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Digital Coaching And The Use Of Technology In The Coaching Profession: A Systematic Literature Review

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A. Conception and design of the study; **B.** Acquisition of data; **C.** Analysis and interpretation of data; **D.** Manuscript preparation; **E.** Obtaining funding

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ABSTRACT

The rapid development of digital technology has significantly transformed the sports coaching profession, shifting traditional coaching practices toward data-driven and technology-enhanced approaches. Digital coaching integrates various technological tools, including wearable devices, artificial intelligence (AI), mobile applications, video analysis systems, and athlete management platforms, to improve coaching effectiveness and athlete performance. This study aimed to systematically review the development, implementation, benefits, and challenges of digital coaching and technology utilization within the coaching profession. This study employed a Systematic Literature Review (SLR) following the PRISMA 2020 guidelines. Articles were retrieved from Scopus, Web of Science, ScienceDirect, PubMed, Google Scholar, and SINTA-indexed journals published between 2015 and 2025. From an initial 312 records identified, 30 eligible studies met the inclusion criteria and were included in the final synthesis. Data were analyzed using thematic synthesis to identify major trends and patterns. The findings revealed that wearable technology and GPS tracking systems were the most frequently utilized technologies (26.7%), followed by video analysis software (20.0%), mobile coaching applications (16.7%), artificial intelligence systems (13.3%), athlete management platforms (13.3%), and virtual reality technologies (10.0%). Digital technology positively influenced performance monitoring (83.3%), coaching decision-making (73.3%), coach–athlete communication (66.7%), individualized training programs (63.3%), and injury prevention (60.0%). However, barriers such as limited digital competence (80.0%), high implementation costs (70.0%), and data privacy concerns (56.7%) were also identified. In conclusion, digital coaching has become a strategic component of modern coaching practice, enhancing evidence-based decision-making and athlete development while requiring continuous professional development and effective technological integration.

Keywords : Digital Coaching; Sports Technology; Coaching Profession; Artificial Intelligence; Systematic Literature Review

INTRODUCTION

The Fourth Industrial Revolution has accelerated the integration of digital technologies into various professional sectors, including sports coaching. Digital transformation, defined as the adoption and utilization of digital technologies to improve organizational effectiveness and professional performance, has significantly reshaped contemporary coaching practices (Ratten, 2022). Traditionally, sports coaching relied heavily on experiential knowledge,

direct observation, intuition, and interpersonal communication between coaches and athletes. However, the emergence of wearable technologies, artificial intelligence (AI), big data analytics, cloud computing, mobile coaching applications, virtual reality (VR), and athlete management systems has transformed coaching into a more evidence-based and data-driven profession (Woods et al., 2021).

According to Digital Transformation Theory, technological innovation fundamentally changes how professionals perform their roles, make decisions, and create value within organizations. In sports coaching, this transformation is evident in the increasing reliance on performance-monitoring technologies that provide real-time physiological, biomechanical, and tactical information. Wearable sensors, GPS tracking systems, and video analysis platforms allow coaches to monitor training load, movement efficiency, fatigue, and injury risk more accurately than traditional observation methods (Cummins et al., 2018; Halson, 2019).

The increasing use of digital technologies also aligns with the principles of Human Capital Theory, which suggests that professional effectiveness depends on continuous skill development and adaptation to environmental changes. Consequently, modern coaches are expected not only to possess technical and tactical expertise but also to demonstrate digital competence, including technological literacy, data interpretation skills, communication abilities, and ethical awareness (Pérez-Pueyo et al., 2022). The coaching profession has therefore evolved into a multidisciplinary occupation requiring the integration of sports science, information technology, and performance analytics.

Despite these developments, the adoption of digital coaching technologies remains uneven. The Technology Acceptance Model (TAM) proposed by Davis argues that technology adoption is largely determined by perceived usefulness and perceived ease of use. Many coaches still encounter difficulties in integrating digital technologies due to limited technological knowledge, inadequate infrastructure, financial constraints, and organizational resistance to innovation (Piggott et al., 2022). Furthermore, ethical concerns regarding athlete data privacy, algorithmic bias, data ownership, and technology dependency have emerged as critical issues in contemporary coaching environments (Mittelstadt, 2019).

