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Exploring the Relationship between Satisfaction with the Video Assistant Referee System and Fans' Social Identity: The Mediating Effects of Analytical Enjoyment and Attitude toward Referee-Assistive Technology in Iranian Volleyball

Bahare Soleymani Tapesari¹, **Iman Safaei**^{*2}, **Mojtaba Ahmadi**³, **Moein Kouzegaran**⁴

1. Department of Physical Education, Adib Mazandaran Institute of Higher Education, soleymani.bahare@yahoo.com

*2. Department of Physical Education and Sport Sciences, BG.C., Islamic Azad University, Bandar Gaz, Iran. iman.safaei@iau.ac.ir

3. Department of Physical Education and Sport Sciences, BG.C., Islamic Azad University, Bandar Gaz, Iran. mojtaba.ahmadi@iau.ac.ir

4. Master's degree in Physical Education graduate. moein.koozehgaran18@gmail.com

Correspondence Iman Safaei: iman.safaei@iau.ac.ir

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Introduction: This study aimed to analyze the structural relationship between Iranian volleyball fans' satisfaction with the Video Assistant Referee system and their social identity, considering the mediating roles of analytical enjoyment and attitude toward technology in decision-making. The statistical population comprised volleyball fans attending matches of the Iranian Premier Volleyball League in 2023.

Methods: Using a convenience sampling method, a total of 384 fans participated in the study. Data were collected using standardized questionnaires on fan satisfaction with VAR, social identity, analytical enjoyment, and attitude toward technology. Descriptive and inferential statistical analyses, including the Kolmogorov–Smirnov test and structural equation modeling (SEM), were applied.

Results: The results indicated a positive and significant relationship between fan satisfaction with VAR and social identity through the mediating role of attitude toward technology.

Conclusion: Since this type of performance has made this type of system an important component of the game, and sports fans feel good about it and consider it one of the most important elements in the process of holding a match, this sense of identity towards the technology has led to its emergence and further expansion in the sports industry. Also, study found that fans' sense of close identification with their team is enhanced by decision-aiding technology, as it limits opportunities to discuss why their team may have been unfairly treated in certain match situations. Video referee assistance helps support accurate decisions by reducing controversial elements in the game of volleyball, which improves and changes fan perceptions of match refereeing.

KEY WORDS : Analytical Enjoyment, Attitude toward Technology, Fan Satisfaction, Iranian Premier Volleyball League, Social Identity, Video Assistant Referee

Introduction

Sport has gained a central position in the twenty-first century, with the extensive investment of money, time, and media attention making athletes' performances an exciting focus of global interest (1). In recent years, the link between sports and technology has become increasingly close, and the numerous misjudgment cases have become the main reason for the introduction of technology to the football officiating field. Therefore, technologies such as the goal line technology, vanishing spray and the video assistant referee technology have been developed. Of course, the necessity of interaction between sports and technology has always been emphasized (39, 40). Among them, the VAR technology belongs to one of the most important technological inventions, which has made a remarkable contribution to improving the fairness of games (2).

Beyond its entertainment aspect, sport serves as a dynamic social, cultural, and psychological phenomenon that fosters both individual and collective identity (3). Volleyball, in particular, due to its team-based nature, structured organization, and collaborative framework, plays a dual role in reinforcing social identity and group cohesion (4). In addition to promoting physical health and agility, volleyball encourages the development of social skills such as cooperation, trust, responsibility, and loyalty among team members (5). According to Duan (2021), volleyball ranks second globally after football in popularity and has strategic importance in sports programming. Consequently, it has become a symbol of teamwork and social interaction in many cultures, drawing increasing attention from fans and policymakers alike (6).

