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UTILIZING VIDEO TECHNOLOGY IN SPORTS SCIENCE

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ABSTRACT

Video technology is a digital intervention practice that enhances the understanding of movements and the improvement of athletes' performance. The purpose of the study was to assess how video feedback can improve athletic performance and how it contributes to the understanding and visualization of sporting behavior. To achieve this, a literature review was conducted, encompassing eight studies published between 2017 and 2024. Utilization was made of search engines such as Google Scholar, PubMed, and Science Direct. The analysis utilized a sample of 189 athletes, which included 158 male and 31 female participants from the sports of football, futsal, and American football and investigated the effects of video feedback in sports coaching and its consequent impact on athletic performance. Results indicated that video feedback is a significant digital intervention tool for enhancing athletes' performance in training. The application of video technology enabled athletes to more readily discern errors, thereby facilitating adjustments to their movements for ongoing enhancement. Ultimately, athletes who received video feedback of their recorded performance were able to share, comprehend, strategize and identify areas for improvement.

Keywords: Video, Technology, Information and Communication Technologies, Sports

1.0 INTRODUCTION

The effect of technology is also considerably recognized in the field of coaching. The advent of video cameras and cassettes introduced the idea of using video to record images for sports coaching. Over the last two decades, there have been rapid developments in Information and Communication Technologies (ICT), audiovisual technology, broadcasting technology and telecommunications. Digital video cameras allow images to be recorded in a format suitable for storage and processing by computers. Laptops possess the capability to process diverse data formats (multimedia), as well as the capacity for digital video storage. External hard drives additionally allow further expansion of the capacity of these computers, supporting the storage and analysis of multiple videos. The complexity of computer equipment and software means that knowledge about the application of video needs to be updated regularly. The purpose of analysing a match at the training level is to provide an enriched feedback to the athletes. In addition, various forms of technology are being utilised in sport, including the ability to split the screen, virtual reality, the ability to manipulate through specific technological levers and

many advanced practices to provide quantitative feedback on movement and technique execution (O'Donoghue, 2017).

Football is arguably one of the most complex, enjoyable and demanding sports. Analysis of the physical activity of footballers reveals that elite athletes cover distances ranging from 9 to 14 kilometers and engage in approximately 1,330 actions, including 220 high-speed movements, throughout a game. The distance covered in a football match clearly differs depending on the role and position of the players (Sarmento et al., 2014).

The impact of technology on team sports is significant and sets a precedent for their advancement (Patsi, Nikolaidou & Evaggelinou, 2025). There are many examples in football and specifically in the field of refereeing, where the intervention of technology assists the human decision to eliminate the possibility of error (Video Assistant Referee, Goal Line Technology). Football teams are obligated to play by the sport's regulations, but the referee's function is to oversee the proceedings on the field. Refereeing judgments can be influenced by noise, pressure from spectators, the significance of the competition, and team proficiency. However, they are crucial and can determine the outcome of the game (Büyükçelebi et al., 2022). The Video Assistant Referee (VAR) represents the most substantial advancement in football refereeing since the introduction of the yellow and red cards in 1970. Following pressure from the International Football Federation (FIFA), VAR was officially adopted for the 2018 World Cup and some national leagues were already using it.VAR assistant referees watch the match from a closed room that has access to live action footage of the match.Their responsibility is to alert the head referee of clear errors and significant missed stages, but only in four specific instances where the referee is authorized to amend their decision (Zglinski, 2022).

The process of providing feedback with Video Technology

Providing feedback serves as both an educational and social instrument, thereby cultivating a relationship of mutual trust and respect between the trainee and supervisor. The content of feedback is the information that allows learners to compare their actual performance with a better model that they admire and in this way they gain the ability to follow it in order to get closer to it by reducing the gap between them. The relationship should be dynamic, constructive and there should be a healthy interaction. Feedback should be implemented in a mutually respectful manner, so that there is no room for the learner or the supervisor to question the ways of thinking and acting (Atkinson, Watling & Brand, 2021). Furthermore, critical inquiries persist regarding the optimal feedback quantity for maximizing learning effectiveness. Learning is facilitated by feedback, but excessive feedback can be harmful. Feedback at reduced frequency, specifically after two or more attempts, demonstrates equivalent efficacy in learning when compared to total frequency feedback (Kalapoda & Patsi, 2025; Kalmpazidou, Vlachou, Patsi & Evaggelinou, 2025; Potdevin, Vors, Huchez, Lamour, Davids & Schnitzler, 2018).