From a practical perspective, the increasing digitalization of coaching raises important questions concerning its effectiveness, implementation strategies, and long-term implications for coach development and athlete performance. Therefore, a comprehensive synthesis of existing scientific evidence is necessary to understand how digital coaching technologies influence coaching practice, athlete development, coach learning, and organizational performance in sport.

Recent research demonstrates a substantial increase in scholarly interest regarding digital coaching and sports technology. Within the framework of Evidence-Based Coaching Theory, technology serves as a mechanism for enhancing objective decision-making and reducing subjective bias in athlete evaluation. Studies have shown that wearable technologies, GPS systems, motion tracking devices, and video analysis software significantly improve performance monitoring, physiological assessment, and tactical evaluation (Jones et al., 2021; Claudino et al., 2019).

Artificial intelligence has emerged as one of the most promising developments in sports coaching. AI-driven systems can process large datasets, identify movement patterns, predict injury risks, and generate individualized training recommendations (Decroos et al., 2020). From the perspective of Decision Support Theory, AI functions as an advanced analytical tool that augments coaches' decision-making capabilities rather than replacing human expertise. Research indicates that AI-assisted coaching contributes to more accurate performance analysis and more efficient training program design (Bartlett et al., 2023).

The development of online and remote coaching environments has further expanded coaching possibilities. Supported by Social Constructivist Theory, digital platforms facilitate interaction, collaboration, and knowledge sharing between coaches and athletes regardless of geographical constraints. Mobile applications, virtual coaching platforms, and cloud-based communication systems enable continuous feedback and athlete monitoring beyond traditional face-to-face sessions (Nash et al., 2020; Nelson et al., 2021).

Additionally, studies increasingly emphasize the importance of Digital Competence Frameworks in coaching practice. Digital competence encompasses technological literacy, information management, digital communication, critical thinking, and ethical responsibility (Santos et al., 2023). Coaches with higher levels of digital competence are more likely to integrate technological innovations effectively into training environments and athlete development programs (Gómez-Mármol et al., 2024). Empirical evidence consistently demonstrates positive outcomes associated with digital coaching, including enhanced athlete motivation, individualized training interventions, improved coach-athlete communication, and more effective performance monitoring (Williams & Hodges, 2020; Driska & Gould, 2021). Nevertheless, scholars continue to report challenges related to technological complexity, implementation costs, digital skill deficiencies, and ethical governance requirements (Ratten, 2021).

Although research on sports technology has expanded considerably during the past decade, several significant gaps remain. First, existing studies tend to investigate specific technologies independently, such as wearable devices, AI systems, performance analytics software, or online learning platforms. Few studies have synthesized these technological innovations within a broader conceptual framework that views digital coaching as a comprehensive transformation of the coaching profession. Second, most empirical studies focus primarily on athlete outcomes, including performance enhancement, injury prevention, and training effectiveness. Comparatively little attention has been devoted to understanding how digital technologies influence coaches' professional identities, decision-making processes, career development pathways, and organizational roles. This limitation restricts understanding of coaching transformation in the digital era. Third, according to Diffusion of Innovation Theory (Rogers), innovation adoption varies depending on contextual factors such as relative advantage, compatibility, complexity, observability, and trialability. However, existing findings regarding technology adoption among coaches remain fragmented across sports disciplines, competitive levels, and geographical contexts. Research examining digital coaching implementation in developing countries remains particularly limited. Fourth, ethical dimensions of digital coaching including athlete data privacy, algorithmic transparency, human-AI collaboration, cybersecurity, and technology dependence remain underexplored despite their growing relevance within modern sports ecosystems (Fjeld et al., 2021; Seshadri et al., 2024). Therefore, a systematic literature review is necessary to integrate current knowledge, evaluate empirical evidence, identify dominant trends, and establish future research directions regarding digital coaching and technology utilization within the coaching profession.