From a theoretical standpoint, the interaction between individuals and collective cultures that shape identity is a central issue in contemporary social sciences (7). While identity in traditional societies was relatively stable, technological and cultural transformations have turned it into a dynamic and multidimensional process. Individuals now simultaneously participate in multiple social contexts and continually redefine their group affiliations (8). Abrams, Lalot & Hogg (2021) defines identity as a persistent sense of self-continuity amid behavioral and environmental changes. Recent studies confirm that identity remains fluid throughout the lifespan and is influenced by social and cultural structures (9).

Social identity—one of the core components of human identity—reflects individuals' positions within society and their relationships with social groups (10). According to Tajfel and Turner's (1986) theory, social identity refers to that part of an individual's self-concept derived from group membership and the positive or negative value attached to that membership. Social identity is considered one of the external components of sports identity that are related to the degree of influence of society on the individual through groups within society such as family, friends, coaches and teachers, and fields of education, sports, and religion (11).

Through such belonging, people experience pride, attachment, and differentiation from other groups (12). Within sports contexts, the social identity theory provides a powerful framework for understanding fan behavior, team loyalty, and social participation (13).

As one of the most critical skills in sports, decision-making is typically defined as the ability to perceive information, interpret it correctly, and respond appropriately [3, 4]. For referees, this skill is paramount because each decision they make directly impacts the fairness and flow of the game

and any form of misjudgment can adversely affect player performance and even the outcome of the game (14).

From a sports psychology perspective, referees—often considered the “third team” in competition—play a pivotal role in maintaining fairness, excitement, and quality during matches (15). Their decisions not only influence outcomes but also affect the emotions of players, coaches, and spectators (16). Misjudgments can reduce perceived fairness and provoke dissatisfaction, whereas accurate officiating enhances fans’ trust and enjoyment (17). The emergence of advanced technologies, such as the Video Assistant Referee (VAR), has minimized human error and improved decision accuracy in many sports (18).

In volleyball, the VAR system provides precise video analysis of controversial scenes, enhancing transparency and fairness (19). Research by Kittel et al (2025) found that this technology improves trust in officiating decisions, although it may sometimes reduce excitement and disrupt game rhythm (20). Fans’ reactions to VAR depend largely on team identification: unfavorable decisions often trigger dissatisfaction, while favorable outcomes enhance satisfaction (13). Serving as a support tool for on-field referees, it is not only a game unifier but also a conflict pacifier by using a technology-based method to objectively appreciate whether human decisions were accurate and fair or erroneous and thus in need of correction. Given the overwhelming support evidenced by its broad adoption, but also some criticisms and concerns about this technology, an objective assessment of the growing literature on VAR is timely to take stock of what is known and what is still unknown about its use and perception (21).

In this regard Prasanth & Nallavan (2025) found that have a clear picture of how the game is becoming fairer with the help of various technologies and providing good and accurate decisions to the players around the world. The real effort of the players will be appreciated with the accurate data that is generated using the available technologies by the referee and organizers to the teams and fans (22).

The “social reasoning” model suggests that fans interpret officiating decisions through a group-bias lens, favoring interpretations that support their team identity (23). However, technology can moderate this bias by providing objective evidence and reducing cognitive distortions (24).

Fan satisfaction is a multidimensional concept derived from perceptions of service quality, fairness, and enjoyment of the sports experience (25). Satisfied fans tend to maintain long-term engagement and contribute to collective social cohesion within the sports community (26). Furthermore, digital innovations such as augmented reality (AR) and online learning platforms have redefined fan participation, allowing remote engagement and data-driven match analysis (27). In this way Extensive changes in technological advances and the use of new technologies in the development of various sports have improved the processes related to performance development and positive feedback resulting from the satisfaction of people involved in the implementation of competitions using these system (28).

As Niu et al. (2016) noted, social media and virtual networks have blurred the boundaries of collective identity, making technology a central factor in shaping fans’ social identities (29). In this digital era, understanding the interaction between identity and refereeing technology provides valuable insights into professional sports management and fan behavior (30).

