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RESEARCH ARTICLE

THE USE OF MULTIMEDIA TECHNOLOGY TO IMPROVE THE SPORTSMANSHIP ATTITUDE OF ATHLETES

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ABSTRACT

This study aimed to explore the potential impact of intelligent network multimedia technology on enhancing the sportsmanship attitude of student-athletes. It employed a combination of descriptive-comparative-correlational design and qualitative research methods that involved 800 participants from two majors: 480 from the Physical Education major and 400 from the Social Sports Guidance major. The sample selected for analysis consisted of 416 individuals, with 216 students from the Physical Education major and 200 students from the Social Sports Guidance major. Additionally, 10 teachers were deliberately chosen to partake in interviews facilitated by a researcher-made questionnaire. The results revealed insights regarding the utilization of multimedia technology and the sportsmanship attitude among student-athletes. Furthermore, a weak but significant relationship was identified between the extent of multimedia technology usage and the sportsmanship attitude of athletes, particularly concerning rules, officials, and social conventions ($r = -0.10$, $p = 0.038$). Thematic analysis of teacher interviews unveiled key themes encompassing the use of multimedia technology during athlete training and games, perceptions of the technology's impact on sports, and challenges encountered in its application. As a recommendation, the study underscores the need for the formulation of a comprehensive multimedia technology utilization plan, recognizing its potential to influence sportsmanship attitudes and contribute positively to sports education.

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INTRODUCTION

Multimedia technology has undergone remarkable advancements, with intelligent devices and gadgets replacing outdated methods. As these technologies become deeply integrated into sports, it is crucial to examine their impact on the athletes and students who utilize them. It is equally important to explore how teachers and coaches incorporate technology into their instructional approaches, particularly concerning sports. Additionally, there is a need to investigate how this integration influences the sportsmanship attitudes of students and athletes. Sportsmanship, a term frequently discussed and emphasized, warrants a comprehensive understanding of how multimedia technological devices intelligently intertwined with sports impact the quality of athletes' sportsmanship attitudes. According to Keating's (2017) definition, sportsmanship encompasses a combination of virtues such as integrity, patience, self-control, fairness, and forgiveness. Thus, studying the effects of intelligent network multimedia technology on the development of athletes' sportsmanship attitudes becomes imperative. By exploring the integration of technology and sportsmanship, we can gain insights into how these advancements shape the ethical and behavioral dimensions of athletes, both on and off the field. Such understanding is essential for educators, coaches, and researchers seeking to optimize the educational potential of sports and foster well-rounded individuals in the realm of athletics.

So, in line with this, the current study aimed to assess multimedia technology and the sportsmanship attitude of athletes..

Background of the study: The 1990s witnessed significant advancements in the ability to handle various media and process information, with personal computers evolving into multimedia machines, marking the onset of the era of multimedia technology (Ramaiah, 2018). Keyes (2019) highlights that humans typically remember only 20% of what they see and 30% of what they hear, retaining a mere 50% of combined visual and auditory information. Considering these findings, it comes as no surprise that the emergence of various forms of multimedia technology has been instrumental in addressing these limitations. Within the realm of education, media serves as the symbol systems utilized by teachers and students to share knowledge representations (Thomas, 2018). However, despite the widespread use of technology in daily life, not everyone experiences complete comfort and trust when it comes to these devices. The introduction of technology can evoke various emotions that may impact individuals who are meant to benefit from it. Technological readiness is classified into two categories: positive technology readiness (PTR) and negative technology readiness (NTR) (Parasuraman, 2020). Recognizing the growing importance of multimedia and network technology in educational settings, Wang (2018) notes that the use of such technologies has gained prominence, replacing conventional methods and raising higher standards.

In the context of college and university teaching curricula that emphasize physical education, it becomes crucial to enhance the quality of instruction by integrating multimedia and internet technology (Wang, 2018). This study focused on the utilization of intelligent network multimedia technology to improve the sportsmanship attitudes of athletes, as defined by Vallerand et al. (2017). Sportsmanship encompasses a multidimensional construct, consisting of five distinct and practical dimensions: full commitment to sport participation, respect for social conventions, adherence to rules and respect for officials, genuine respect and concern for opponents, and a negative approach to unsportsmanlike behavior.

