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Sports Communication Using Transformative Engagement Theory: The Impact of Virtual Reality Technology

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A B S T R A C T

The advent of virtual reality (VR) technology is poised to bring about a notable change in the sports communication environment, as it presents a unique opportunity to revolutionize traditional communication methods by immersing participants in realistic and interactive settings. The purpose of this study is to look into how VR technology is changing sports communication. Through a thorough grounded theory (GT) inquiry, this study explores the potential benefits, drawbacks, opportunities, and difficulties of integrating VR into sports communication. The study uses qualitative analysis with MAXQDATM20 software, which includes interviews with 17 prominent sports experts and a thorough coding process. The study found that VR greatly enhances communication abilities by fostering dynamic and engaging surroundings. Additionally, VR can assist in creating creative marketing techniques and strengthen ties between athletes, fans, and organizations. Finally, in light of these findings, we developed a new theoretical framework called "Transformative Engagement Theory in Sports Communication." The novel contribution of this study is the proposition of the Transformative Engagement Theory in Sports Communication. The study provides a thorough grasp of the complex interactions between VR technologies and the dynamics of sports communication, as well as a road map for professionals in sports management, stakeholders, and researchers to navigate this revolutionary change successfully.

Keywords: *Virtual Reality, Metaverse, Immersive Experiences, Fan Engagement, Athletic Training, Sports Marketing, Digital Transformation.*

1. Introduction

The exchange of information between athletes, teams, spectators, and the media that takes place within the sports sector is referred to as sports communication (Kassing et al., 2004). The area, which was once dominated by broadcast and print media, has changed as a result of digital technologies to produce more dynamic and captivating experiences (Pavlik & Bridges, 2013). Numerous topics have been studied by academics, such as organizational tactics, media effect, and fan behavior (Parveen et al., 2015). Nevertheless, despite these advancements, little is known about how new technologies,

such as virtual reality (VR), alter the dynamics of sports communication. Current research frequently ignores comprehensive frameworks that address VR's holistic impact on fan interaction, marketing, and communication processes in favor of concentrating on discrete aspects, such as fan engagement or athlete training (Pashaie et al., 2024). The necessity for integrative techniques to comprehend VR's role in transforming the sports communication landscape is highlighted by this research gap.

Advances in a variety of technologies, such as artificial intelligence (AI), VR, augmented reality (AR), and data visualization (DV), have notable changed the sports communication landscape in recent years (Kiani, 2024). The capacity of VR to provide sports fans with an immersive experience of live events makes it stand out among these advances (Cohen, 2023). As a key technology in Industry 4.0 (Wen & Gheisari, 2020), VR is developing quickly in line with societal changes and a growing corpus of scientific study (Morimoto et al., 2022). Numerous cutting-edge displays and input devices have been produced by this second wave of VR technology, expanding study fields and applications (Ahir et al., 2020).

Even though VR has been thoroughly studied in domains including education, healthcare, and entertainment (Bryant et al., 2019; Liao, 2018; Lin et al., 2020), little is known about its precise uses and revolutionary potential in sports communication. The use of alternative technologies in sports decision support systems is steadily growing, according to current trends (Pashaie, Dickson, et al., 2023). However, current research frequently concentrates on discrete elements, like the function of VR in fan engagement (Huang & Wang, 2021) or athlete training (Feiz et al., 2022; Miles et al., 2012), without offering a thorough grasp of how VR can radically alter the whole sports communication landscape. This disparity emphasizes the need for a cohesive theoretical framework that incorporates these various facets and tackles the intricacies of VR's function in the sports industry.

Markowitz and Bailenson (2019) describe VR as a medium that creates immersive digital environments, presenting computer-simulated images that enable real-time interaction. This technology fosters intrinsic face-to-face communication in virtual settings (Aburumman et al., 2022) and is being applied across various sectors, including sports (Abich IV et al., 2021). For example, platforms like Meta offer National Basketball Association (NBA) games in VR, allowing users to engage in innovative consumption patterns, such as collecting non-fungible tokens (NFTs) and participating in the decentralized culture of Web 3.0 (Cohen, 2023). By providing rich auditory and visual stimuli, VR and AR technologies create multimedia content that enhances users' sense of presence, thereby influencing their attitudes, behavioral goals, and actions (Liao, 2018; Lin et al., 2020).

One of VR's defining characteristics is its ability to help interaction with virtual environments (Muhanna, 2015). Applications of VR in sports encompass situational productivity and animation control in real-world scenarios. By isolating users from their immediate surroundings, VR stimulates imagination and enhances the perception of real presence (Loureiro et al., 2020). The integration of VR into sports communication includes immersive live broadcasts, sports simulations, and virtual fan interactions (Vincent & Frewen, 2023), substantially transforming sports training, marketing, and fan engagement. However, despite the growing adoption of VR, substantial gaps persist in understanding its specific impact on sports communication.

Moreover, existing studies often lack a cohesive theoretical foundation. For instance, there has been insufficient exploration of how VR can synergize with traditional sports media to enhance fan engagement or its implications for marketing and athlete development (Flavián et al., 2019). The integration of VR in sports communication also faces considerable challenges, including technological and cost barriers that hinder widespread adoption. Additionally, issues such as high implementation costs, varying cultural acceptance, and legal complexities remain inadequately investigated (Feiz et al., 2022; Muhanna, 2015). This study aims to bridge these research gaps by investigating the transformative impact of VR technology on sports communication. Specifically, we seek to answer the following research questions:

RQ1: How does VR technology enhance communication practices in sports?

RQ2: What are the implications of VR for fan engagement and marketing strategies in sports?

RQ3: How can VR be integrated with traditional sports media to improve the overall sports communication experience?

By addressing these questions, this research contributes to the academic discourse on sports communication and provides a roadmap for professionals in sports management, stakeholders, and researchers to navigate the challenges and opportunities presented by VR.

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Furthermore, this study offers a comprehensive understanding of the complex interactions between VR technologies and the dynamics of sports communication. By proposing the Transformative Engagement Theory in Sports Communication, we introduce a novel framework that underscores the potential of VR to revolutionize communication practices within the sports industry. This contribution is significant as it addresses the existing lack of theoretical foundations in the literature and opens new avenues for both research and practical application in the evolving landscape of sports communication.

2. Theoretical background

2.1. Sports communications

Sports communication involves the exchange of information within the sports ecosystem, encompassing interactions among athletes, teams, fans, media, sponsors, and organizations. Historically reliant on traditional channels like print and broadcast media, the field has seen significant transformation with the advent of digital technologies, creating opportunities for more immersive and interactive experiences (Pedersen et al., 2020). While considerable attention has been given to the impact of media technologies on fan engagement and marketing strategies (Meier, 2015), there is a notable lack of research exploring how emerging tools like VR can influence key areas such as athlete development, fan experiences, and innovative sponsorship opportunities. Most existing studies focus on individual applications—such as using VR for athlete training (Miles et al., 2012) or enhancing fan immersion (Huang & Wang, 2021), without synthesizing these elements into a cohesive framework for sports communication (Aburumman et al., 2022; Bryant et al., 2019). This gap highlights the need for research into VR's integrative potential, not only in engaging fans but also in fostering athlete development and advancing marketing practices, to create a transformative impact across the sports industry (Loureiro et al., 2020; Mueller, 2024).

2.2. Application of VR in sports communication

The integration of VR into sports communication is increasingly recognized for its potential to transform how fans interact with sports events. VR technologies offer immersive experiences that create a heightened sense of presence, allowing fans to feel as though they are physically at the event (Boroumand et al., 2021). For example, VR applications enable fans to experience sports from unique perspectives, such as a front-row seat or even from the players' viewpoint, enhancing their emotional connection to the game (Vincent & Frewen, 2023). Furthermore, VR facilitates interactive features like virtual stadium tours and real-time game analysis, enriching the overall viewing experience (Bailenson, 2018).

The application of VR in sports communication not only enhances fan engagement but also provides new avenues for sports organizations to attract global sponsors and expand their reach (Ha et al., 2017). By leveraging VR, sports entities can create more personalized and memorable interactions with fans, fostering a deeper connection and loyalty. This transformative potential of VR in sports communication underscores its importance and necessity in today's digital landscape.