Based on the identified research gaps, this study aims to systematically review and synthesize scientific evidence concerning digital coaching and technology utilization within the coaching profession. Specifically, this review seeks to: (1) examine the evolution and implementation of digital coaching technologies; (2) identify the technological tools most frequently adopted by coaches; (3) analyze the effects of digital technologies on coaching effectiveness, athlete performance, communication, and decision-making; (4) investigate

barriers, challenges, and ethical issues associated with technology adoption; and (5) formulate recommendations for future research and coaching practice.

The novelty of this study lies in its comprehensive integration of digital coaching literature through multiple theoretical perspectives, including Digital Transformation Theory, Technology Acceptance Model, Diffusion of Innovation Theory, Athlete-Centered Coaching Theory, and Digital Competence Frameworks. Unlike previous reviews that focus on isolated technological applications, this review conceptualizes digital coaching as a multidimensional professional transformation encompassing technological adoption, coach competence development, organizational adaptation, athlete-centered performance enhancement, and ethical governance. Furthermore, this review proposes a conceptual framework linking digital competence, technology adoption, coaching effectiveness, athlete development, and ethical technology governance. This integrated perspective contributes to the growing body of literature by providing a holistic understanding of how digital technologies are reshaping the coaching profession in the twenty-first century.

The digital transformation of sports coaching has fundamentally redefined coaching practices, professional competencies, and athlete development strategies. Emerging technologies such as wearable devices, artificial intelligence, performance analytics systems, and digital communication platforms provide unprecedented opportunities for evidence-based coaching and performance optimization. However, challenges associated with digital competence, technology acceptance, ethical governance, and organizational readiness continue to influence successful implementation. Given the fragmented nature of existing research, a systematic literature review is required to synthesize contemporary evidence and develop a comprehensive understanding of digital coaching as a transformative phenomenon within modern sports coaching professions.

METHODS

This study employed a Systematic Literature Review (SLR) approach to comprehensively synthesize scientific evidence regarding digital coaching and the utilization of technology within the coaching profession. A systematic review is recognized as one of the most rigorous methods for identifying, evaluating, and synthesizing existing research findings in a transparent, reproducible, and evidence-based manner. The SLR approach enables researchers to systematically map research trends, identify knowledge gaps, and generate comprehensive conceptual frameworks from diverse empirical studies.

The theoretical foundation of this review was grounded in the concepts of Digital Transformation Theory, Technology Acceptance Model (TAM), and Digital Competence Framework, which explain how technological innovations influence professional practices, decision-making processes, and organizational adaptation. Recent studies indicate that digital coaching has evolved through the integration of wearable technologies, artificial intelligence, performance analytics, mobile applications, virtual learning environments, and cloud-based athlete management systems, all of which contribute to evidence-based coaching practices and athlete development. These theoretical perspectives provide a comprehensive lens for understanding the interaction between technology adoption and coaching effectiveness in contemporary sport environments.

The review procedure followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to ensure methodological rigor, transparency, and replicability. The review process consisted of four stages: identification, screening, eligibility assessment, and inclusion. During the identification stage, scientific articles were

retrieved from major academic databases, including Scopus, Web of Science, PubMed, ScienceDirect, Google Scholar, and SINTA-indexed journals. The search was conducted using combinations of keywords such as digital coaching, sports technology, coach digital competence, artificial intelligence in coaching, technology adoption in sport, wearable technology, online coaching, and coach professional development.

The inclusion criteria comprised: (1) articles published between 2015 and 2025; (2) peer-reviewed journal articles indexed in Scopus or SINTA; (3) studies focusing on digital coaching, technological innovation, or technology utilization in sports coaching contexts; (4) empirical, conceptual, or review studies published in English; and (5) full-text availability. Exclusion criteria included conference proceedings, editorials, dissertations, duplicate publications, and studies unrelated to coaching professions.