In the necessity and importance of the present study, it should be acknowledged that volleyball, as one of the first sports to use video refereeing, has witnessed many advances in the refereeing sector, which shows the synergy between technology and the sports industry. Of course, the satisfaction of fans with this technology and whether game analysis and new technology have an impact on each other is a new and researchable topic. Technology in the field of sports has had a significant impact on the growth of this industry and has created many changes in the behavior of sports fans. In some scenes of volleyball competitions, which were always challenging before the advent of technology and caused behavioral changes in sports fans; today, with the advent of new technologies in this field, this has been resolved to some extent, and this has reduced the intensity of tension and analytical behaviors of sports fans and challenges to refereeing opinions. Therefore, the importance of technology in sports and its impact on sports fans' satisfaction and their enjoyment of analyzing sports competition events are among the important topics of this research. Accordingly, this study investigates how fan satisfaction with VAR relates to social identity through the mediating effects of analytical enjoyment and attitude toward technology among fans of the Iranian Premier Volleyball League.

Material and Methods

This study is applied in purpose and descriptive–correlational in method. The research population consisted of all fans attending matches of the Iranian Premier Volleyball League in 2023. Using Krejci and Morgan's sampling table, 384 participants were selected through multistage cluster convenience sampling. To ensure representativeness, an online questionnaire was distributed across active volleyball fan groups on WhatsApp and Telegram after coordination with group administrators.

Data collection involved both library and field methods. Standardized instruments were used:

- **Fan Satisfaction with VAR Questionnaire** (Lauven et al., 2002) with 5 items on a 5-point Likert scale ($\alpha = 0.76$) (6).
- **Social Identity of Sports Fans Scale** (Saffarinia et al., 2011) with 20 items ($\alpha = 0.91$) (31).
- **Sports Analytical Enjoyment Scale** (Winand et al., 2021) with 6 items ($\alpha = 0.89$) (23).
- **Attitude toward Technology Scale** (Giesler et al., 2003) with 10 items ($\alpha = 0.76$) (32).

Content and face validity were confirmed by 10 experts in sports management. Reliability was verified through Cronbach's alpha using a pilot sample of 30 respondents: 0.70 (fan satisfaction), 0.85 (social identity), 0.72 (analytical enjoyment), and 0.71 (attitude toward technology).

Data analysis employed both descriptive and inferential statistics. Mean, median, and frequency analyses were conducted using SPSS v22, while hypothesis testing and model fit were performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS v3.

Results

Among the 384 respondents, females constituted 63% of the sample and males 37%. The majority were under 20 years old (44%), while only 7% were between 31–40 years. Most fans (49%) reported 11–20 years of fandom experience, and 13% had more than 20 years.

Mean analysis showed relatively high satisfaction with VAR ($M = 3.31$), moderate analytical enjoyment ($M = 3.50$), and favorable attitudes toward technology ($M = 3.73$) and social identity ($M = 3.80$). Data normality was confirmed via the Kolmogorov–Smirnov test. Results demonstrated a significant and positive indirect relationship between fan satisfaction with VAR and social identity through the mediating role of attitude toward technology ($p < 0.05$). Thus, technological engagement and positive perceptions toward innovation strengthen the link between fans' evaluative satisfaction and their sense of group belonging. All positive values indicate that both models demonstrate adequate predictive relevance and convergent quality. CV-COM (Communality Validity) and CV-Red (Redundancy Validity) indices were used to assess the quality of the measurement and structural models.

Table 1. Validity and reliability indicators

Latent Variables	AVE	CR	Cronbach's Alpha	AVE Root
Fan Satisfaction	0.55	0.86	0.80	0.74
Analytical Enjoyment in Sport	0.52	0.82	0.74	0.72
Attitude Toward Technology	0.50	0.78	0.70	0.70
Social Identity	0.51	0.86	0.83	0.71

Structural equation modeling revealed that the proposed model achieved satisfactory goodness-of-fit indices. The Average Variance Extracted (29) exceeded 0.5 for all constructs, confirming convergent validity. Both composite reliability and Cronbach's alpha values exceeded 0.70, indicating strong internal consistency.

