and materials from companies such as Catapult Sports, Hudl, Dartfish, and StatsPerform, as well as scientific articles published in peer-reviewed journals including Sports Medicine, Journal of Sports Sciences, and FIVB Technical Reports.

The research methodology included the following stages:

1. **Selection of analysis objects.** Platforms widely used in volleyball and capable of collecting both biomechanical and tactical data were chosen. These include:

- Catapult. A system for GPS tracking, load monitoring, and analyzing player movements and jumps.

- Hudl. A platform for video analysis of game episodes, automatic tagging, and statistical processing.

- Dartfish. A tool for in-depth review of technical skills and visualization of errors.

- VolleyMetrics. A system providing advanced statistics and the use of artificial intelligence for analyzing the actions of players and opponents.

Key parameters and functional capabilities of each platform were examined. For example, the Catapult system tracks over 100 indicators, including vertical load, peak speed, heart rate zone, and fatigue index [2]. Hudl, in turn, enables the creation of detailed reports for each game episode, recording passes, blocks, attacks, and error zones [3].

Examples of integrating these platforms into the practice of national teams and club teams were studied, including the Poland national team, the USA national team, Zenit-Kazan Volleyball Club, and NCAA university teams. It was noted, for instance, that the USA national team actively uses VolleyMetrics to forecast game scenarios and optimize player positioning on the court [4].

Modern studies focusing on the monitoring of training loads, injury prevention, and the role of digital technologies in sports training were also analyzed.

Thus, the research methodology is based on an interdisciplinary approach that combines principles of sports analytics, biomechanics, physiology, and information technology. The use of qualitative content analysis made it possible to identify patterns in the application of digital solutions in volleyball and to assess their impact on the effectiveness of the training process.

Research Results. The analysis of modern analytical platforms and tracking systems used in volleyball demonstrated their high effectiveness in monitoring athletes' physical, technical, and tactical performance indicators. Each of the systems reviewed performs unique functions, complementing one another and together forming the foundation for a comprehensive digital approach to team training.

The Catapult system enables the monitoring of key physical activity parameters of volleyball players, including:

- total number of jumps per training session or match;
- height of each jump (average and maximum);
- peak movement speed;
- number of accelerations and decelerations;
- subjective rating of perceived exertion (sRPE);
- real-time heart rate monitoring (HR Live);
- fatigue and recovery indicators (Fatigue Index, Recovery Load).

For example, reports from professional clubs using Catapult indicate that players whose training load exceeds 1,200 GPS-Score units per session experience a sharp increase in the likelihood of muscle micro-injuries [2]. The use of Catapult by the Polish national team and several European clubs contributed to a 25% reduction in overuse injuries over the course of a season [5].

The Hudl video platform offers coaches and analysts tools for:

- post-game analysis with frame-by-frame breakdown of game episodes;
- tagging errors in reception, serving, setting, and attacking actions;
- developing tactical patterns of opponents based on analysis of previous matches;
- assessing individual player actions within the context of team interactions.

The use of Hudl in NCAA university teams (USA) has improved the quality of video training by 40% through visual feedback and automated match processing [3].

The Dartfish system is focused on improving players' technical skills. It allows for:

- analyzing the phase structure of movements (approach to serving, take-off, landing);
- comparing the techniques of different athletes using the "video overlay" mode;
- identifying subtle motor pattern disruptions that cannot be detected visually without slow-motion analysis.

The use of Dartfish at the Lausanne Volleyball Academy (Switzerland) made it possible to reduce the number of serving errors by 17% within a single training cycle [6].

The VolleyMetrics system by StatsPerform uses machine learning and artificial intelligence (AI) algorithms to:

- building team gameplay models;
- predicting the effectiveness of player formations;
- tracking player activity by court zones;
- analyzing opponents' strategies and identifying their weak points.

In the USA national team, VolleyMetrics is used not only for analyzing current matches but also for long-term planning. According to FIVB reports, the system's use has enabled the team to adapt tactics in real time during matches, which has been a key factor in achieving victories at international tournaments [7].

Thus, the analysis revealed that the use of tracking systems not only allows for objective measurement of training loads but also enables personalized preparation. Video platforms provide coaches with tools for rapid error diagnosis and strategy adjustment. The integration of artificial intelligence and predictive analytics elevates volleyball to a qualitatively new level of digital management in training and tactical planning. These findings underscore the high relevance of digitalization in the training process and justify the need for its systematic implementation in educational and sports practice.