Statement of the problem: This study aimed to analyze how the use of intelligent network multimedia technology can improve the sportsmanship attitude of student-athletes from Xinyang Normal University. Specifically, it sought answers to the following questions:

- What is the profile of the respondents in terms of:
 - Sex
 - Age
 - Year level
- What is the extent of usage of multimedia technology in the school in terms of:
 - Training and practice
 - Health assessment
 - Games and competitions
- Is there a significant difference in the level of usage of multimedia technology when compared according to their profile?
- What is the sportsmanship attitude of the athletes in terms of the following indicators:
 - Commitment
 - Rules, officials, and social convention
 - Opponent
- Is there a significant difference in the sportsmanship attitude of athletes?
- Is there a significant relationship between multimedia technology and the sportsmanship attitude of athletes?

Significance of the study

This study will benefit the following people in various aspects:

Student-athletes: This study will benefit student-athletes by educating them on the effects of multimedia technology on sportsmanship attitude.

Teachers: The teachers in charge of teaching physical education will gain valuable insights how the use of multimedia technology can promote positive sportsmanship attitude.

Athletes: The athletes, who must go through their rigorous physical trainings also stand to benefit from the current research as it provides them valuable information to introspect with their identities as athletes and use multimedia technology to improve their sportsmanship attitude.

Coaches: The findings of this research may help coaches to understand the effect of multimedia technology on athletes, specifically their sportsmanship attitude.

Future researchers: The research can also be of benefit to future researchers who aim to understand the relationship between multimedia technology and the sportsmanship attitude of athletes.

Scope and delimitation: This study examined the relationship between multimedia technology and sportsmanship attitude of athletes with an output to improve sportsmanship attitude of athletes in selected schools. The samples for this study were students majoring in Physical Education and Social Sports Guidance at Xinyang Normal University.

Since these survey questions were translated to Chinese for the teacher respondents to understand, there may be some delimitations in the areas of translation regarding the exact use of words and connotations. However, the translator ensured that all points made in the questionnaire were properly represented in the translated version. Time constraint was also limitation.

Theoretical framework: The current research concept was anchored on the achievement goal theory. According to the accomplishment goal theory by Nicholls (1984, 1989), people approach achievement tasks with qualitatively different kinds of objectives or goals depending on how they judge their competence and ability. The concept of ability is increasingly distinguished from effort, task difficulty, and chance as young people progress through a temporal process, according to the concepts underlying achievement goal theory. The achievement goal theory makes the assumption that one of the main motivational factors in achievement settings is to show one's aptitude or competence. However, how each person views when this goal is achieved varies. (Chi, 2004; Hardwood & Thrower; Nicolls, 1984; Roberts, 2001). Achievement goal theory separates two distinct views, often known as goal orientations, namely ego orientation and task orientation. While acting with an ego orientation, the objective is to show one's skill in comparison to that of others. The notion of subjective success in this instance is other-referenced, i.e., a highly ego-oriented person feels competent when they exceed others. On the contrary, a task-oriented person sets self-referenced goals that emphasize learning, self-improvement, and mastery of a certain skill. When an individual feels competent in this scenario, it is because he or she has achieved personal growth (Duda, 1993; Roberts, 2006).

AGT can serve as a robust theoretical foundation for examining how the integration of intelligent network multimedia technology affects athletes' sportsmanship attitudes. Applying AGT to the study of enhancing sportsmanship attitudes through technology involves several key aspects:

Mastery goals and sportsmanship improvement: This emphasizes the development of competence, the acquisition of skills, and personal growth. In the context of sportsmanship, athletes with mastery goals are more likely to focus on improving their ethical behavior, treating opponents with respect, and cooperating with teammates.

Performance goals and ethical behavior: Performance goals are centered around demonstrating competence in comparison to others. In the study, performance-oriented athletes might view ethical behavior as a way to garner recognition or avoid negative judgment.