2.3. Challenges and barriers to VR integration in Sports

Despite the promising applications of VR in sports communication, several challenges hinder its widespread adoption. One significant barrier is the high cost associated with VR technology, including expenses for hardware, software, and content creation (Faghir Ganji et al., 2021). Additionally, both users and developers often face a steep learning curve, which can impede the integration of VR into existing sports communication frameworks. Technological limitations also present challenges. Real-time VR experiences require robust internet connectivity, which may not be available in all regions. Furthermore, users may experience physical discomfort, such as VR sickness, which can detract from the overall experience (Chang et al., 2020). Social resistance to new technologies can complicate integration efforts. This resistance often arises from a lack of understanding or trust in VR, highlighting the need for effective education and demonstrations of its benefits. Training and informative resources are crucial for helping stakeholders adapt to technological changes (Singh, 2015). As VR technology continues to advance and become more accessible, its application in sports communication is expected to grow (Bailenson, 2018; Greengard, 2019). However, addressing economic, technological, and social barriers is essential for its successful integration into the industry.

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2.4. *Theoretical Perspectives on VR in Sports Communication*

Understanding the transformative role of VR in sports communication can be enhanced by examining several key communication and media theories. These theoretical frameworks provide insights into how VR shapes audience engagement and interaction within the sports realm.

One foundational theory is the Uses and Gratifications Theory (UGT), developed by Blumler and Katz (1974). This theory posits that audiences actively seek out media to satisfy specific needs, categorizing these needs into affective, cognitive, personal, integrative, and tension-free dimensions. UGT challenges the conventional view of media influence by emphasizing the audience's active role in selecting and engaging with media content. As the theory has evolved, it has responded to critiques by deepening its understanding of audience engagement and media effects (Sichach, 2023). When applied to VR in sports, UGT suggests that fans utilize immersive technologies to enhance their engagement, access real-time information, and experience a heightened sense of presence within virtual environments (Park et al., 2024).

Another relevant theoretical framework is Media Richness Theory, introduced in the mid-1980s by Daft and Lengel (Ishii et al., 2019). This theory asserts that richer media facilitate more effective communication (Daft & Lengel, 1984). Given its capacity to convey visual, auditory, and spatial information, VR is classified as a highly rich medium (Biocca & Delaney, 1995). This richness not only enhances sports communication by minimizing ambiguity but also fosters greater interactivity, ultimately leading to a more engaging experience for fans (Cheung et al., 2024).

Additionally, Presence Theory, proposed by Lombard and Ditton (1997), highlights that the more immersive a medium is, the stronger the user's sensation of "being there" becomes (Vincent & Frewen, 2023). Research within the context of sports has demonstrated that virtual experiences can significantly strengthen fans' emotional and psychological ties to their teams and athletes (Zhang et al., 2024). Evidence also indicates that online social support plays a pivotal role in attracting fans to these virtual communities, encouraging active participation across diverse social media platforms. This dynamic participatory engagement not only benefits the fans but also the clubs, paving the way for a new theoretical framework focused on value co-creation in sports (Hajli, 2025).

Lastly, the Technology Acceptance Model (TAM), developed by Davis (1989), offers insights into how users adopt new technologies based on perceived usefulness and ease of use. Studies on the adoption of VR in sports indicate that fan engagement significantly increases when the technology is both accessible and intuitive, thereby enhancing the overall viewing experience (Kim & Ko, 2019).

Overall, these theoretical perspectives collectively underscore the profound impact that VR has on sports communication, illustrating how it not only transforms audience engagement but also reshapes the dynamics between fans, teams, and the broader sports community.

3. Methods and Materials

The study investigates sports communication contexts, specifically focusing on VR's transformative role. This encompasses areas like immersive fan engagement, athlete training, and innovative marketing strategies. While existing VR applications are prevalent across sports like basketball and football, our research adopts a broad perspective to develop a generalizable theoretical framework. So, the research targets sports communication as a field rather than specific sports.

Since, The study of VR in sports communication is still nascent, it lacks mature theoretical assumptions and variable research categories. Consequently, the authors utilized grounded theory (GT) with following Corbin and Strauss (1990) principle, to discern relevant influencing factors and develop an action mechanism and paradigm model, furnishing both theoretical elucidation and practical direction for future research endeavors. GT is a common qualitative approach in sport management (Pashaie, Abbaszadeh, et al., 2023). It entails thorough examination of systematically gathered data in order to build a theory grounded in those data (Li, 2022). It is often used to develop an understanding of social relationships and processes. We adopted a GT approach to theoretically describe the essence and significance of the phenomenon of VR in sports communication and to establish a suitable theory to describe the actual situation. A GT analysis of open-ended interview transcripts and texts helped us to establish the key influencing factors in VR in sports communication. Given the lack of theorizing previous VR in sports communication, GT is well suited to such an undertaking.

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3.1. *Data collection and sample*

The interviewees were selected through purposeful sampling, supplemented by the snowball technique, ensuring inclusion of experts with specialized knowledge in VR and sports communication. This approach is widely acknowledged in qualitative research for its effectiveness in identifying information-rich cases (Patton, 2002). We selected participants based on their academic publications, involvement in VR projects, and professional networks within sports and technology sectors, as highlighted in key databases (e.g., Scopus, Web of Science). Purposeful sampling aligns with qualitative research norms, offering a robust strategy for gathering insights when exploring new or complex phenomena (Bernard, 2017; Creswell & Clark, 2017). Ultimately, seventeen participants were chosen to achieve data saturation, which is the point at which no new themes emerge from additional interviews. Data saturation is a critical criterion for ensuring rigor in determining sample sizes in qualitative research. The participant pool included international experts, providing a broad perspective on VR's application in sports communication.

The sample size of seventeen aligns with qualitative research norms, where 10-20 participants are often deemed sufficient to reach saturation, particularly in studies involving expert interviews (Creswell & Poth, 2016; Danaeifard et al., 2004). For instance, Boddy (2016) suggests 12 participants, while Hennink and Kaiser (2022) recommend sample sizes ranging from 9 to 17 interviews to achieve saturation in qualitative research.

To gather data, semi-structured interviews were conducted electronically via email, with correspondence completed within 2 to 5 days of initial contact. The interview questions were distributed in the form of structured questionnaires designed to elicit detailed and specific information pertinent to the study.

All participants voluntarily agreed to partake in the study and provided recorded consent. They were assured of the confidentiality of their data and personal information. The selection criteria for interviewees were designed to ensure a well-rounded and informed perspective. The study's focus on academic and technological experts was deliberate to construct a foundational theory regarding VR in sports communication. Unlike fans or industry professionals, the selected participants possess the theoretical and practical expertise necessary to address this underexplored research area comprehensively. The findings from this expert-driven study lay the groundwork for future investigations involving broader stakeholder groups, such as fans and industry practitioners. The interviewees comprised 17 well-established sports communication and technology experts, selected for their significant academic and professional contributions to the field. Their profiles span diverse areas such as VR applications, sports management, and digital communication, ensuring a multidimensional understanding of VR's role in sports communication. Table 1 in the manuscript provides detailed demographic and professional information.

Table 1

Characteristics of the interviewees

Row	Sex	Age	Education	Job/post	Pertinent Experience
P 1	Man	42	PhD	University professor	Engaged in studies on VR technologies in sports contexts.
P 2	Man	59	PhD	University professor	Expertise in sports management and technology integration.
P 3	Man	43	PhD	University professor	Research focus on digital media in sports.
P 4	Man	44	PhD	University professor	VR/AR Developers
P 5	Man	58	PhD	University professor	Experience with VR applications in sports training.
P 6	Man	62	PhD	University professor	Extensive background in sports psychology and communication.
P 7	Man	38	PhD	University professor	Researcher with publications on technology in sports.
P 8	Man	40	PhD	Technology Experts	VR/AR Developers
P 9	Man	43	PhD	IT Manager	Machine Learning
P 10	Man	35	Student	PhD Student	Expertise in media studies with a focus on sports communication.
P11	Female	39	PhD	University professor	Focus on the intersection of sports and digital communication.
P12	Female	50	PhD	University professor	Researcher in the effects of technology on sports performance.
P 13	Female	48	PhD	University professor	Research focus on digital media in sports.
P 14	Female	41	PhD	University professor	Research focus on digital media in sports.
P 15	Female	44	PhD	University professor	Engaged in studies on VR technologies in sports contexts.
P 16	Female	39	PhD	University professor	Engaged in studies on VR technologies in sports contexts.
P 17	Female	34	Student	PhD Student	Expertise in media studies with a focus on sports communication.