Discussion. The results of the analysis of modern digital solutions applied in volleyball indicate significant changes in the structure and philosophy of the training process. The integration of analytical platforms and tracking systems not only enriches the coaches' toolkit but also transforms the very approach to managing athlete preparation.

The traditional coaching model was predominantly based on intuition, personal experience, visual assessment, and subjective observations. Today, thanks to technological advancements, coaching staff have access to objective data on athletes' physical condition, technique, tactical actions, and readiness levels in real time. This enables more precise load management, identification of potential overtraining risks, and informed decision-making regarding training adjustments and recovery strategies.

Studies show that the use of GPS tracking and video surveillance systems contributes to a 30–40% reduction in injury risk by enabling the timely detection of fatigue factors and biomechanical movement irregularities [8].

Digital feedback provided through video analytics, charts, and specialized applications enhances athletes' motivation and engagement. Players gain a deeper understanding of their strengths and weaknesses, which fosters the development of self-regulation skills and accountability for performance outcomes. Particularly effective is the use of error visualization and comparative analysis of technical techniques.

The modern coach in team sports, including volleyball, increasingly assumes the roles of data analyst and information manager. This shift necessitates that specialists acquire a new level of digital literacy and develop skills in interpreting large volumes of data. New positions are emerging within team structures, such as analysts responsible for data collection, processing, and visualization [4]. As a result, we are witnessing not only the digitalization of processes but also a transformation of the coach's professional profile.

Despite the clear advantages, the widespread use of analytical platforms in volleyball faces a few limitations.

Table

Barriers to the Implementation of Analytical Platforms

1	High cost of equipment and software licenses, which is particularly relevant for teams from developing countries
2	Shortage of trained personnel with the competencies required to work with analytical systems
3	Insufficient development of digital infrastructure and support at the level of sports federations
4	Lack of comprehensive integration of digital technologies into university curricula and coaching certification programs

As A. G. Sukharev notes, without systematic integration of digital solutions into the educational process and continuous professional development of coaches, the effectiveness of their application will be significantly limited.

In the coming years, the use of artificial intelligence (AI) and machine learning is expected to increase for predicting game scenarios, automated scouting, and personalized training. Such technologies are already being tested within the VolleyMetrics system and research projects conducted by the International Volleyball Federation [7].

A promising direction is also the adaptation of existing solutions to meet the needs of youth and junior teams through simplified interfaces and integration with educational platforms.

Thus, the digital transformation of volleyball training is experiencing sustained positive momentum. However, its effectiveness depends on a comprehensive approach that includes adequate financial support, targeted personnel training, and the overall digital maturity of the sports environment.

Conclusions. Analytical and tracking systems have fundamentally transformed the methodological approaches to volleyball training. Their application facilitates a shift from generalized training methods to a personalized model that helps reduce injury rates and enhance overall athlete performance. The future development of volleyball training is intrinsically linked to the systematic integration of digital technologies both into practical activities and educational programs for coaching staff.

References

1. Gabbett, T. J. (2021). Monitoring training load to understand fatigue in athletes. *Sports Medicine*, 51(3), 351–358.
2. Catapult Sports. (2024). *Elite Volleyball Case Studies*. Retrieved from <https://www.catapultsports.com/blog/volleyball-performance>
3. Hudl Academy. (2023). *Using Hudl for Team and Individual Performance*. Retrieved from <https://www.hudl.com/sports/volleyball>

4. StatsPerform. (2024). *VolleyMetrics* by StatsPerform. Retrieved from <https://www.statsperform.com/products/volleymetrics>
5. Drust, B., & Green, M. (2022). Technology in volleyball: Performance analysis and injury prevention. *Journal of Sports Sciences*, 40(3), 301–308.
6. Dartfish. (2023). *Volleyball Video Analysis Solutions*. Retrieved from <https://www.dartfish.com/solutions/sports/volleyball>
7. Fédération Internationale de Volleyball (FIVB). (2024). *FIVB Technical Report: Volleyball Nations League 2024*. Retrieved from <https://www.fivb.com/en/technical-reports>
8. Sukharev, A. G. (2022). Modern monitoring methods in team sports (pp. 112–126). Kazan: KGIFK.