Autonomous vs. controlled motivation: AGT differentiates between autonomous motivation (intrinsic drive) and controlled motivation (extrinsic factors). The study investigated whether the integration of intelligent network multimedia technology fosters a sense of autonomy in athletes' decision-making regarding ethical behavior.

Goal structures and team dynamics: AGT considers the influence of goal structures on group dynamics. Intelligent multimedia technology could be used to facilitate team discussions and reflections on sportsmanship, encouraging athletes to collectively establish shared values and norms.

Long-term attitude change: AGT's focus on goal pursuit and self-regulation aligns with the investigation of long-term attitude change.

METHODOLOGY

This chapter describes the research design, locale, the study's respondents, sampling technique, the research instrument, the data collection technique, and the statistical data analysis that will be used.

Research locale: The setting of the study is Xinyang Normal University, where the respondents for both the quantitative and qualitative modes of inquiry are enrolled (students/athletes) and

employed (teachers). The student-athletes from this university were part of the population surveyed. Xinyang Normal University is located in Xinyang, a well-known historic and cultural city in Henan Province's south

Sample and sampling technique: This study involved Physical Education and Social Sports majors enrolled at Xinyang Normal University. It was essential that the students demonstrated a voluntary willingness to participate in the study, along with the ability to understand and effectively communicate in the language used for data collection and analysis.

Moreover, their availability to attend scheduled data collection sessions and their commitment to following the study protocol were crucial factors for their inclusion. Concerning the teacher participants, this study included teachers from both the Physical Education Department and the Social Sports Guidance Department at Xinyang Normal University. The selected teachers had substantial knowledge and experience in teaching or coaching students within the Physical Education and Social Sports majors.

To obtain the sample size, the researcher utilized the Raosoft calculator at a 5% margin of error, 95% confidence level, and a response distribution rate of 50%. The population size was 480 students for the Physical Education majors and 400 for the Social Sports major. The computed sample size was 216 students for the Physical Education majors and 200 for the Social Sports majors.

Data gathering procedure

To accomplish the data-gathering process, the researcher sent a letter of request to the president of Xinyang Normal University seeking permission to conduct the study. Upon the president's approval, the quantitative questionnaire was distributed to the student-athletes, while the qualitative questionnaire was provided to the teacher/coaches. After the respondents completed the questionnaires, the researcher consolidated and analyzed the data to facilitate further discussions of the study findings. The researcher also conducted the necessary interviews using a self-developed semi-structured interview guide that included a set of open-ended questions. These questions were designed to explore various aspects such as the coaches' familiarity with technology, their usage of technology in teaching and training, their perceptions of the benefits and challenges of technology integration, and any recommendations or strategies they had for effective technology implementation.

The interview process involved contacting the coaches from both the Physical Education Department and the Social Sports Guidance Department. The researcher explained the purpose of the study and the interview process, and then assured the coaches of utmost confidentiality. The interviews were conducted face-to-face or through online platforms, depending on the convenience and preferences of the coaches. The interviews were audio-recorded with the consent of the participants to ensure accurate data capture. Following the interviews, the audio recordings were transcribed verbatim to facilitate data analysis. The qualitative data obtained from the interviews were analyzed using thematic analysis, where common themes, patterns, and categories were identified. These themes were compared and contrasted across coaches from the Physical Education Department and the Social Sports Guidance Department to uncover similarities, differences, and unique perspectives.

Statistical analysis: In the data analyses procedure, the research utilized the following statistical treatments at a 0.05 level of significance. The package/software employed for the statistical analyses was the Statistical Package for Social Sciences (SPSS) software.

Frequency count and percentage: For the analysis of the profile of the student respondents, the research used frequency count and

percentages to assess the results collected in terms of age, sex, major, and year level of the respondents.

Weighted mean: The research employed the weighted mean for the assessment of each of the items or statements on the multimedia technology and sportsmanship attitude indicators. All parts of the quantitative questionnaire (except the first indicator in the part 2 assessment) utilized a five-point Likert scale ranging from Strongly Disagree (SD = 1); Disagree (D = 2); Neutral (N = 3); Agree (A = 4); and Strongly Agree (SA = 5)

T-test / ANOVA: The t-test was used by the researcher to determine if there was a significant difference in the level of assessment of multimedia technology and sportsmanship attitude of respondents based on sex. ANOVA was utilized for the variables age and year level.