It has been established that the ability of a player to record and evaluate their performance is essential for success in professional football, while youth football typically prioritizes both player development and match results. The objective of optimizing learning prospects in youth football has resulted in the multifaceted employment of video-based performance analysis by coaches, athletes, and sports scientists within the realm of football. Coaches utilize video for

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diverse applications, encompassing tactical considerations, psychological preparation prior to matches, team organization, and as a resource for reflection and evaluation. It has identified movement and performance patterns in competitive football, and other applications such as the identification and use of key performance indicators, and the role of movement analysis in technique to obtain information related to effort rate data. Nonetheless, while video has been extensively utilized to collect sports performance data in an accurate and reliable way, there is less emphasis on the psychological responses of athletes to video feedback (Middlemas & Harwood, 2018).

The purpose of the present study was to determine the effects of video technology, used for feedback, on the development of football players' technical, tactical and football abilities. The aim of these studies was to determine how video feedback enhances athletic performance, encompassing both individual and team dynamics.

2.0 METHOD

In this research, a literature review was conducted and the study process was divided into five stages in order to make it more understandable:

Stage 1: Identifying the research question
Step 2: Identification of relevant studies
Stage 3: Selection of studies
Phase 4: Data mapping
Phase 5: Discussion, summarization, and reporting of results.

Stage 1

The present scientific research focused on the benefits of using video feedback in team sports. The purpose of the survey was to answer the following questions:

What is known from the existing literature about the positive effects of video feedback in team sports?

How can video feedback be used to provide significant benefits to the performance of athletes both at individual and team level?

Stage 2

For data acquisition, a review of scientific literature was conducted on Google Scholar, PubMed and Science Direct. Publication of articles was required between 2017 and 2024.

Publications predating 2017 were excluded from the survey. Consequently, eight of the twenty scientific articles were selected.

Stage 3

For the study selection process, the focus was on team sports and particular attention was paid to the use of video feedback. Similarly, keywords such as: feedback, video technology, team sports, football, information and communication technologies were used.

Stage 4

The data were entered into a data recording form and the program "Excel" was used. The information was recorded as follows:

Title, Authors (year), Participant, Measurement devices, Approach, Outcomes. The nine articles were arranged alphabetically in Table 1, according to the first author.

Stage 5

The results of the surveys were reported. All data related to the use of video feedback in team sports were collected.

3.0 RESULTS

A selection of eight studies (2017-2024) highlights recent advancements in Video Technology in Sports Science. Details are described as follows.

Table 1. Overview of main characteristics of the selected studies regarding the use of Video Technology in Sports Science

Authors	Participants	Instruments	Outcomes
Capalbo et al. (2022)	2 goalkeepers 9 years old	iPhone XR camera iPad Air 2	Video viewing alone gave minor boosts, but video plus feedback helped goalkeepers improve significantly.
Chinaglia et al. (2023)	26 competitors, ages 10-15.	GoPro cameras, model Hero 10. Open Pose was used to assess pose during the kicking motion. Unity software A portable Eurocam note book computer for video viewing.	The group with the training video showed a longer final step, but no other variables changed significantly.
Fele et al. (2024)	11 college students	Panasonic HC-VX1 Camera GoPro	Video feedback proved to be a social process which required coach-player interaction as well as appropriate video management skills from the coach.
Groom et al. (2017)	10 college students	A customized version of the "LearningStyleInventory" as an indicator of participants' receptiveness to video-based briefings. Video analysis questionnaire.	Video feedback enabled players to: understand the game, identify strengths, improve weaknesses, and develop skills.
Hadiana et al. (2019)	49 college students	Game Performance Assessment Instrument (GPAI)	The students were able to see their mistakes in motion in terms of decision making, execution of skills and the