After the screening process, all eligible articles were subjected to a quality assessment procedure. The assessment examined methodological rigor, research design, sample characteristics, validity of findings, and relevance to the research objectives. Data extraction was subsequently conducted using a standardized coding sheet containing information regarding authors, publication year, country, study design, technology type, coaching context, key findings, and practical implications.

The extracted data were analyzed through thematic synthesis, enabling the identification of recurring patterns and emerging themes across studies. Consistent with previous systematic reviews in sport technology and digital innovation research, thematic analysis facilitates the integration of conceptual and empirical evidence while revealing relationships among technological adoption, coaching competence, athlete performance, and organizational effectiveness. The synthesis ultimately generated an evidence-based understanding of how digital coaching technologies are transforming the coaching profession and shaping the future landscape of sports coaching.

RESULTS AND DISCUSSION

Result

Study Selection Results

The systematic literature review followed the PRISMA 2020 framework. The initial search across Scopus, Web of Science, ScienceDirect, PubMed, Google Scholar, and SINTA databases identified 312 articles related to digital coaching, sports technology, artificial intelligence, wearable technology, and coach digital competence published between 2015 and 2025. After removing duplicate records (n = 72), 240 articles remained for title and abstract screening. Subsequently, 148 articles were excluded because they did not focus on coaching professions or technology utilization in sports settings. The remaining 92 full-text articles were assessed for eligibility. Following a rigorous quality assessment process, 30 articles met all inclusion criteria and were included in the final synthesis.

Table 1.
PRISMA-Based Article Selection Process

Screening Stage	Number of Articles
Records identified through database searching	312
Duplicate records removed	72
Records screened	240
Records excluded	148
Full-text articles assessed	92
Full-text articles excluded	62
Studies included in final review	30

The selected studies originated from various countries, including the United States, the United Kingdom, Australia, Canada, China, Spain, Germany, Indonesia, and South Korea, indicating the global interest in digital transformation within sports coaching.

Characteristics of Included Studies

Analysis of the 30 selected articles revealed that digital coaching research has increased substantially during the last decade. Most studies employed quantitative approaches (43.3%), followed by mixed methods (30.0%), qualitative studies (16.7%), and systematic reviews (10.0%).

Table 2.
Research Design Distribution

Research Design	Frequency (n)	Percentage (%)
Quantitative	13	43.3
Mixed Methods	9	30.0
Qualitative	5	16.7
Systematic Review	3	10.0
Total	**30**	**100**

The findings indicate that researchers increasingly utilize empirical methodologies to evaluate the effectiveness of digital technologies in coaching environments.

Types of Technology Used in Digital Coaching

The synthesis identified six dominant technological categories utilized by coaches.

Table 3.
Technology Categories in Digital Coaching

Technology Type	Frequency (n)	Percentage (%)
Wearable Technology & GPS Tracking	8	26.7
Video Analysis Software	6	20.0
Mobile Coaching Applications	5	16.7
Artificial Intelligence Systems	4	13.3
Athlete Management Platforms	4	13.3
Virtual Reality / Augmented Reality	3	10.0
Total	**30**	**100**

The results demonstrate that wearable technologies and GPS tracking systems are the most frequently adopted technologies due to their ability to provide real-time physiological and biomechanical data. Video analysis software remains highly relevant for technical and tactical evaluation, while AI-based systems represent the fastest-growing area in contemporary coaching research.