Table 2. Correlation coefficient matrix

Latent Variables	1	2	3	4
Fan Satisfaction	0.74	-	-	-
Analytical Enjoyment in Sport	0.40	0.70	-	-
Attitude Toward Technology	0.47	0.61	0.65	-
Social Identity	0.31	0.10	0.12	0.71

Above are the pairwise correlation coefficients between the latent variables. The value of 1 appears on the main diagonal of the matrix, indicating a perfect correlation of each variable with itself. All correlation coefficients are statistically significant at the 95% confidence level (p -value < 0.01). Overall, the larger the correlation coefficient, the stronger the relationship between the two variables.

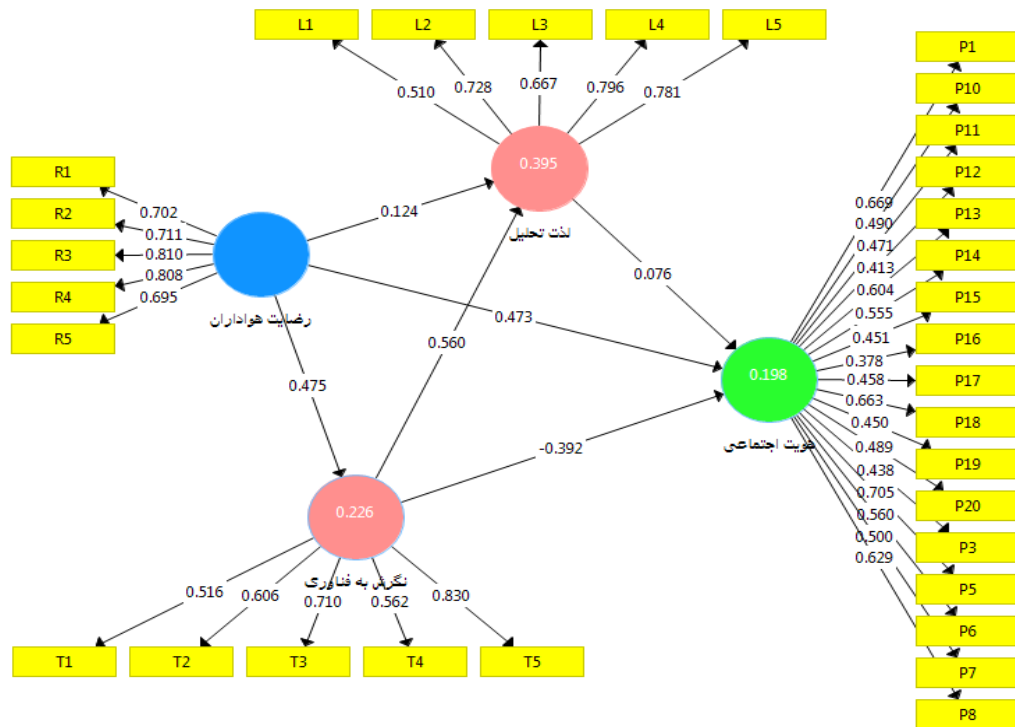


Figure 1. Path coefficients of the structural model of the research

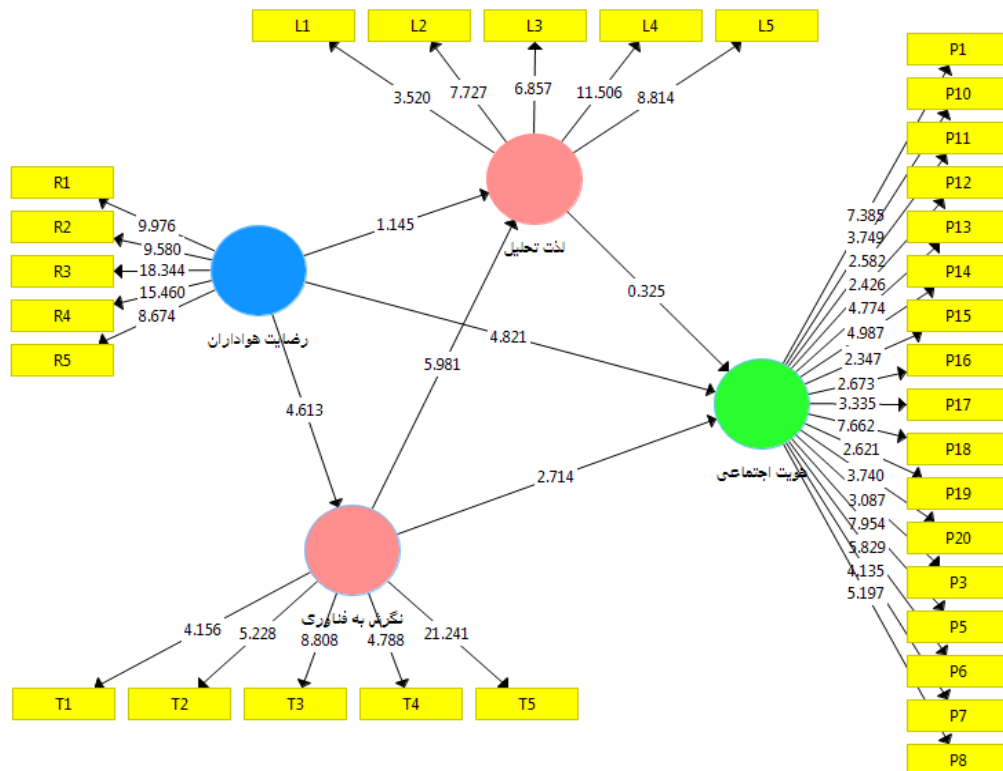


Figure 2. T-coefficients of the structural model of the research

The structural equation model shows that (fan satisfaction) positively and significantly affects both (attitude toward technology) and (social identity), while (analytical enjoyment) did not mediate the relationship. However, (attitude toward technology) acted as a significant mediator, confirming its role in linking technological satisfaction with fan social identity.

