More Decision-Aid Technology in Sport? An Analysis of Football Supporters' Perceptions on Goal Line Technology.

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Bios
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Abstract

The introduction of decision-aid technology in sport, such as Goal Line Technology (GLT) in football, has generated minimal literature on supporters' perspectives. This paper aims to investigate Scottish football supporters' perceptions towards GLT. Two hundred and seventy Scottish supporters completed a questionnaire to assess their satisfaction with GLT and factors that influence their level of satisfaction. The majority of Scottish supporters trust the technology applied in football and favours its use. However, they are dissatisfied with GLT in part because GLT is considered to detract from the atmosphere resulting from contentious goals which supporters appreciate and lessen the debate around crucial decisions. Findings also showed that football supporters are against GLT viewing in the stadium and do not welcome future decision-aid technology in football.

Keywords: Decision-aid technology**,** Goal Line Technology, supporter satisfaction, supporter identification, football

Introduction

Our modern society is replete with new technologies designed to make our life easier. Likewise, the world of sport has embraced the new waves of decision-aid technology, designed to help referees and officials make the right decision. Examples include instant replay systems used in Basketball, Hockey and Rugby, and Hawk-Eye technology, i.e. a computer and camera based system which traces a ball's trajectory, used in Cricket and Tennis. Professional sports pace has made it hard for referees and umpires to take correct decisions,[1] and any wrong decision has greater sporting and financial consequences and implications. These reasons might explain the growing use of decision-aid technologies being applied in different sports. Academic research undertaken on decision-aid technology in sport has mostly taken a descriptive approach combined with a critical philosophical perspective on the necessity and/or consequences of the use of the technology in sport.[2] Empirical research on the use of decision-aid technology is rare, and limited to a research on referees' views on decision-aid technology in football.[3] It is though crucial to collect and analyse the views of stakeholders that are confronted with the technology. One of these key stakeholders is supporters. Collins and Evans[4] suggest that technology might impact sport spectators' behaviour, though no academic research has been undertaken to analyse supporters' views on decision-aid technology in sport or on the introduction of future technology. Drawing on social identity theory and customer satisfaction, the present study aims to fill this gap by analysing sport supporters perceptions on decision-aid technology recently introduced into the game of football, Goal Line Technology (GLT), and on factors that can contribute to (dis)satisfaction with that technology.

Football's international governing body, FIFA (Fédération Internationale de Football Association), has long been opposed to the introduction of instant replay or technologies that

remove the responsibility from referees (FIFA, 2010a). FIFA has previously argued technology undermines the game and that football "must be played in the same way no matter where you are in the world".[5] Though reluctant to include technologies that slow down the game,[6] incidents such as Frank Lampard's disallowed goal for England at the 2010 World Cup pressured FIFA to find a solution.[7] In October 2010, IFAB (International Football Association Board) the body determining the Laws of the Game of football, agreed to discuss the introduction of a technology that identifies whether or not the ball had fully crossed the goal line and hence whether a goal should be awarded.[8] After testing procedures were put in place to guarantee the accuracy of the technology, FIFA announced in 2012 the introduction of GLT in football.[9] Different systems were accepted which are based on cameras situated around the football pitch tracking the ball (Hawk-Eye Goal System and Goal-Control), or based on a chip inserted inside the ball (GoalRef). No matter the system used, once the ball has fully crossed the goal line, a signal is sent to the referee's watch. A major step in the introduction of decision-aid technology in football was when Goal-Control was adopted by FIFA for the 2013 Confederations Cup and the 2014 World Cup in Brazil.[10] FIFA's main rationale referred to the rapid technical and tactical evolution of the game which results in goals being at a premium and hence the increased importance of determining whether one has been scored or not.[11] The introduction of GLT has long been debated within FIFA instance.[12] Players, managers and teams are not the only ones directly concerned by the new technology and interestingly, one of the first arguments against GLT focused on supporters' presumed dissatisfaction therewith.[13] Indeed, supporters may be concerned by GLT and with how it affects their experience of the game as well as any impact on their team. Hunt, Bristol, and Bashaw[14] suggest that this derives from levels of supporter identification and passion towards a football club. But at the same time, football supporters dissatisfied by poor decisions making by match officials may welcome the introduction of GLT as well as the possibility of

future innovation. To date, however, no study has investigated supporters' perceptions of GLT, despite its implications for FIFA and international governing bodies given the importance they claim to attach to supporter satisfaction. The present research contributes to the literature by exploring for the first time football supporters' perceptions of decision-aid technology and factors of supporters' satisfaction at a football game that are affected by the technology.