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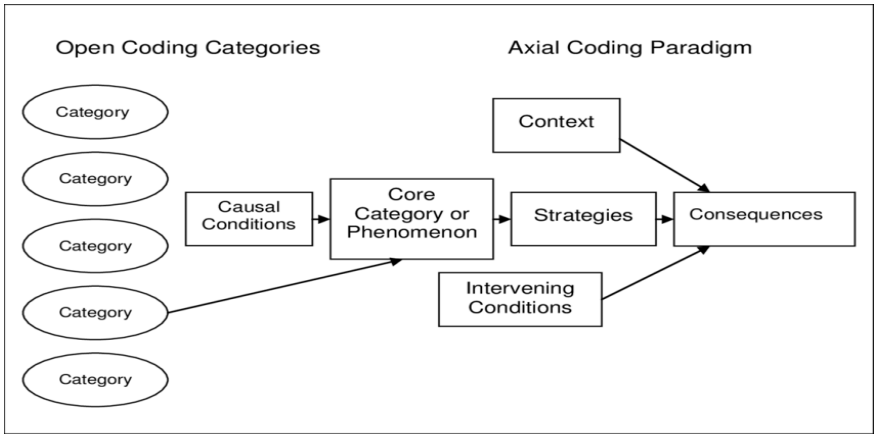
3.2. *Data Analysis*

Analysis was undertaken concurrently with the data collection process. After the interviews were transcribed by the lead author, each transcript was coded independently by two authors. Adhering to the systematic approach proposed by (Corbin & Strauss, 2015), the connections between the first- and second-level categories were established using three distinct coding methods: open, axial, and selective. In open coding, categories were developed and then authors determined how the categories changed along the specified dimensions. In axial coding, the categories were systematically refined and linked with subcategories. Some critics, including Charmaz (2014), argue that axial coding could be considered an optional step within the constant comparison method. During this phase, data previously separated in the open coding process are reassembled to offer a more detailed depiction of the phenomenon (refer to Fig 1). In the selective coding stage, the research paradigm model was developed. A paradigm model includes: the categories and their interrelationships, as per the axial coding model, are presented in the form of central phenomena or causal condition, phenomenon, background condition, intervening condition, strategy, consequences (Corbin & Strauss, 2015).

Figure 1

Open coding to axial coding paradigm



Source: Figure by Creswell (2015)

Classifications were performed based on code refinement, duplicate code removal, and comparison of embryonic codes with previously obtained codes. During the coding process, various factors were taken into account to determine the removal of 47 codes. These factors included redundancy, irrelevance, and lack of supporting evidence, alignment with research questions, conceptual clarity, and consultation with the research team. Repetition of codes was observed from the fifteenth interview, however, the data collection process continued until the seventeenth interview to ensure complete theoretical saturation. Lastly, steps were done to guarantee the analysis's accuracy. The research team discussed the themes and interpretations of the data. Validity and reliability are fundamental concerns in all research methodologies, drawing substantial attention from scholars (Babbie, 2002). Some scholars further argue that the objective of qualitative researchers is not to conduct generalizable and replicable studies, but rather to offer novel theoretical insights or to develop foundational theories. Consequently, such criteria are deemed unnecessary for qualitative research. These experts contend that the primary consideration in qualitative research should be the reliability and accuracy of the data (Gall et al., 2016; Seale, 1999). Since the researcher plays a pivotal role in qualitative research and considering that data collection in this study was conducted through interviews, the method for ensuring validity involved consulting with other researchers and professors at each stage of data collection and analysis, as well as the derived categories, to incorporate their feedback throughout the research process. Reliability, defined as the consistency of research findings, was assessed in this study through Inter-Coder Reliability (ICR). ICR is a measurement of how much researchers agree when coding the same data set.

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Throughout these coding phases, MAXQDA$_{TM}$[20] software was utilized to manage and analyze data, facilitating systematic coding and categorization of interview transcripts.

4. Findings and Results

4.1. Open and Axial Coding

Through the open coding process, 17 interviews with experts resulted in 153 codes. Following the removal of irrelevant and duplicate codes, 106 abstract concepts remained, which were subsequently scrutinized and coded using the GT approach. This visualization serves as a starting point for the subsequent axial coding and selective coding processes, which involve further analysis and refinement of the initial concepts to develop a comprehensive theoretical model of VR in sports communication. The results of this step include the formation of basic concepts, and the categories derived from them using a (Table 2).

Table 2

Secondary Open and Axial Codes and Selective

Open Coding	Axial	Selective
Creating new competitive experiences for fans	Competitive Advantage	Opportunities for sports marketers and sponsors
Brands can use VR to create engaging and immersive advertising experiences, putting fans directly at the heart of their campaigns.	Draw attention	
VR creates a deeper emotional connection between fans and brands.	Emotional connection	
Business process improvement	Business	
Transformation and increase in productivity	Increase Productivity	
By using VR communications in their business methodology and developing their industry relationships, they can see real benefits.	Innovation in business	
Better understanding of people from being in a simulated environment	Simulation environment	VR sports games and simulations
Shorter and clearer communications	Clearer communication	The future of VR in sports communication
VR allows fans to experience the thrill of being in the middle of the action from the comfort of their own home.	Excitement to attend	
VR can be beneficial for athletes recovering from injury, allowing them to gradually regain confidence and physical abilities in a controlled environment.	Innovation in communication	
VR has the potential to break down geographic barriers and bring fans from around the world closer to their favorite teams and athletes.	Integration of the virtual world	
Facility management is improved in line with the development of technology	Facility management	
Safety training is improved in line with the development of technology	Safety training	
Facilitating communication is expanded through VR	Facilitate communication	
Living in a digital environment	Technological dimension	
It is possible to travel and visit with the lowest cost	Low cost travel and visit	
Design, manufacture, and distribute products at the lowest cost.	Economic	
Global access	Global Communications	
More interaction and empathy	Increase interaction	
Interpersonal communication between the physical world and VR	Comprehensive communication	
As a new and efficient method of communication to attract fans	New communications	
Promotion and strengthening of intra-departmental and inter-departmental communication	Intra- and inter-departmental communication	
Reducing negative effects on the environment	Environment	
Increasing the satisfaction level of fans from internal and external communications	Fan satisfaction	
This technology can help people connect with each other virtually and share their experiences.	Strengthening virtual communication	
VR fans are a new form of sports media consumption	Sports media consumption	
Pleasantness and open-mindedness of people in communication	Openness in	