Table 3. Results of the measurement and structural model quality test

Latent Variables	CV-Com	CV-Red
Fan Satisfaction	0.32	-
Analytical Enjoyment in Sport	0.26	0.16
Attitude Toward Technology	0.17	0.07
Social Identity	0.17	0.04

The quality of the measurement model was assessed using the indices of Commuality and Redundancy Cross-ValidityAs shown in Table 3, both indices were positive for all variables in the study, confirming the adequacy of the measurement model.

Table 4. Results of the Structural Equation Modeling for Research Hypotheses

Hypothesis	β (Beta)	t-value	p-value	Hypothesis Status	Direction of Effect
Fan Satisfaction → Social Identity	0.47	4.82	0.001	Supported	+
Fan Satisfaction → Analytical Enjoyment	0.12	1.14	0.18	Not Supported	-
Fan Satisfaction → Attitude Toward Technology	0.47	4.61	0.001	Supported	+
Analytical Enjoyment → Social Identity	0.07	0.32	0.73	Not Supported	-
Attitude Toward Technology → Social Identity	0.39	2.71	0.001	Supported	+
Fan Satisfaction → Analytical Enjoyment → Social Identity	-	0.82	0.22	Not Supported	
Fan Satisfaction → Attitude Toward Technology → Social Identity	-	2.08	0.038	Supported	

$|t| > 1.96$ indicates significance at $*p < 0.05$; $|t| > 2.58$ indicates significance at $*p < 0.01$.