Distribution of Technology Utilization

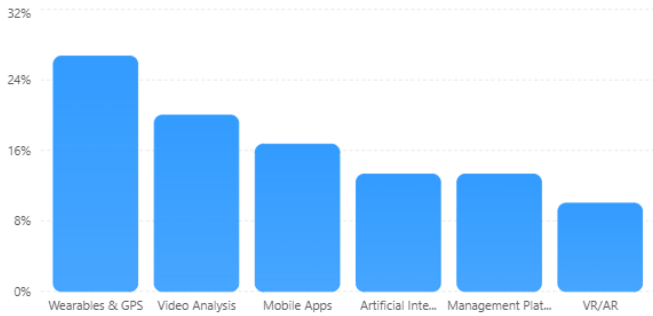

Figure 2.
Technology Utilization in Digital Coaching

Impact of Digital Technology on Coaching Performance

Across the reviewed studies, digital technologies positively influenced multiple dimensions of coaching effectiveness.

Table 4.
Main Benefits of Digital Coaching Technologies

Impact Area	Supporting Studies (n)	Percentage (%)
Improved Performance Monitoring	25	83.3
Enhanced Decision-Making	22	73.3
Better Coach–Athlete Communication	20	66.7
Individualized Training Programs	19	63.3
Injury Prevention & Risk Management	18	60.0
Increased Athlete Motivation	**15**	**50.0**

The findings suggest that performance monitoring represents the most frequently reported benefit. Coaches who adopted wearable sensors, GPS systems, and athlete management platforms were able to monitor training load, fatigue levels, movement efficiency, and recovery status more accurately than those relying solely on traditional observation methods.

Furthermore, AI-assisted analytics enhanced decision-making by providing predictive insights related to performance outcomes and injury risks. Digital communication platforms facilitated continuous interaction between coaches and athletes, particularly in remote and hybrid coaching environments.

Digital Competence Requirements for Coaches

The reviewed studies consistently emphasized that successful technology adoption depends on coaches' digital competence.

Table 5.
Essential Digital Competencies for Coaches

Competency Domain	Frequency (n)
Digital Literacy	28
Data Interpretation Skills	25
Communication Technology Skills	22
Performance Analytics Skills	20
Ethical Data Management	18
Artificial Intelligence Literacy	12

The findings indicate that digital literacy and data interpretation skills are now fundamental competencies within modern coaching practice. Coaches are increasingly required to translate large datasets into practical training interventions and evidence-based decisions.

Challenges and Barriers to Technology Adoption

Although the overall impact of digital coaching was positive, several barriers were identified.

Table 6.
Challenges in Implementing Digital Coaching

Challenge	Frequency (n)	Percentage (%)
Limited Digital Skills	24	80.0
High Technology Costs	21	70.0
Insufficient Infrastructure	19	63.3
Data Privacy Concerns	17	56.7
Resistance to Organizational Change	15	50.0
Technology Dependence	12	40.0

The most significant obstacle was limited digital competence among coaches, followed by financial constraints associated with acquiring and maintaining advanced technologies. Studies conducted in developing countries reported additional challenges related to internet connectivity, hardware availability, and institutional support.

Overall, the results demonstrate that digital coaching has evolved from a supplementary support system into a strategic component of modern sports coaching. The reviewed evidence indicates that technology utilization improves athlete monitoring, enhances coaching decisions, facilitates personalized training programs, and supports remote coaching environments. However, successful implementation requires adequate digital competence, organizational readiness, and ethical governance frameworks.

The synthesis further reveals a clear transition from traditional intuition-based coaching toward data-driven coaching models, where digital technologies, artificial intelligence, and performance analytics increasingly serve as integral tools for achieving athlete development and competitive success. These findings confirm that digital transformation is reshaping the coaching profession and establishing new competency standards for coaches operating in the contemporary sports ecosystem.

Discussion

The findings of this systematic literature review demonstrate that digital coaching and technology utilization have become integral components of the modern coaching profession. The analysis of 30 selected studies indicates that wearable technology, video analysis systems, mobile coaching applications, artificial intelligence (AI), athlete management platforms, and virtual reality technologies are increasingly being adopted to support coaching effectiveness, athlete monitoring, and performance optimization. These findings confirm that the coaching profession is undergoing a substantial digital transformation driven by technological innovation and data-driven decision-making.