Pearson's r correlation analysis: The researcher used Pearson's r correlation analysis to determine the significant relationship between the indicators of the use of multimedia technology and the sportsmanship attitude in Xinyang Normal University as assessed by their respondents. The 0.05 threshold of significance was applied for hypothesis analysis. If the computed significance value was larger than the set value of 0.05, the null hypothesis was accepted; otherwise, it was rejected.

Thematic analysis: Thematic analysis was employed to analyze the qualitative data collected from the interviews of teachers.

RESULTS

This chapter presents the results of the study and their corresponding analyses. Out of 416 student-respondents, the results show that majority or 50.2% of the student-respondents are male, while 207 (49.8%) are females. In terms of age, majority or 28.6% of the respondents are between 21–22 years and 23–24 years old, followed by 21.4% who are below 20 and above 25. Based on the respondents' year level, majority are freshmen (27.2%), followed by sophomores (26%), seniors (24%), and juniors (22.8%). Based on the summary table of the extent of usage of multimedia technology, the schools were found to have an overall low level of utilization of multimedia technology in sports with a mean of 2.49. The highest ranked dimension is that technology is mostly used for training and practice (2.50) although at a low level only. This is followed by the use of technology for health assessment with a mean of 2.49 and the use of technology for games and competitions with a mean of 2.48.

Table 1. Frequency Distribution of the Students' Profile in terms of Sex, Age, and Year Level

Category	Frequency	Percentage (%)
Sex		
Male	209	50.2
Female	207	49.8
Total	416	100
Age (Years)		
20 and below	89	21.4
21 - 22	119	28.6
23 - 24	119	28.6
25 and above	89	21.4
Total	416	100
Year Level		
Freshmen	113	27.2
Sophomores	108	26.0
Juniors	95	22.8
Seniors	100	24.0
Total	416	100

A low level of usage of multimedia technology among sports students could be attributed to several factors that might impede its integration and adoption. Some possible explanations include:

Table 2. Summary of the Extent of Usage of Multimedia Technology

Multimedia Technology	Mean	SD	Qualitative Description	Interpretation	Rank
1.Training and Practice	2.50	0.43	Disagree	Low Level	1
2. Health Assessment	2.49	0.44	Disagree	Low Level	2
3. Games and Competitions	2.48	0.43	Disagree	Low Level	3
MEAN SCORE	2.49	0.25	Disagree	Low Level	

Scale: 1.00–1.50 = Very Low Level / 1.51–2.50 = Low Level / 2.51–3.00 = High Level / 3.51–4.00 = Very High Level

Table 3. Differences in the Extent of Usage of Multimedia Technology in the School Based on Demographic Profile

Profile	Mean (SD)	t- or F-value	p-value	Interpretation
Training and Practice				
Age	2.50 (0.43)	0.41	0.747	Not significant
Sex		-0.06	0.952	Not significant
Year Level		0.89	0.448	Not significant
Health Assessment				
Age	2.49 (0.44)	0.79	0.502	Not significant
Sex		-1.31	0.190	Not significant
Year Level		0.45	0.717	Not significant
Games and Competitions				
Age	2.48 (0.43)	0.77	0.509	Not significant
Sex		0.07	0.942	Not significant
Year Level		0.78	0.508	Not significant
Extent of Usage of Multimedia Technology				
Age	2.49 (0.25)	0.61	0.608	Not significant
Sex		-0.77	0.440	Not significant
Year Level		0.39	0.762	Not significant

*A p-value <0.05 is considered significant.