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	communication	
The COVID-19 pandemic and the importance of social distancing are forcing several industries to explore face-to-face alternatives that enable remote communication and collaboration.	Alternative communication	All-round live streaming
Cultivation of values, beliefs, and moral principles	Culture	
VR is organizing an event or a conference with several people in several other countries	Social communication	
Changes in fan motivationSocial physique anxietyThe fans' sense of self-awareness	Psychological dimension	
The fans feel like they are really present at the game and it creates a stronger sense of connection with the players and the atmosphere.	Strong sense of connection	
Imaginary event	Infrastructure	
Using VR to bring fans together	Social relations	
Internal communications embrace new technology	Internal communication	
Creative uses of VR in communication	Creativity	
Optimizing the processes of production and distribution of products	Optimization	Advanced data visualization
It provides many features and capabilities for its users	Ability	
Communication accuracy (information is correctly communicated and correctly understood)	Ensuring the correctness of the connection	
Visual VR provides a high level of social presence with conversational patterns that closely resemble face-to-face interaction.	Social presence	Interact with virtual fans
VR creates a deeper connection between athletes, teams, and supporters	Deep connection	
VR has revolutionized the way sports are experienced, providing immersive experiences that take fan engagement to a new level.	Transforming sports experiences	
Its ability to create a sense of presence and immersion.	Creating a sense of presence and immersion	
VR allows fans to experience sports in a way that was previously unimaginable	Immersive experiences	
Enthusiasts can participate in virtual training sessions and receive guidance from coaches or professional athletes.	Participate in training sessions	
Fans can compete against each other in VR sports games and test their skills and compare their performance with others.	Interactive opportunities	
VR creates a sense of community and camaraderie among sports enthusiasts.	Create a sense of community and friendship	
VR has the potential to bridge the gap between fans and athletes by offering behind-the-scenes access. Fans can go behind locker room doors, witness pre-game rituals, and get a glimpse of athletes' lives off the field.VR technology used to provide exclusive content such as interviews, training sessions, and documentary-style features that give fans an intimate look into the lives of their sporting idols	Behind-the-scenes access	Virtual tours and behind-the-scenes access
VR provides fans with a deeper understanding of the game	Deep understanding of fans	
VR technology allows fans to have this immersive experience, bringing them closer to the game than ever before.	Enriching the sports viewing experience	
intimate connection with the sports world builds a stronger bond between fans and their idols, fostering loyalty and support.	Strengthening loyalty and support	
VR can be used by athletes and coaches for training purposes	Training goals	Training and skill development
Training of job skills	Educational goals	
VR can be used to provide coaching clinics and interactive educational sessions for fans who want to learn more about the sport.	Training and coaching	
VR allows athletes to simulate real game scenarios and provide a safe and controlled environment to practice their skills.	Game simulation	Athlete development
Through VR, athletes can repeat exercises, test different strategies, and receive immediate feedback on their performance.	Test different strategies	
VR enables coaches to analyze every aspect of an athlete's performance in detail.	Training and performance analysis	
By creating virtual environments that replicate the intensity and pressure of competitive situations, athletes can practice their focus and mental flexibility. This aspect of VR training can be especially beneficial for athletes who struggle with performance anxiety or high-pressure situations.	Increase mental readiness	
VR technology allows athletes to collaborate and compete with others remotely.	Remote cooperation and competition	
VR fosters a sense of camaraderie and healthy competition.	Immersive and interactive training	

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	experience	
With VR, the sports viewing experience becomes more immersive, engaging and vivid, bringing fans closer to the game and their favorite athletes.	Experience behind-the-scenes access	Enhancing the experience of fans and athletes
Sports media can create VR experiences that transport fans to iconic sports venues and allow them to experience the atmosphere and excitement up close.	Feel realistic emotions	Sports journalism
VR allows sports reporters to capture good moments and present them to viewers in a way that was rarely possible before.	Interactive experiences of journalists	
Creating a stronger emotional connection between fans and favorite teams	Create an emotional connection	
With VR, sports fans can now immerse themselves in the action and feel like they are right in the middle of the game.	Real feeling	
Through the use of specialized cameras and advanced technology, sports reporters can now capture 360-degree footage from multiple angles, providing viewers with a truly immersive experience.	Breaking new ground in storytelling	
Transmitting sensory information to fans	Technological dimension	
Production and distribution of VR content can be complex and resource-intensive, requiring substantial technical expertise and investment.	Need for experts	Challenges of VR in sports communication
While VR technology has advanced substantially, the level of realism in simulating live sports events may not fully match the experience of attending a physical game.	Limited Realism in Simulation	
Acceptance of virtual sports experiences may vary across different cultures and generations, with some individuals preferring traditional forms of sports engagement.	Societal and Cultural Acceptance	
Legal considerations, such as broadcasting rights and licensing agreements, may present challenges in the virtual space, requiring careful navigation to avoid legal disputes.	Legal and Regulatory Issues	
Expanding non-verbal communication in social interaction	Expansion of non-verbal communication	
Weakening of emotional relationships	Weak emotional relationships	
Prolonged use of VR technology may lead to discomfort, fatigue, or motion sickness for some users, limiting the duration of immersive sports experiences	Privacy Concerns	
Long-term use can damage people's eyes	Health considerations	
Infrastructural weakness of VR technology	Infrastructural weakness	
VR has the ability to transport fans to the heart of the action, allowing them to experience the thrill of being on the field or court.	Emotional experiences	
Exciting virtual experiences and journeys	Exciting trips	
Creating a VR technology system where the whole world can participate in a joint sports competition would be very expensive.	Costly	
The cost of VR technology may limit its accessibility for both sports organizations and fans.		
VR headsets can be expensive making		
Identifying sustainable revenue models for virtual sports experiences can be challengingBalancing affordability for users with the financial viability of virtual initiatives is a delicate task	Monetization Challenges	
Lack of face-to-face communication and non-verbal communication	Reduced communication	
Fans may hide their identity in the virtual environment and act as someone else	hidden identity	
While VR can simulate the live event experience, it may lack the spontaneous social interactions that occur in a physical stadium, potentially decreaseing the sense of community among fans	Limited social interaction	
Creating high-quality VR content for sports events requires notable resources, including specialized equipment and skilled professionals, which can be a barrier for smaller sports organizations.	Content Production Challenges	
Lack of interaction and reduction of face-to-face communication and interactions	Fading interactions	
Digital communication media lack the combination of verbal, facial or body language cues that are present in face-to-face conversations	Digital communication media	
The ability of fans to engage the user in a completely new environment	New environment	
Creating immersive VR experiences requires high-quality equipment and specialized software, which can be expensive for both sports teams and fans.	Technological requirements	
High costs associated with VR equipment and technology can create accessibility barriers for fans who cannot afford the necessary devices	Accessibility barriers	Limitations of VR in sports communication
Only a subset of fans may be able to engage with content in the way they want.	Little access to VR experiences	
VR is still a relatively new technology and its adoption in the sports industry is still in its early stages	New technology	
There are limited resources and best practices available to sports teams and organizations when implementing VR into their communication strategies.	Resource limitations	

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The lack of standardized guidelines and frameworks can make it challenging for stakeholders to effectively translate into the VR landscape.	Lack of instructions
Creating differences in communication between fans. For example, in some cases, fans may indirectly harm or conflict with others in the virtual environment.	Differences in communication between fans
No need to be physically present in communication with others	Lack of physical presence
Lack of personalization and the possibility of communication gaps	Communication gaps
Fans should be smart about using this technology and respect their limitations and responsibilities	Be smart about using VR
VR experiences may be affected by external factors such as internet outages, technical glitches, or server issues, leading to disruptions in the user experience.	Dependency on External Factors
Communication process between people through computer systems	Mediation of communication processes
VR has emerged as a disruptive technology to improve the performance of current computer graphics techniques and address intractable problems related to human-computer interaction.	Disruptive technology

Table 2 outlines the transition from open coding to axial and selective coding during the research process. It presents how individual concepts and codes identified in the open coding phase were grouped into categories in the axial coding phase and later refined into broader dimensions during the selective coding phase.

4.2. Validity and reliability of data

Reliability, which refers to the consistency of research findings, was assessed using ICR. ICR measures the degree of agreement between researchers when coding the same dataset and is commonly used to ensure the consistency and validity of qualitative analysis (Coleman, 2022). Table 3 illustrates that the researcher and research assistant collectively recorded 63 codes, with 45 instances of agreement. The ICR, calculated using the specified formula, was found to be 71%. An ICR above 60 percent means that the results obtained from coding can be considered valid and reliable. This is important for the scientific and practical credibility of the findings, as it indicates that the codes have been accurately and precisely identified.

Table 3

Test ICR

Row	Interview	Total number of codes	Number of agreements	ICR
1	First	18	14	77%
2	Seventh	30	21	70%
3	Fifteenth	15	10	66%
Total		63	45	71%

In this study, we achieved an ICR of 71%, which exceeds the generally accepted threshold of 60% (Roulston, 2010), indicating a high level of agreement and reliability.

4.3. Selective Coding and Theory Formulation

Our approach follows an inductive methodology where themes emerged organically from the data, rather than being imposed by prior assumptions. The inclusion of verbatim excerpts strengthens the credibility of our findings and demonstrates that the Transformative Engagement Theory is firmly rooted in qualitative evidence. Through the open and axial coding process, the data revealed critical themes that shaped our understanding of VR's role in sports communication. Table 2 presents these themes, categorized into causal conditions, intervening factors, background conditions, strategies, and consequences. However, the categories identified in Table 2 were not merely isolated observations; rather, they represented patterns of engagement, challenges, and strategic implementations of VR in sports communication. These themes served as the foundational elements for constructing the Transformative Engagement Theory in Sports Communication.