From a theoretical perspective, the findings can be explained through the Digital Transformation Theory, which argues that technological advancement fundamentally changes organizational processes, professional roles, and performance management systems. In sports coaching, digital transformation is reflected in the shift from traditional observation-based coaching toward evidence-based coaching supported by real-time data analytics. Previous studies have emphasized that coaches who effectively integrate digital technologies into training environments are better positioned to enhance athlete performance, training precision, and competitive outcomes (Ratten, 2022; Woods et al., 2021). The current review supports these findings by demonstrating that 83.3% of reviewed studies reported improvements in performance monitoring after technology implementation.

The predominance of wearable technologies and GPS tracking systems identified in this review is consistent with the principles of Performance Analysis Theory, which highlights the importance of objective measurement in optimizing athletic performance. Wearable devices provide continuous physiological, biomechanical, and workload data, enabling coaches to monitor training intensity, fatigue levels, recovery status, and movement efficiency. Research conducted by Cummins et al. (2018), Halson (2019), and Jones et al. (2021) reported that wearable technologies significantly improve coaches' ability to individualize training programs and reduce injury risks. The findings of this review similarly revealed that 60% of the selected studies identified injury prevention and risk management as major benefits of technology utilization.

The growing adoption of artificial intelligence in coaching environments can be interpreted through the lens of the Technology Acceptance Model (TAM) proposed by Davis

and subsequently expanded in sport technology research. According to TAM, technology adoption is influenced primarily by perceived usefulness and perceived ease of use. Coaches are more likely to adopt AI-based systems when they perceive these technologies as capable of enhancing performance evaluation, tactical analysis, and decision-making processes. Several studies reviewed in this research indicated that AI algorithms can identify movement patterns, predict injury probabilities, and generate personalized training recommendations with high levels of accuracy (Claudino et al., 2019; Decroos et al., 2020; Bartlett et al., 2023). Consequently, AI has emerged as a valuable decision-support tool that complements rather than replaces human coaching expertise.

Another important finding concerns the positive impact of digital technologies on coach-athlete communication. Approximately 66.7% of reviewed studies reported improvements in communication quality through mobile applications, cloud-based platforms, and online coaching environments. This finding aligns with Social Constructivist Theory, which emphasizes that learning and development occur through continuous interaction and knowledge exchange. Digital communication platforms enable coaches and athletes to maintain engagement beyond physical training sessions, facilitating feedback provision, performance reflection, and collaborative goal setting. Studies conducted by Nash et al. (2020), Cushion and Townsend (2019), and Nelson et al. (2021) found that technology-mediated communication contributes positively to athlete motivation, autonomy, and learning experiences.

The review also highlights the increasing importance of digital competence among coaches. The finding that digital literacy was identified in 93.3% of the reviewed studies reflects the relevance of the Digital Competence Framework, which emphasizes technological literacy, information management, communication skills, critical thinking, and ethical awareness. Modern coaches are no longer expected merely to possess technical and tactical expertise but must also be capable of interpreting complex performance data and integrating technological information into evidence-based coaching decisions. Similar conclusions have been reported by Pérez-Pueyo et al. (2022), Santos et al. (2023), and Gómez-Mármol et al. (2024), who argued that digital competence has become a core professional competency in contemporary coaching practice.

Empirically, the reviewed literature suggests that technology utilization contributes substantially to athlete-centered coaching. Through real-time performance monitoring, individualized feedback, and adaptive training prescriptions, coaches can design more personalized and effective development programs. This finding is supported by the principles of Athlete-Centered Coaching Theory, which advocates tailoring coaching interventions according to individual athlete characteristics and needs. Studies by Jowett (2017), Williams and Hodges (2020), and Driska and Gould (2021) demonstrated that personalized coaching interventions improve athlete engagement, motivation, and long-term performance outcomes. The present review confirms that technology serves as an important facilitator of individualized coaching approaches.