To evaluate the overall model fit, the Goodness of Fit (GOF) index was used.

$$GOF = \sqrt{\text{Communalities} * R^2} = \sqrt{0.52 * 0.31} = 0.40$$

A GOF value greater than 0.40 indicates a satisfactory model fit. In this study, the GOF value was 0.44, exceeding the threshold and demonstrating an acceptable overall fit of the model. Furthermore, according to Table 4, the hypothesis proposing a relationship between “fan satisfaction with the Video Assistant Referee” and “social identity” through the mediating role of “attitude toward referee-assisting technology” in the Iranian Premier Volleyball League was supported. The t-statistic for this path was 2.08, which is greater than the critical value of 1.96 at the 95% confidence level, thus confirming the hypothesis with 95% confidence.

Discussion

The findings of this research revealed that the model describing the relationship between volleyball fans' satisfaction with the Video Assistant Referee and their social identity, mediated by attitude toward referee-assisting technology and analytical enjoyment, demonstrated a good overall fit. This result indicates that VAR technology not only influences fans' perceived fairness of officiating and match quality but also contributes to the development and reinforcement of their social identity by fostering positive attitudes toward technological innovation and enhancing both cognitive and emotional enjoyment in match analysis (23) & (6).

Recent studies in the field of fan behavior have shown that officiating technologies such as VAR and the Video Challenge system reduce human error and enhance fans' trust in referee decisions. This improvement strengthens perceptions of distributive justice, which indirectly affects social identity and team loyalty (33). When fans perceive officiating as accurate and fair, they develop a stronger sense of justice within the sport, leading to higher trust in the refereeing system and a greater sense of belonging to the fan community (34).

From a theoretical perspective, these results can be interpreted through the lens of Social Identity Theory (Tajfel & Turner, 1986), which posits that individuals derive part of their self-concept from group membership and shared social belonging. When the experience of watching a match and interacting with innovative technologies evokes collective pride and positive emotion, social identity is reinforced (12). Accordingly, the VAR system serves as an objective mechanism of justice and transparency, increasing fans' trust in both their team and the broader sport structure. This process enhances social capital among fans (35).

Several prior studies have similarly confirmed the mediating role of attitude toward technology in linking fan experience and social identity. For example, found among 480 South Korean football fans that a positive attitude toward VAR increased both satisfaction with the match-viewing experience and identification with the team. Likewise, in a study, showed that favorable attitudes toward analytical technologies improved fans' cognitive and emotional satisfaction and strengthened social interactions within online fan communities, (6).

Consistent with the current findings, analytical enjoyment also emerged as a mediating factor that connects fans' perceptions of officiating fairness and technological quality with their sense of social belonging. According to the theory of pleasurable experience in sport, when fans cognitively engage in analyzing key moments of a match, they experience greater psychological involvement and control, which enhances their group identity (36).

Thus, the opportunity to review and interpret refereeing scenes not only serves educational and technical purposes but also fosters a shared sense of participation and "togetherness" among fans (19). Similar findings have been reported in domestic studies. Qazasfloo and Alavi (2022) found that new sports technologies, such as the Video Challenge system in volleyball, improved refereeing accuracy and consequently increased fan satisfaction (34). Likewise, Sadeghi et al. (2021) showed that perceived refereeing justice enhances fans' trust, leading to more positive attitudes toward officiating technologies and a stronger perception of organizational fairness in sport environments (37).

From a psychosocial and communication standpoint, recent models proposed by Cho (2024) and Zacca et al. (2024) suggest that fans' attitudes toward officiating technologies have two dimensions: Cognitive — perceptions of accuracy, reliability, and efficiency and Affective — enjoyment, trust, and sense of fairness. The combination of these two dimensions forms stable trust and satisfaction among fans. In line with this, the present findings show that a positive attitude toward technology not only increases fan satisfaction but also leads to more balanced and trust-based emotional reactions during refereeing decisions.

Moreover, the results support Winand et al. (2021), who argued that fans with stronger social identities may initially resist new officiating technologies, fearing a loss of excitement and controversy (23). However, in the Iranian volleyball context, fans with positive technological attitudes reported greater analytical enjoyment, which moderated potential conflicts between excitement and fairness. This cultural nuance may stem from the relatively calmer nature of volleyball compared to football and its more structured refereeing system.