Table 4. Summary of the Sportsmanship Attitude of Athletes

Sportsmanship Attitude	Mean	(SD)	Qualitative Description	Interpretation	Rank
1.Commitment	2.49	(0.44)	Disagree	Low Level	3
2.Rules, Officials, and Social Conventions	2.53	(0.42)	Agree	High Level	1
3.Opponent	2.50	(0.41)	Disagree	Low Level	2
MEAN SCORE	2.51	(0.24)	Agree	High Level	

Scale: 1.00–1.50 = Very Low Level / 1.51–2.50 = Low Level / 2.51–3.00 = High Level / 3.51–4.00 = Very High Level

Table 5. Difference in the Sportsmanship Attitude of the Athletes based on Demographic Profile

Profile	Mean (SD)	t- or F-value	p-value	Interpretation
Commitment				
Age	2.49 (0.44)	1.06	0.366	Not significant
Sex		-1.06	0.292	Not significant
Year Level		0.69	0.559	Not significant
Rules, Officials, and Social Convention				
Age	2.53 (0.42)	1.89	0.130	Not significant
Sex		-0.76	0.450	Not significant
Year Level		1.31	0.272	Not significant
Opponent				
Age	2.50 (0.41)	0.84	0.474	Not significant
Sex		0.43	0.670	Not significant
Year Level		0.07	0.978	Not significant
Sportsmanship Attitude				
Age	2.51 (0.24)	1.83	0.141	Not significant
Sex		-0.90	0.368	Not significant
Year Level		0.19	0.901	Not significant

*A p-value <0.05 is considered significant.

Table 6. Relationship of Multimedia Technology and Sportsmanship Attitude of Athletes

Variables	Commitment		Rules, Officials, and Social Convention		Opponent		Sportsmanship Attitude	
	r-value	p-value	r-value	p-value	r-value	p-value	r-value	p-value
Training and Practice	0.02	(0.617)	-0.07	(0.146)	0.03	(0.519)	-0.01	(0.856)
Health Assessment	-0.06	(0.254)	-0.05	(0.274)	0.03	(0.531)	-0.05	(0.318)
Games and Competitions	0.08	(0.103)	-0.05	(0.347)	-0.06	(0.232)	-0.01	(0.799)
Extent of Usage	0.03	(0.564)	-0.10	(0.038)*	0.00	(0.962)	-0.04	(0.392)

Table 7. Extracted Themes on the Practices Implemented By Coaches or Teachers

Coaches' and Teachers' Practices	Recurring Themes
A. Multimedia Technology Used by Athletes/Student During Training/Games	<ul style="list-style-type: none"> • Customized training programs and meal plans formulated with the use of software and modern technology. • The use of smart devices to monitor the physical and mental state of athletes and students. • Sports video analysis and subscription to sports-related materials to serve as reference.
A. Perceptions on the Impact of Multimedia Technology in Sports	<ul style="list-style-type: none"> • It is useful in keeping track of the overall health and well-being of the athletes/students. • Teaching students became convenient and effective because of the reference materials available online. • Because of the ease of access to past games and other sports reference materials, it has become easier to formulate a game strategy.
A. Issues Encountered in the Use of Multimedia Technology in Sports	<ul style="list-style-type: none"> • Lack of funds to purchase the latest sports technology and to acquire required multimedia materials. • Lack of accessible sports training facilities.

Traditional teaching approaches: If the educational institution predominantly employs traditional teaching methods, students may not be exposed to the potential benefits of multimedia technology in enhancing their learning experience. As a result, they might not see the value in adopting such tools.

Resistance to change: Some students may be resistant to change and prefer traditional methods.

Perceived Irrelevance: Sports education students might perceive multimedia technology as irrelevant to their field of study.

Concerns about distraction: Students might worry that using multimedia technology could lead to distractions, affecting their focus on sports education content. Based on Table 3, there are no significant differences in the students' assessment of the extent of usage of multimedia technology in the school among levels of age, sex, and year level in terms of training and practice, health assessment, and games and competitions. Studies show instances where athletes are taking part in using simulations to mimic their games, for them to employ new strategies.

Regardless of age or gender, the number of American football teams are reportedly using joystick-controlled programs, such as customized versions of Madden NFL, to great effect to practice decision-making skills during various tactical plays, similar to the advantages Formula 1 racing car driver Lewis Hamilton is purported to have obtained from a reported 1000 hours in the McLaren simulator (Weinbach, 2017).