To bridge the gap between Table 2 and our proposed theoretical model, we applied selective coding to identify relationships among the extracted themes. Specifically:

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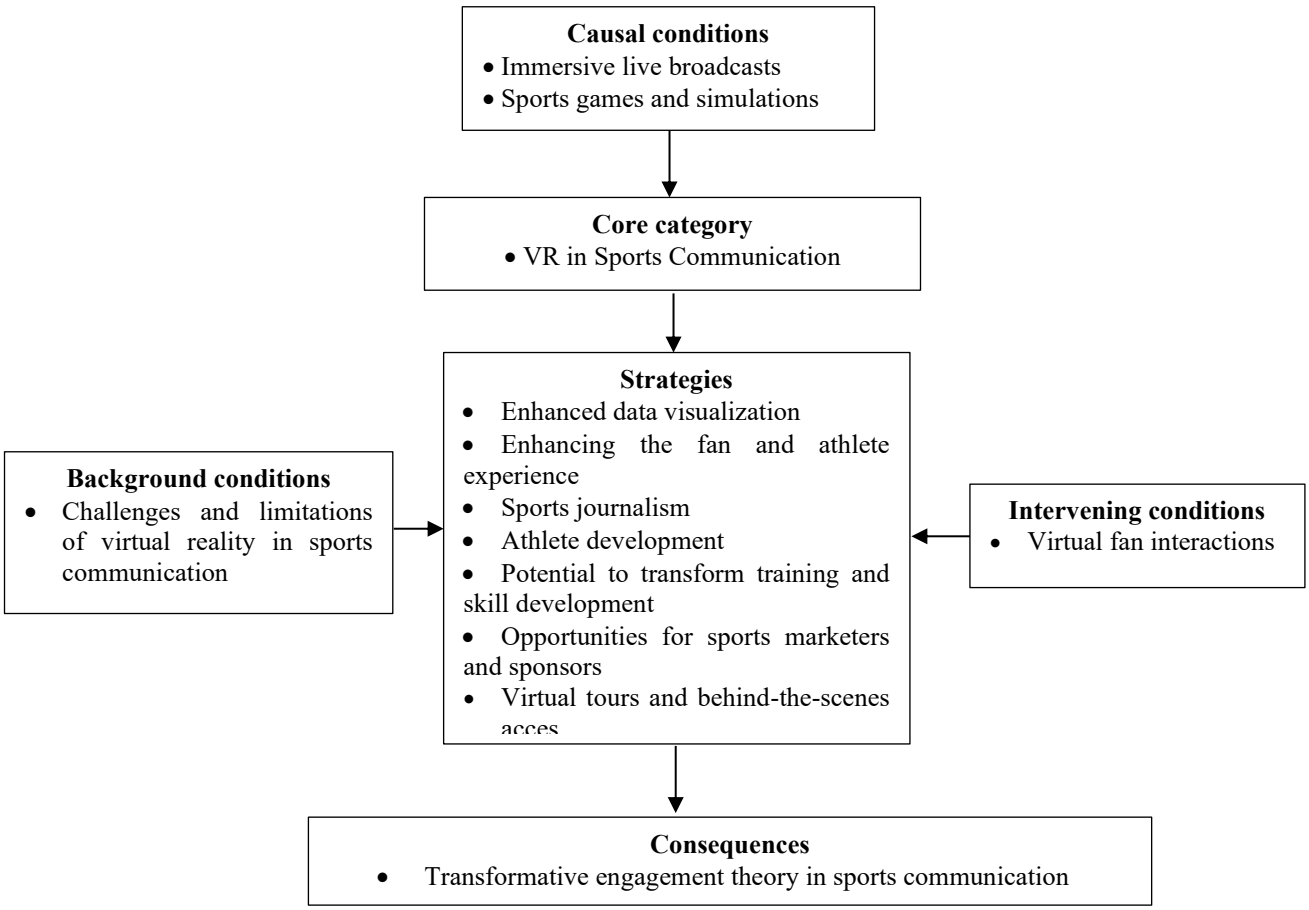
- ***Causal Conditions*** (e.g., immersive live broadcasts, VR-based sports simulations) emerged as primary enablers of VR in sports communication. These elements create an engaging digital environment, directly influencing fan interaction and athlete experiences.
- ***Intervening Conditions*** (e.g., virtual fan interactions, behind-the-scenes access) were identified as key factors that mediate how users engage with VR content. These factors enhance the personalization of VR experiences and serve as facilitators of immersive engagement.
- ***Background Conditions*** (e.g., technological and financial limitations) highlighted the barriers to widespread VR adoption in sports. These limitations contextualized the challenges that impact the effectiveness of VR strategies.
- ***Strategic Responses*** (e.g., enhanced data visualization, sports journalism, virtual sponsorship opportunities) demonstrated how organizations leverage VR to maximize its potential. These strategies outline actionable steps taken to integrate VR effectively.
- ***Consequences*** (e.g., transformative engagement, evolving sports marketing) encapsulated the broader impact of VR adoption in sports communication. These outcomes provide the rationale for proposing a structured theoretical model.

Figure 2

The Transformative Engagement Theory in Sports Communication Paradigm Model



The Transformative Engagement Theory in Sports Communication was developed as a direct response to these identified factors. Each component of the model is grounded in empirical findings:

Immersive live broadcasts and sports simulations (causal conditions) were repeatedly emphasized by interviewees as key drivers of engagement. Virtual fan interactions and enhanced data visualization (intervening conditions) were

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identified as mechanisms that amplify user experiences. Challenges such as high costs and technical barriers (background conditions) emerged as significant impediments requiring strategic solutions. Strategic responses like VR-enhanced journalism and marketing innovations were derived from industry best practices observed in the data. The ultimate impact on fan engagement, athlete training, and sponsorship models forms the theoretical basis for transformative engagement in sports communication.

5. Discussion and Conclusion

The Transformative Engagement Theory in Sports Communication synthesizes VR's role across key domains such as fan engagement, athlete development, and marketing. This model highlights the causal, contextual, and intervening factors that influence VR's integration into sports communication. By using grounded theory, this study contributes to sports communication literature by identifying and categorizing VR's transformative potential into actionable theoretical insights. The study bridges gaps between technology and sports communication by integrating concepts from digital transformation, immersive media, and sports psychology into a unified framework. The research identifies how VR enhances communication by fostering immersive, interactive, and data-driven practices, emphasizing its potential to revolutionize fan experiences and organizational strategies.

The findings of this study elucidate the profound and multifaceted impact of VR technology on sports communication. The research, encapsulated in the paradigm model " Transformative Engagement Theory in Sports Communication," confirms both expected outcomes and uncovers surprising trends, providing a comprehensive understanding of VR's transformative potential. During the coding process, 106 open codes were identified, forming 13 main extraction categories and their characteristics. The paradigmatic model presented is an indigenous model for using VR technology to enhance sports communication and bring fans closer to the action. It includes recognition of causal, contextual, and intervening conditions, strategies, and consequences related to enhanced sports communication and fan engagement through VR and interactions.

The first research question received support, indicating that VR significantly improves communication through immersive live broadcasts and interactive simulations, , which as an are key elements under causal conditions. These technologies allow fans to engage deeply with sports, enhancing their emotional connection and satisfaction. VR's capacity to provide a highly engaging and interactive viewing experience is well-documented in previous literature. These findings align with growing research indicating that VR can transform how sports are consumed and experienced by fans, athletes, and sports organizations (Kim & Ko, 2019). Previous studies support our findings regarding enhanced fan engagement through immersive experiences (Wu et al., 2022), improved athlete training and performance via VR simulations (Richlan et al., 2023), and innovative marketing opportunities facilitated by VR experiences (Hoyer et al., 2020). Empirical evidence shows that VR can replicate intricate environments (Li & Li, 2020), making it applicable across various sports (Baca & Perl, 2019). VR allows fans to experience games within a virtual stadium-like setting, providing a comprehensive 360-degree view of the action (Kittel et al., 2020).