From a sociological viewpoint, the Video Assistant Referee system represents a symbol of technical rationality and transparency in the sports industry (20). By reducing human error, technological innovations have redefined power relations among referees, players, and fans, enhancing the perceived legitimacy of the competitive structure (19). Within this context, Iranian volleyball fans perceive VAR not as a threat but as a tool for improving refereeing quality and minimizing conflict, which in turn strengthens their group identity and fair-play orientation (12). This aligns with Cho (2024), who highlighted the growing role of fans as digital analysts—active participants in match interpretation through social media and online platforms. The current findings support this notion, suggesting that analytical enjoyment fosters a participatory identity among volleyball fans (38).

Overall, the findings demonstrate that attitude toward technology serves as a critical mediating factor linking satisfaction with VAR to social identity. This aligns with Seo & Kim (2020), who found that technological attitudes exert an indirect yet significant influence on fans' willingness to support sports innovations (19). Theoretically, this phenomenon is consistent with the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use strengthen positive attitudes and foster social acceptance (20).

In summary, the Video Assistant Referee technology in volleyball not only enhances refereeing accuracy but also strengthens fans' social identity through the development of positive technological attitudes and increased cognitive enjoyment in match analysis. The relationship between fan satisfaction with officiating technology and their sense of team belonging extends beyond decision accuracy—it operates through psychological and social mechanisms such as trust, perceived fairness, and analytical participation (6).

According to the conceptual model of this study, the VAR system effectively serves as a dual mediator between fan satisfaction and social identity:

- Cognitively, by improving perceived fairness and decision efficiency
- Emotionally, by enhancing analytical enjoyment and participatory experience.

These two pathways complement each other, providing a comprehensive explanation of how technology shapes fan attitudes and behaviors.

Ultimately, the present study concludes that the VAR system in volleyball not only enhances officiating performance but also fosters stronger fan identity and belonging by promoting positive attitudes toward technological innovation and cognitive engagement. Technology, therefore, is not merely a functional tool—it has become an integral part of the new cultural and emotional fabric of sports spectatorship (19).

In the context of Iranian volleyball, fans appear less resistant to officiating technologies than their European football counterparts, perceiving VAR as a means of ensuring fairness and calm rather than reducing excitement (34).

As a final conclusion, the dual mediating role of attitude toward technology and analytical enjoyment is a key finding of this research, demonstrating that both cognitive and affective mechanisms are essential to understanding the broader social impact of technology in sport. It should be said that if people have a positive view of their identity in a team, they are more likely to establish good relationships with other people in that team and have positive feelings about themselves. Therefore, these positive feelings can lead to greater loyalty to their favorite team.

Now, satisfaction with a team and satisfaction with the constituent elements of a game and sports competition can also be effective in creating social identity. What the present study found was that video assistant referees play a decisive role in referee decisions and increasing the quality of games. Because if sports fan in volleyball matches is satisfied with the way this type of system works, it will make them believe in this type of system and respect the referee's opinion in a situation where there is a disagreement in the refereeing of their favorite team's match, and this type of respect can be an example of social identity in sports.

Therefore, recommended that the Iran Volleyball Federation not only continue to develop the technical aspects of VAR but also design educational and communication programs to enhance fans' understanding of its function, accuracy, and limitations. Raising awareness can strengthen perceptions of technological justice and promote broader social acceptance.

Additionally, Premier League clubs are encouraged to use digital and social media platforms to share interactive video analyses and refereeing clips with fans, thereby deepening analytical engagement and reinforcing collective identity through participatory experiences. It is suggested that the Mass media should take steps to provide educational programs to increase fans' awareness of video referee assistance, thereby increasing their satisfaction with this technology in sports competitions and forming their social identity correctly.