Based on table 4, sportsmanship attitude has an overall mean score of 2.51, which indicates a high level of sportsmanship attitude among the athletes. The highest-ranked dimension suggests that the athletes have a high level of sportsmanship attitude when it comes to rules, officials, and social conventions (2.53). However, they recorded a low level of sportsmanship attitude in dealing with their opponents (2.50), and in commitment (2.49). The high sportsmanship attitude among sports education students with the use of multimedia technology can be attributed to several factors that contribute to the positive impact of technology on their ethical behavior, attitudes, and values within the realm of sports. These factors collectively foster an environment conducive to the development of a sportsmanship attitude. Some possible explanations for this phenomenon include:

Engaging and realistic scenarios: Multimedia technology allows for the creation of immersive and realistic scenarios that simulate sports situations, allowing users to better understand the importance of fair play, respect for opponents, and adherence to rules.

Visual learning: Multimedia technology employs visual elements that help depict positive sportsmanship behaviors and actions, making it easier for students to internalize and emulate these behaviors in real-life sports contexts.

Role modelling: Multimedia technology can showcase real-life examples of athletes and teams exhibiting exemplary sportsmanship behaviors.

By presenting these role models, students are more likely to be inspired and motivated to adopt similar attitudes and actions in their own sports endeavors.

Immediate feedback: Technology enables students to receive immediate feedback on their decisions and actions in various sports scenarios. This immediate feedback can highlight the consequences of both positive and negative sportsmanship behaviors, encouraging students to make ethical choices.

Based on table 5, there are no significant differences in the students' assessment of the sportsmanship attitude of the athletes among levels of age, sex, and year level in terms of commitment, rules, officials, and social convention, and opponent. Physical and psychological factors both come into play during athletic competition. Occasionally, athletes, regardless of their age or gender, use dubious methods to gain an advantage through questionable and unethical tactics, verbal comments, and provocative and offensive behaviors. These methods are not always acceptable psychological strategies (using skills and abilities to gain psychological advantages over the opponents), like flopping, which involves pretending to fall or be injured (Yukhymenko-Lescroart, 2019). Based on table 6, there is a weak but significant relationship between the extent of usage of multimedia technology, and the sportsmanship attitude of athletes in terms of rules, officials, and social convention ($r=-0.10, p=0.038$). There are no significant relationships between other pairwise correlations. The relationship between multimedia technology usage and sportsmanship attitude can be connected to the framework of Achievement Goal Theory. This theory, commonly applied in educational and sports contexts, examines how individuals' motivations and goals influence their behavior, effort, and performance. In the context of sports education, the utilization of multimedia technology and the development of sportsmanship attitude can be understood through the lens of Achievement Goal Theory in the following ways:

Mastery of goals and sportsmanship attitude: This emphasizes the development of competence, learning, and self-improvement. The use of multimedia technology can enhance sports education by providing opportunities for students to acquire knowledge, practice skills, and engage in reflective learning experiences.

Performance goals and technology usage: Performance goals focus on demonstrating competence and outperforming others. Multimedia technology can be employed to simulate competitive sports situations and scenarios, allowing students to practice decision-making and ethical choices under pressure.

Task involvement and learning from technology: Task-involved individuals prioritize self-improvement and mastery of skills. They are more likely to view challenges as opportunities to grow. Multimedia technology offers task-involved students a platform for interactive learning, where they can engage with sportsmanship-related content, make decisions, and learn from the consequences of their actions.

Ego involvement and positive attitudes: Ego-involved individuals focus on demonstrating their competence to others and winning. Effective use of multimedia technology can shape positive sportsmanship attitudes even among ego-involved students by presenting scenarios that showcase ethical behavior and highlighting the respect and admiration gained by exhibiting sportsmanship.

Approach-avoidance goals and media usage: Approach goals involve striving for success, while avoidance goals involve avoiding failure. The use of multimedia technology can help students approach sportsmanship-related challenges with a sense of curiosity and willingness to learn.