The second research question, which posited that Virtual fan interactions, as an intervening condition, effectively bridge the gap between physical presence and remote engagement, making fans feel as if they are in the stadium, garnered support from the study's findings. A notable benefit of VR training is its ability to simulate real-life game scenarios in a controlled and immersive environment, reducing injury risks and the limitations of conventional training methods. This helps lower athletes' stress and anxiety, enhancing their readiness for competitive sports by improving decision-making processes, reaction times, and overall performance. Lee et al(٢٠١٣) . highlighted that the success of these simulators relies heavily on player interaction rather than solely on technological advancements. This underscores the importance of social interaction and collaboration in enhancing VR applications beyond their technical capabilities. Immersive live broadcasts are crucial in creating a sense of presence among fans, fostering deeper emotional connections with players and the game environment (Miah et al., 2020). This supports previous research on VR's immersive qualities and its potential to boost fan engagement in sports communication (Jiang & Phakdeephirot, 2024). VR enables fans to virtually participate in sports games and simulations, providing a unique opportunity to experience sports from the perspective of professional athletes, thereby enriching the interactive dimension of sports viewing.

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The third research question was supported that VR to offer new opportunities for sathlete development and sports marketing to create personalized, immersive advertising experiences. Virtual fan interactions, including virtual tours and behind-the-scenes access, emerged as critical tools for fostering deeper relationships between fans and sports entities. This unexpected but substantial result reveals that VR can help innovative marketing strategies and produce satisfactory consumer experiences that mirror those in physical storesThis trend underscores VR's potential in personalized content delivery, enhancing brand recall and loyalty (Alcañiz et al., 2019). Another surprising result was VR's role in data visualization, which is transforming sports journalism and analytics by making complex data more accessible and engaging, thereby improving decision-making for coaches and analysts.

However, despite substantial advancements, VR technology faces challenges and limitations in its application to sports communication. The functionality of VR technology is contingent on contextual conditions, including challenges and limitations in its application. The COVID-19 pandemic has heightened the demand for digitalization in the sports sector, emphasizing the need for innovative solutions (López Carril et al., 2020; Pashaie & Golmohammadi, 2024). Addressing these challenges can unlock unprecedented possibilities, bringing sports to life in previously unimaginable ways and creating memorable experiences for global sports enthusiasts (Martín-Gutiérrez et al., 2017). However, our research also highlights ongoing challenges, including technological accessibility barriers and societal acceptance issues. To maximize VR's potential in sports communication, it is crucial for sports organizations to invest in VR infrastructure, address accessibility concerns, establish standardized guidelines, and leverage VR's unique capabilities for marketing and fan engagement initiatives.

The results of this study emphasize the recognition of obstacles and limitations associated with VR technology in sports communication, highlighting them as critical contextual factors. These challenges encompass a range of issues including technological limitations, accessibility concerns, and societal acceptance barriers (Thatcher et al., 2020). One notable barrier to the adoption of VR technology in sports is the high cost of VR equipment and software (Wu, 2021), which restricts access for smaller sports organizations or teams operating on limited budgets. Another challenge is the requirement for specialized expertise to operate and maintain VR systems, necessitating investment in training or hiring professionals skilled in VR technology (Cook et al., 2019). Effective collaboration among sports teams, technology developers, and content creators is important for developing practical and affordable solutions. For instance, in the research by Jiang and Phakdeephirot (2024), key challenges include managing digital rights, regulating online content, and sustaining fan engagement in a competitive digital landscape. This may involve exploring alternative delivery methods for VR experiences, such as VR streaming platforms or mobile-based VR applications that utilize existing devices. The study also underscores the need for sports organizations to adapt to evolving digital environments while considering ethical and regulatory considerations (Jiang & Phakdeephirot, 2024).

This paper presents the Transformative Engagement Theory in Sports Communication, which summarizes how VR can improve stakeholder relationships, provide immersive experiences, and open up new avenues for fan engagement, athlete development, and sports marketing. This framework, which is based on a grounded theory approach, is derived from qualitative data and represents the distinct perspectives and experiences of specialists in sports communication.

The Transformative Engagement Theory incorporates VR dynamics to offer a thorough explanation of how engagement is changed by digital transformation, in contrast to other theories that frequently focus on discrete aspects of sports communication. The theory places engagement as a key mechanism in changing sports communication practices by highlighting the importance of VR in strengthening emotional connections, creating interactive environments, and bridging gaps between traditional and virtual experiences.

By addressing a significant gap in the literature—the absence of a cohesive framework that addresses how VR changes communication processes between fans, athletes, and organizations—this contribution improves the subject. It provides theoretical insights that are consistent with more general trends in immersive media and digital transformation, emphasizing the emergent nature of interaction as a major result of VR integration. Additionally, this framework's uniqueness is highlighted by the grounded theory methodology, which guarantees its applicability and flexibility to the changing sports communication environment.

This study provides a foundation for future research by linking engagement to practical applications, including fan

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satisfaction, athlete performance, and marketing innovation. By doing so, the Transformative Engagement Theory offers both conceptual and applied value, contributing to the academic discourse on sports communication and equipping practitioners with actionable insights to navigate the integration of VR technology effectively.

The practical implications of VR in sports include several key aspects. For sports organizations, investing in VR infrastructure can help increase fan engagement through virtual tours, immersive live streaming, and gamification interactions, and the technology can also help in athlete training and development by creating realistic simulations to improve performance and reduce injury risks. On the other hand, marketers can develop VR-based campaigns that immerse fans in brand stories and increase emotional connection and loyalty, and can also use VR for innovative sponsorship activations and advertising. Finally, content and media producers can create more engaging and interactive stories by integrating VR into traditional sports media strategies, as well as explore the potential of VR to provide behind-the-scenes access and exclusive content that deepens fan relationships with brands and athletes.

The limitations of this study include several aspects. First, the sampling frame, which was mainly focused on academic and technology experts, resulted in limited perspectives from industry or fan actors. Second, the generalizability of the results may be limited, as the theoretical framework was developed using qualitative methods and may require further validation through quantitative studies. There are also technological and contextual limitations due to the rapid evolution of VR technology, which may require updating the findings to remain relevant.

This study highlights the need for more research and investment in VR technology and provides professionals and researchers with a crucial road map for navigating the complexity of digital transformation in sports. For future research, it is recommended that studies involving sports fans and industry actors be conducted to validate and expand the proposed theoretical framework. It would also be useful to examine cost-effective VR solutions and their feasibility for small sports organizations. Research into the long-term psychological and social impacts of VR-based sports communication on fans and athletes is also of great importance. Finally, studying specific sports applications of VR (such as football and basketball) can help ground and improve the theoretical framework.

By presenting the Transformative Engagement Theory, which clarifies how VR is altering communication dynamics between fans, athletes, and organizations, this study enhances the subject of sports communication. This innovative theoretical framework, which is based on qualitative insights, emphasizes how VR creates immersive experiences, strengthens emotional bonds, and unites conventional and digital interactions in the sports ecosystem. This study fills a significant vacuum in the literature and offers a coherent viewpoint on VR's potential to revolutionize sports marketing tactics, athlete development, and fan engagement. The results highlight how VR has the potential to transform sports communication practices and provide stakeholders with practical advice on how to best use these technologies.

This paper admits its shortcomings despite its contributions, such as the requirement for more extensive empirical verification and investigation of other cutting-edge technology. Future studies should build on this paradigm by examining the long-term effects of VR on sports communication and taking into account the opinions of many stakeholders. The findings highlight the value of creativity and flexibility in the quickly changing sports sector and contribute to scholarly discussion while providing helpful advice for integrating VR. The findings of this study offer a crucial starting point for scholars and professionals hoping to capitalize on VR's transformation potential as immersive technologies continue to influence sports in the future.

Authors' Contributions

All authors equally contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

References

Abich IV, J., Parker, J., Murphy, J. S., & Eudy, M. (2021). A review of the evidence for training effectiveness with virtual reality technology. *Virtual Reality*, *25*(4), 919-933. https://doi.org/10.1007/s10055-020-00498-8

Aburumman, N., Gillies, M., Ward, J. A., & Hamilton, A. F. d. C. (2022). Nonverbal communication in virtual reality: Nodding as a social signal in virtual interactions. *International Journal of Human-Computer Studies*, *164*, 102819. https://doi.org/10.1016/j.ijhcs.2022.102819

Ahir, K., Govani, K., Gajera, R., & Shah, M. (2020). Application on virtual reality for enhanced education learning, military training and sports. *Augmented Human Research*, *5*, 1-9. https://doi.org/10.1007/s41133-019-0025-2

Alcañiz, M., Bigné, E., & Guixeres, J. (2019). Virtual reality in marketing: a framework, review, and research agenda. *Frontiers in psychology*, *10*, 1530. https://doi.org/10.3389/fpsyg.2019.01530

Babbie, E. (2002). The Basics of Social Science Research, 2e. *Wadsworth, Belmont, California*, 461 (2, illustrated)

Baca, A., & Perl, J. (2019). *Modelling and simulation in sport and exercise*. Routledge.