			support they received in order to improve performance
Kérivel et al. (2021)	20 postgraduate students, aged 20 to 23	Wide-angle camera connected by Wi-fi to a touchscreen device	The players were able to share, understand, plan and find solutions to improve their performance.
Martinez et al. (2024)	A 9-year-old boy and two 10-year-old girls.	iPadPro third generation (11-inch diagonal screen) The online platform soccermovescollection.com.	Video feedback was as effective as video viewing combined with feedback.
van Maarseveen et al. (2018)	14 female soccer players (M age=15.8 years, SD=1.3).	GoPro camera (1920×1080 resolution, 30 Hz, Hero 3 model, black version, GoPro) 15.6-inch Laptop Stream Catcher Software (1.1.0.114, StarTech.com)	For complex football plays, self-controlled feedback was used to verify and fix mistakes.

4.0 DISCUSSION

The aim of the present study was to examine how video feedback can enhance the performance of athletes and the benefits of this method in the understanding, audiovisual reproduction and representation of sports performance. For this purpose, a literature review of eight studies published from 2017 to 2024 was conducted. Google Scholar, PubMed, and Science Direct search engines were utilized. Research results demonstrated video feedback's significance as a digital intervention tool in team sports coaching. Utilizing video analysis, players could review particular maneuvers or tactics employed in a game or training exercise, thereby pinpointing their respective advantages and disadvantages. This feedback method fostered self-awareness, promoted comprehension of team tactics and communication, and facilitated focused development of technical proficiencies and overall performance.

The study conducted by Hadiana et al. on the subject of football. (2019) showed that the combined use of video and verbal feedback from the coach led to positive results, enhancing the players' confidence and their ability to perceive mistakes and improve on a practical level. Exhibiting similarity in an additional survey (Chinaglia et al., 2023) results showed a significant improvement in kicking technique, where the players, after the coach showed a training video, increased the length of the last step before the kick. Through feedback using video, it was demonstrated that the players were able to share, understand, plan and confirm solutions they had experienced during the execution (Kérivel et al., 2021).

It was observed that coaches generally displayed a positive attitude toward technology, believing that video feedback was an efficient tool for athlete training and improvement (Martinez et al., 2024). The players also responded positively, especially when the feedback was accompanied by supportive comments that boosted their confidence (van Maarseveen et al., 2018). However, it was observed that excessive criticism or misuse of video can induce stress in players, which compromises their performance (Capalbo et al. 2022).

In addition, it was found that the use of video feedback significantly improved the athletes' perception of their mistakes and their understanding of the aspects of their performance that could be improved. Due to the athletes' difficulty in visually identifying areas for improvement, verbal feedback alone frequently proved inadequate. In American soccer (Schussler et al., 2024), video analysis provided a complete visual representation, thereby encouraging athletes' engagement in learning and improvement. The utilization of video observation and feedback has improved save performance, particularly in goalkeeper research (Capalbo et al., 2022).

The coaches were amenable to integrating video feedback into their sessions. Nonetheless, it was emphasized that excessive technology use could be unproductive and detrimental without suitable guidance and assistance for the participants. Technology should be used as a supportive tool and not as a substitute for interpersonal communication and emotional support (Fele & Campagnolo, 2024).

Overall, the effects of video feedback seemed to differ depending on the psychological profile of the players. Some athletes benefited directly, as they were able to quickly adapt her movements and improve their technique. Athletes may experience pressure or anxiety from continuous performance analysis, indicating a necessity to adjust technology use based on individual personality and psychological condition (Groom & Cushion, 2017).

5.0 CONCLUSIONS

In conclusion, this study confirmed the importance of video feedback as a valuable tool for the coaching process in sports. Coaches should integrate technology into their daily practices to offer athletes the possibility, through audiovisual representation, to monitor their performance and learn from their mistakes in a more direct and practical way.

Further research might examine utilizing more complex technologies to provide even more accurate sports performance data. Moreover, the establishment of tailored training programmes for coaches is proposed, which will facilitate their comprehension of how to implement video feedback and other technological advancements to enhance athletes' performance.

Conflict of Interest: The author declares no conflict of interest.

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