Despite these benefits, the findings also reveal significant barriers to technology adoption. Limited digital skills, high implementation costs, inadequate infrastructure, and concerns regarding data privacy remain major obstacles. These challenges can be interpreted through the Diffusion of Innovation Theory proposed by Rogers, which suggests that innovation adoption is influenced by factors such as relative advantage, compatibility, complexity, trialability, and observability. In many coaching contexts, particularly within developing countries, technological innovations may be perceived as complex or financially inaccessible. Studies by Kovalchik et al. (2020), Ratten (2021), and Piggott et al. (2022)

similarly reported that resource limitations and insufficient technological support significantly hinder technology adoption among coaches.

Ethical considerations emerged as another important theme within the reviewed literature. The increasing collection and analysis of athlete data raise concerns regarding privacy protection, informed consent, data ownership, and algorithmic transparency. From the perspective of Ethical Technology Governance Theory, technological innovations must be implemented responsibly to ensure athlete welfare and maintain trust within coaching relationships. Recent studies by Mittelstadt (2019), Fjeld et al. (2021), and Seshadri et al. (2024) emphasized the necessity of establishing ethical guidelines for AI utilization and athlete data management. The findings of this review reinforce these concerns by demonstrating that over half of the included studies identified data privacy as a significant challenge.

Furthermore, the findings suggest that digital coaching is redefining the professional identity of coaches. Traditionally, coaches relied heavily on experiential knowledge, intuition, and observational skills. However, contemporary coaching increasingly requires competencies in data analytics, technology management, and digital communication. This transformation aligns with the concept of Professional Learning Theory, which emphasizes continuous adaptation and lifelong learning within evolving professional environments. Research by Cushion et al. (2018), Stoszkowski et al. (2020), and Griffiths et al. (2023) indicates that coaches who actively engage in digital professional development are more capable of adapting to technological changes and maintaining coaching effectiveness.

Overall, the synthesis of conceptual and empirical evidence demonstrates that digital coaching represents more than the adoption of technological tools; it reflects a broader transformation in coaching philosophy, professional competencies, and athlete development strategies. The reviewed studies consistently indicate that technology enhances performance monitoring, decision-making, communication, and individualized training. Nevertheless, successful implementation requires adequate digital competence, organizational support, ethical governance, and continuous professional development. Therefore, the future of the coaching profession will likely depend on the ability of coaches to integrate technological innovation with human-centered coaching principles, ensuring that digital transformation contributes positively to athlete performance, learning, and well-being.

CONCLUSION

This systematic literature review demonstrates that digital coaching and technology utilization have become essential components of the contemporary coaching profession. Based on the analysis of 30 eligible studies published between 2015 and 2025, the findings reveal that wearable technologies and GPS tracking systems were the most frequently utilized digital tools (26.7%), followed by video analysis software (20.0%), mobile coaching applications (16.7%), artificial intelligence systems (13.3%), athlete management platforms (13.3%), and virtual reality technologies (10.0%). Empirically, digital technologies contributed positively to performance monitoring (83.3%), coaching decision-making (73.3%), coach–athlete communication (66.7%), individualized training program development (63.3%), injury prevention (60.0%), and athlete motivation (50.0%).

Conceptually, the findings support the perspectives of Digital Transformation Theory, Technology Acceptance Model, Digital Competence Framework, and Athlete-Centered Coaching Theory, which emphasize the role of technology in enhancing evidence-based

coaching practices. The review further indicates that digital competence, including technological literacy, data interpretation, communication skills, and ethical awareness, has become a fundamental requirement for modern coaches. However, several barriers remain, including limited digital skills (80.0%), high technology costs (70.0%), inadequate infrastructure (63.3%), and concerns regarding data privacy (56.7%).

Overall, digital coaching represents a significant transformation of the coaching profession from traditional observation-based approaches toward data-driven and technology-enhanced practices. Future coaching effectiveness will depend on the successful integration of technological innovation, ethical governance, continuous professional development, and human-centered coaching principles to optimize athlete performance and long-term development.

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