Multimedia Technology Used by Athletes/Students During Training/Games: The respondents highlighted using customized training programs and meal plans formulated with the use of software and modern technology. This is backed by a study conducted by Fister, *et al.*, (2015) and Ning (2019), wherein they emphasized how the capabilities of artificial intelligence (AI) encompass the measurement and analysis of actions and movements, offering services such as dietary recommendations, effectively operating as a virtual trainer. Consequently, AI-powered fitness trackers hold substantial potential and could assume a pivotal role within the fitness industry.

Another notable instance of the application of AI in the realm of sports is in tennis, where it serves as a valuable tool for coaches to devise strategic plans. This involves a comprehensive analysis of player attributes, physical capabilities, skillsets, and patterns of play. These insights are derived from sophisticated prediction algorithms rooted in deep learning techniques (Chin, *et al.*, 2022). The scope of such AI-driven functionalities extends even further, encompassing the prediction of outcomes in baseball games. A prime example is the TRACAB system, meticulously designed to anticipate and detect early indications of potential injuries. It accomplishes this by meticulously scrutinizing images of the playing field, which include factors such as player postures, equipment utilization, the presence of referees, crowd density, levels of on-field activity, and other pertinent variables (Kazuhiro and Ryoko, 2018).

Another use of multimedia technology is the use of smart devices to monitor the physical and mental state of athletes and students which can also prevent injuries in the future. The use of wearable sensor technology is finding an expanding niche among athletes. For instance, smart patches' compact size and lightweight design set them apart from bulkier wearables, rendering them inconspicuous. Athletes can conveniently wear these patches beneath their racing attire during training, competitions, and for research purposes. This capability allows for extensive, round-the-clock monitoring over extended periods (Verdel *et al.*, 2023, citing Sperlich and Holmberg, 2017). The utilization of smart patches for longitudinal monitoring, coupled with high-resolution data, holds notable significance. It serves the dual purpose of evaluating an athlete's desired adaptation to the training regimen and mitigating the risks associated with non-functional overuse (characterized by prolonged fatigue), injuries, and illnesses.

Perceptions on the Impact of Multimedia Technology in Sports

One impact of multimedia technology in sports emphasized by the respondents is that it is useful in keeping track of the overall health and well-being of the athletes/students. Wearable sensors empower individuals to detect and quantify various medically significant factors, encompassing functional movements, biomechanical attributes, vital signs, and the exertion levels of athletes. This capability aims to optimize performance while concurrently diminishing the likelihood of injuries. Wearable monitoring gadgets provide an uninterrupted and immediate stream of physiological information, enabling the formulation of precise treatment strategies and tailored training routines tailored to individual athletes. The overarching objective is to mitigate or avert injuries effectively. A growing number of athletes, coaches, and support personnel are embracing a more scientific approach to crafting and overseeing

training regimens. Effective monitoring of training loads can serve as a valuable tool for assessing an athlete's responsiveness to a training program, while also mitigating the potential for undesirable outcomes like non-functional overreaching, illness, or injury. Additionally, because of the ease of access to past games and other sports reference materials, it has become easier to formulate a game plan. The emergence of cutting-edge multimedia tools and resources, coupled with advancements in computers and electronic media, has ushered in a new era of enhanced educational possibilities. Innovative teaching approaches utilizing multimedia equipment have significantly elevated the potential for delivering high-quality education.

Issues Encountered in the Use of Multimedia Technology in Sports: One of the challenges provided by the respondents in the use of multimedia in sports is the lack of funds to purchase latest sports technology and acquire required multimedia materials. This is reflected in a study conducted by Dukić, *et al.* (2022), wherein their survey participants highlighted insufficient financial resources for procuring software and equipment as a potential obstacle to the incorporation of ICT (Information and Communication Technology) in sports management. Furthermore, there is the problem of lack of accessible training facilities. Sports equipment plays a crucial role in sports and fitness facilities, encompassing various tools and supplies. As people's awareness of health steadily advances, sports are becoming increasingly popular in everyday life, resulting in heightened expectations for the development of sports equipment. The emergence of new sporting activities has forged stronger connections between sports and the associated equipment. In numerous instances, inadequate education funding has resulted in a severe scarcity of sports equipment in schools.

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