Ethical Considerations:

Compliance with ethical guidelines

The authors commit to adhering to ethical guidelines.

Disclosure

The Authors have nothing to disclose.

During the preparation of this work, the authors used Chat GPT Plus v5 to enhance readability and language, aiding in formulating and structuring content. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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Conflict of Interest

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«مقاله پژوهشی»

بررسی رابطه بین رضایت از سیستم کمک داور ویدیویی و هویت اجتماعی هواداران: نقش میانجی لذت تحلیل و نگرش نسبت به فناوری در والیبال ایران

بهاره سلیمانی تپه سری^۱ ID، ایمان صفائی^{۲*} ID، مجتبی احمدی^۳ ID، معین کوزه گران^۴ ID

- ۱- استادیار مدیریت ورزشی موسسه آموزش عالی غیر دولتی ادیب مازندران
- ۲- گروه تربیت بدنی و علوم ورزشی، واحد بندرگز، دانشگاه آزاد اسلامی، بندرگز، ایران Iman.safaei@iau.ac.ir
- ۳- گروه تربیت بدنی و علوم ورزشی، واحد بندرگز، دانشگاه آزاد اسلامی، بندرگز، ایران
- ۴- دانش آموخته کارشناسی ارشد تربیت بدنی

نویسنده مسئول: ایمان صفائی Iman.safaei@iau.ac.ir

مقدمه: این مطالعه با هدف تحلیل رابطه ساختاری بین رضایت هواداران والیبال ایران از سیستم کمک داور ویدیویی و هویت اجتماعی آنها، با در نظر گرفتن نقش میانجی لذت تحلیل و نگرش نسبت به فناوری در تصمیم‌گیری، انجام شد. جامعه آماری شامل هواداران والیبال حاضر در مسابقات لیگ برتر والیبال ایران در سال ۲۰۲۳ بود.

روش‌ها: با استفاده از روش نمونه‌گیری در دسترس، در مجموع ۳۸۴ هوادار در این مطالعه شرکت کردند. داده‌ها با استفاده از پرسشنامه‌های استاندارد رضایت هواداران از VAR، هویت اجتماعی، لذت تحلیلی و نگرش نسبت به فناوری جمع‌آوری شد. تجزیه و تحلیل‌های آماری توصیفی و استنباطی، از جمله آزمون کولموگروف-اسمیرنوف و مدل‌سازی معادلات ساختاری (SEM)، به کار گرفته شد.

نتایج: نتایج نشان دهنده رابطه مثبت و معنادار بین رضایت هواداران از VAR و هویت اجتماعی از طریق نقش میانجی نگرش نسبت به فناوری بود. نتیجه‌گیری: از آنجایی که این نوع عملکرد، این نوع سیستم را به یکی از اجزای مهم بازی تبدیل کرده است و هواداران ورزش نسبت به آن احساس خوبی دارند و آن را یکی از مهمترین عناصر در فرآیند برگزاری مسابقه می‌دانند، این حس هویت نسبت به این فناوری منجر به ظهور و گسترش بیشتر آن در صنعت ورزش شده است. همچنین، مطالعه نشان داد که حس شناسایی نزدیک هواداران با تیمشان توسط فناوری کمک به تصمیم‌گیری افزایش می‌یابد، زیرا فرصت‌ها را برای بحث در مورد اینکه چرا ممکن است در موقعیت‌های خاص مسابقه با تیمشان ناعادلانه رفتار شده باشد، محدود می‌کند. کمک داور ویدیویی با کاهش عناصر بحث‌برانگیز در بازی والیبال، به پشتیبانی از تصمیمات دقیق کمک می‌کند که باعث بهبود و تغییر درک هواداران از داور ویدیویی مسابقه می‌شود.

واژه‌های کلیدی رضایت هواداران، لذت تحلیلی، لیگ برتر والیبال ایران، کمک داور ویدیویی، نگرش نسبت به فناوری، هویت اجتماعی