Bailenson, J. (2018). *Experience on demand: What virtual reality is, how it works, and what it can do*. WW Norton & Company.

Bernard, H. R. (2017). *Research methods in anthropology: Qualitative and quantitative approaches*. Rowman & Littlefield.

Biocca, F., & Delaney, B. (1995). Immersive virtual reality technology. *Communication in the age of virtual reality*, *15*(32), 10-5555.

Blumler, J. G., & Katz, E. (1974). The Uses of Mass Communications: Current Perspectives on Gratifications Research. Sage Annual Reviews of Communication Research Volume III.

Boddy, C. R. (2016). Sample size for qualitative research. *Qualitative market research: An international journal*, *19*(4), 426-432. https://doi.org/10.1108/QMR-06-2016-0053

Boroumand, M. R., Pourkiani, M., & Afrouzeh, A. (2021). Creating telepresence and flow experience through virtual reality (VR) technology and their impact on brand attitude and purchase intentions of sport products customers. *Sport Management and Development*, *10*(2), 182-197. https://doi.org/ 10.22124/jsmd.2021.5053

Bryant, L., Brunner, M., & Hemsley, B. (2019). A review of virtual reality technologies in the field of communication disability: implications for practice and research. *Disability and Rehabilitation: Assistive Technology*. https://doi.org/10.1080/17483107.2018.1549276

Chang, E., Kim, H. T., & Yoo, B. (2020). Virtual reality sickness: a review of causes and measurements. *International Journal of Human–Computer Interaction*, *36*(17), 1658-1682. https://doi.org/10.1080/10447318.2020.1778351

Charmaz, K. (2014). Constructing grounded theory. In: sage.

Cheung, M. L., Leung, W. K., Chang, L. M. K., Aw, E. C.-X., & Wong, R. Y. (2024). Immersive time in the metaverse and visits to the physical world: why not both? A holistic customer engagement framework. *International Journal of Contemporary Hospitality Management*, *36*(11), 3674-3703. https://doi.org/10.1108/IJCHM-07-2023-0999

Cohen, A. (2023). NBA signs multi-year virtual reality partnership extension with Meta. *ahead-of-print*. https://www.sportsbusinessjournal.com/Daily/Issues/2023/01/23/Technology/nba-meta-virtual-reality.aspx

Coleman, P. (2022). Validity and reliability within qualitative research for the caring sciences. *International Journal of Caring Sciences*, *14*(3), 2041-2045.

Cook, M., Lischer-Katz, Z., Hall, N., Hardesty, J., Johnson, J., McDonald, R., & Carlisle, T. (2019). Challenges and strategies for educational virtual reality: Results of an expert-led forum on 3D/VR technologies across academic institutions. *Information Technology and Libraries*, *38*(4), 25-48. https://doi.org/10.6017/ital.v38i4.11075

Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative sociology*, *13*(1), 3-21. https://doi.org/10.1007/BF00988593

Corbin, J., & Strauss, A. (2015). *Basics of qualitative research* (Vol. 14). SAGE Publications, Inc. https://doi.org/10.4135/9781452230153

Creswell, J. W. (2015). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. pearson.

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications. https://scholar.google.com/scholar?q=related:Fs7-7HJYX2sJ:scholar.google.com/&scioq=Qualitative+inquiry+and+research+design:+choosing+among+five+approaches+including+narrative+research&hl=en&as_sdt=0,5

Daft, R. L., & Lengel, R. H. (1984). Information richness: A new approach to managerial behavior and organizational design. *Research in organizational behavior*.

Danaeifard, H., Alvani, S. M., & Azar, A. (2004). Qualitative research methodology in management: a comprehensive approach. *Tehran: Saffar Pub*.

Davis, F. D. (1989). Technology acceptance model: TAM. *Al-Suqri, MN, Al-Aufi, AS: Information Seeking Behavior and Technology Adoption*, *205*(219), 5.

Faghir Ganji, M., Keshkar, S., Honari, H., & Shahlaei, J. (2021). Qualitative pattern of virtual reality application in sports marketing. *Sports Marketing Studies*, *2*(4), 1-34.

Feiz, D., Asgharinajib, M., Alipour, S., & Maleki Minbashrazgah, M. (2022). The effectiveness of virtual reality-based advertising in creating a customer empathy map using the video hermeneutic method: A case study of Ramak Company. *Journal of Business Administration Researches*, *14*(29), 181-212. https://doi.org/10.22034/jbar.2023.16599.3976

Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). The impact of virtual, augmented and mixed reality technologies on the

AITBSS
AI and Tech in Behavioral and Social Sciences
E-ISSN: 3041-9433

customer experience. *Journal of business research*, *100*, 547-560. https://doi.org/10.1016/j.jbusres.2018.10.050

Gall, M., Borg, W., & Gall, J. (2016). Quantitative and qualitative research methods in educational sciences and psychology. *Translated by Ahmad Reza Nasr, et al*, *1398*(11).

Greengard, S. (2019). *Virtual reality*. Mit Press.

Ha, J.-P., Kang, S. J., & Kim, Y. (2017). Sport fans in a "smart sport" (SS) age: drivers of smartphone use for sport consumption. *International Journal of Sports Marketing and Sponsorship*, *18*(3), 281-297. https://doi.org/10.1108/IJSMS-08-2017-093

Hajli, N. (2025). Exploring fan engagement and value co-creation in virtual sport communities: A comparative study of virtual sport communities over time. *Technological Forecasting and Social Change*, *212*, 123934. https://doi.org/10.1016/j.techfore.2024.123934

Hoyer, W. D., Kroschke, M., Schmitt, B., Kraume, K., & Shankar, V. (2020). Transforming the customer experience through new technologies. *Journal of interactive marketing*, *51*(1), 57-71. https://doi.org/10.1016/j.intmar.2020.04.001

Huang, Q., & Wang, F. (2021). VR Technology on the Communication of Sports Culture in Chinese Universities. The Sixth International Conference on Information Management and Technology,

Ishii, K., Lyons, M. M., & Carr, S. A. (2019). Revisiting media richness theory for today and future. *Human behavior and emerging technologies*, *1*(2), 124-131. https://doi.org/10.1002/hbe2.138

Jiang, K., & Phakdeephirot, N. (2024). The Impact of Digital Media on Sports Management. *Academic Journal of Science and Technology*, *10*(3), 208-213. https://doi.org/10.54097/x2xxah70

Kassing, J. W., Billings, A. C., Brown, R. S., Halone, K. K., Harrison, K., Krizek, B., Mean, L. J., & Turman, P. D. (2004). Communication in the community of sport: The process of enacting,(re) producing, consuming, and organizing sport. *Annals of the international communication Association*, *28*(1), 373-409. https://doi.org/10.1080/23808985.2004.11679040

Kiani, M. S. (2024). An in-depth look at the future of sports with artificial intelligence, virtual reality, and data visualization to improve athlete performance analysis. *Intelligent Knowledge Exploration and Processing*, *4*(12), 1. https://doi.org/10.30508/kdip.2024.451951.1100

Kim, D., & Ko, Y. J. (2019). The impact of virtual reality (VR) technology on sport spectators' flow experience and satisfaction. *Computers in human Behavior*, *93*, 346-356. https://doi.org/10.1016/j.chb.2018.12.040

Kittel, A., Larkin, P., Elsworthy, N., Lindsay, R., & Spittle, M. (2020). Effectiveness of 360 virtual reality and match broadcast video to improve decision-making skill. *Science and Medicine in Football*, *4*(4), 255-262. https://doi.org/10.1080/24733938.2020.1754449

Lee, H.-G., Chung, S., & Lee, W.-H. (2013). Presence in virtual golf simulators: The effects of presence on perceived enjoyment, perceived value, and behavioral intention. *New media & society*, *15*(6), 930-946.

Li, C., & Li, Y. (2020). Feasibility analysis of vr technology in physical education and sports training. *IEEE Access*. https://doi.org/10.1109/ACCESS.2020.3020842

Li, J. (2022). Grounded theory-based model of the influence of digital communication on handicraft intangible cultural heritage. *Heritage Science*, *10*(1), 126. https://doi.org/10.1186/s40494-022-00760-z

Liao, T. (2018). Mobile versus headworn augmented reality: How visions of the future shape, contest, and stabilize an emerging technology. *New Media & Society*, *20*(2), 796-814. https://doi.org/10.1177/1461444816672019

Lin, L.-P., Huang, S.-C., & Ho, Y.-C. (2020). Could virtual reality effectively market slow travel in a heritage destination? *Tourism Management*, *78*, 104027. https://doi.org/https://doi.org/10.1016/j.tourman.2019.104027

Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of computer-mediated communication*, *3*(2), JCMC321. https://doi.org/10.1111/j.1083-6101.1997.tb00072.x

López Carril, S., Villamón Herrera, M., & McBride, S. (2020). Embracing social media in sport management education: perspectives for its use in the classroom. *Journal of Physical Education and Sport, 2020, vol. 20, num. 6, p. 3706-3712.*

Loureiro, S. M. C., Guerreiro, J., & Ali, F. (2020). 20 years of research on virtual reality and augmented reality in tourism context: A text-mining approach. *Tourism Management*, *77*, 104028. https://doi.org/https://doi.org/10.1016/j.tourman.2019.104028

Markowitz, D., & Bailenson, J. (2019). Virtual reality and communication. *Human Communication Research*, *34*, 287-318. https://doi.org/10.1007/978-3-030-50801-2_15

Martín-Gutiérrez, J., Mora, C. E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual technologies trends in education. *Eurasia journal of mathematics, science and technology education*, *13*(2), 469-486.

Meier, A. A. (2015). *The ever-evolving landscape in sports communication: gaining insights from collegiate athletics* Kansas State University].

Miah, A., Fenton, A., & Chadwick, S. (2020). Virtual Reality and Sports: The Rise of Mixed, Augmented, Immersive, and Esports Experiences. In S. L. Schmidt (Ed.), *21st Century Sports: How Technologies Will Change Sports in the Digital Age* (pp. 249-262). Springer International Publishing. https://doi.org/10.1007/978-3-030-50801-2_15

Miles, H. C., Pop, S. R., Watt, S. J., Lawrence, G. P., & John, N. W. (2012). A review of virtual environments for training in ball sports. *Computers & Graphics*, *36*(6), 714-726. https://doi.org/https://doi.org/10.1016/j.cag.2012.04.007

Morimoto, T., Kobayashi, T., Hirata, H., Otani, K., Sugimoto, M., Tsukamoto, M., Yoshihara, T., Ueno, M., & Mawatari, M. (2022). XR (extended reality: virtual reality, augmented reality, mixed reality) technology in spine medicine: status quo and quo vadis. *Journal of Clinical Medicine*, *11*(2), 470. https://doi.org/10.3390/jcm11020470

Mueller, A. (2024). *How New Technology in Sports Impacts Fan Engagement* Texas Christian University]. Texas

Muhanna, M. A. (2015). Virtual reality and the CAVE: Taxonomy, interaction challenges and research directions. *Journal of King Saud University-Computer and Information Sciences*, *27*(3), 344-361. https://doi.org/10.1016/j.jksuci.2014.03.023

Park, K., Koo, G.-Y., Kim, M., & Kim, S. (2024). Consumer adoption of virtual reality for spectator sport: an adopter categorization based on the diffusion of innovation and uses and gratification theories. *International Journal of Sports Marketing and Sponsorship*, *ahead-of-print*. https://doi.org/10.1108/IJSMS-04-2023-0059

Parveen, F., Jaafar, N. I., & Ainin, S. (2015). Social media usage and organizational performance: Reflections of Malaysian social media managers. *Telematics and informatics*, *32*(1), 67-78. https://doi.org/10.1016/j.tele.2014.03.001

Pashaie, S., Abbaszadeh, M., Abdavi, F., & Golmohammadi, H. (2023). Improving the Validity of Mixed and Multi-Methods

through Triangulation in New Sports Management Research. *Research in Sport Management and Marketing*, *4*(2), 16-27. https://doi.org/10.22098/RSMM.2023.12593.1216

Pashaie, S., Dickson, G., Abdavi, F., Badri Azarin, Y., Golmohammadi, H., Zheng, J., & Habibpour, R. (2023). Football and the Video Assistant Referee: A Grounded Theory Approach. *Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology*, *OnlineFirst* 1-12. https://doi.org/10.1177/17543371231213739

Pashaie, S., & Golmohammadi, H. (2024). Exploring the Influence of E-CRM on the innovation capabilities of sports venues: The moderating role of covid-19. *Sports Marketing Studies*, *4*(3), 108-128. https://doi.org/10.22034/sms.2024.139773.1253

Pashaie, S., Mohammadi, S., & Golmohammadi, H. (2024). Unlocking Athlete Potential: The Evolution of Coaching Strategies through Artificial Intelligence. *Proc IMechE Part P: J Sports Engineering and Technology*, *Articles in Press*, 1-20. https://doi.org/10.1177/17543371241300889

Patton, M. Q. (2002). Qualitative research and evaluation methods. Thousand Oaks. *Cal.: Sage Publications*, *4*.

Pavlik, J. V., & Bridges, F. (2013). The emergence of augmented reality (AR) as a storytelling medium in journalism. *Journalism & communication monographs*, *15*(1), 4-59. https://doi.org/10.1177/1522637912470819

Pedersen, P. M., Laucella, P., Geurin, A., & Kian, E. (2020). *Strategic sport communication*. Human Kinetics Publishers.

Richlan, F., Weiß, M., Kastner, P., & Braid, J. (2023). Virtual training, real effects: A narrative review on sports performance enhancement through interventions in virtual reality. *Frontiers in Psychology*, *14*, 1240790. https://doi.org/10.3389/fpsyg.2023.1240790

Roulston, K. (2010). Considering quality in qualitative interviewing. *Qualitative research*, *10*(2), 199-228. https://doi.org/10.1177/1468794109356739

Seale, C. (1999). The quality of qualitative research. *Sage Publications, Inc*, *5*(4), 478.

Sichach, M. (2023). Uses and Gratifications Theory-Background, History and Limitations. *History and Limitations (November 17, 2023)*, 11. https://doi.org/10.2139/ssrn.4729248

Singh, K. (2015). The study of key factors resistance to change when adoption of new technologies in the companies. https://doi.org/123456789/1796

Thatcher, B., Ivanov, G., Szerovay, M., & Mills, G. (2020). Virtual reality technology in football coaching: barriers and opportunities. *International Sport Coaching Journal*, *8*(2), 234-243. https://doi.org/10.1123/iscj.2020-0011

Vincent, A., & Frewen, P. (2023). Being where, with whom, and when it happens: spatial, interpersonal, and temporal presence while viewing live streaming of collegiate sports in virtual reality. *Frontiers in Virtual Reality*, *4*, 1167051. https://doi.org/10.3389/frvir.2023.1167051

Wen, J., & Gheisari, M. (2020). Using virtual reality to facilitate communication in the AEC domain: A systematic review. *Construction Innovation*, *20*(3), 509-542. https://doi.org/10.1108/CI-11-2019-0122

Wu, C.-W., Shieh, M.-D., Lien, J.-J. J., Yang, J.-F., Chu, W.-T., Huang, T.-H., Hsieh, H.-C., Chiu, H.-T., Tu, K.-C., & Chen, Y.-T. (2022). Enhancing fan engagement in a 5G stadium with AI-based technologies and live streaming. *IEEE Systems Journal*, *16*(4), 6590-6601. https://doi.org/10.1109/JSYST.2022.3169553

Wu, F. (2021). Construction of Digital Dynamic Sports System Platform Based on VR Technology. 2021 2nd International Conference on Computers, Information Processing and Advanced Education, Ottawa ON Canada

Zhang, J., Zhang, D., & Dai, G. (2024). Mechanisms of Emotional Experiences of Online Spectators of E-Sports Events From the Perspective of Interactive Ritual Chain. *Communication & Sport*, *12*(6), 1054-1074. https://doi.org/10.1177/21674795241227771

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