The paper proceeds as follows. First, the paper reviews literature on football supporters identification, satisfaction and decision-aid technology in sport. Second, the paper's methodology is set out, including a description of data collection and analysis. Third, results are presented and discussed. Finally, theoretical and managerial implications are suggested.

Literature Review

Football Supporter Identification and Satisfaction

According to social identity theory[15] individuals have two identities: a personal identity and a social identity which relates to groups with which individuals identify themselves. In the case of sport fans, they identify to the sport team they support, and their level of identification can explain how they act on behalf of their team.[16] Hence, a football fan can be categorised as an individual emotionally attached to a football team.[17] Haynes[18] furthers the argument by suggesting that the difference between a football fan and a spectator (not being a fan) is that the spectator has no emotional connection with a club, therefore they would not suffer if the club they were watching lost. Different levels of commitment have been highlighted in the literature. Hunt et al.[19] argue that football fans vary in levels of identification and emotional attachment towards their football club- temporary; local; devoted; fanatical; and dysfunctional. 'Temporary' relates to a fan who would attend a one off match such as a World Cup final without any emotional attachment whereas a 'dysfunctional' fan would miss

their wedding day to watch their football team play.[20] Vallerand et al.[21] provide a similar model relating to different types of passion between football fans- harmonious and obsessive. 'Harmonious' refers to an individual celebrating their team's victory and 'obsessive' relates to a fan missing their work to attend a game. Looking at spectator identities, Giulianotti[22] provides a theoretical classification of four ideal-type categories of football spectators based on the kind of identification they have toward their club: supporters, fans, followers and flâneurs. According to the author, supporters have a long term personal attachment to the club whereas flâneurs have low identity and a market-centered relationship with the club. Fans have high degree of loyalty and identification to the club but their relationship with the club is more distant compared to supporters. Furthermore, fans are also characterised by the consumption of products related to the club or its players. Followers keep up to date with the clubs' developments for which they have an interest that can come from historical links with the club. According to researchers[23] there are differences in types or levels of identification between football spectators and their favourite club. For the purpose of the present paper we use the term supporters to designate the categories of fans, supporters, flâneurs and followers established by Giulianotti[24] while emphasizing the attachment they have towards their favourite club. The more strongly supporters identify with their team, the more likely they will be committed to ensuring its best interest; the less identified they are the more focussed they will be on their own needs and self-interest.[25] Therefore, according to their level of identification, supporters might have different expectations when attending games.

The differences in supporters' identification have been investigated in research through different scales such as the Motivational Scale for Sport Consumption (MSSC)[26] and the Sport Spectator Identification Scale (SSIS).[27] While the MSSC is a suitable measurement for understanding the relationship and attachment between football supporters and their club,[28] it does not provide insight into the level or type of identification supporters have with their

club. In order to measure supporter identification, one can use the SSIS[29] recently applied in research to measure supporters' level of identification to their team.[30] The SSIS classifies sport spectators under one of three categories - low; moderate; or highly identified spectators.[31] According to researchers who analysed the reliability of the measurement[32], not only does the SSIS identify different types of football spectators but it can also produce clear findings as to how supporters might be identified with their club, which in turn could be associated with supporters' expectations and satisfaction with different aspects of the game. The introduction of a new component into the game such as decision-aid technology may potentially impact supporters' expectations and satisfaction differently depending on their level of identification.

Drawing on social identity theory[33] and customer satisfaction through the disconfirmation of expectations model,[34] Leeuwen et al.[35] developed a framework which investigates team identification as a possible indicator of sport spectator satisfaction – the Sport Spectator Satisfaction Model (SSSM). Leeuwen et al.[36] suggest that a highly identified spectator would be more likely to experience a higher level of satisfaction with spectator services compared to a lowly identified spectator. These findings are in line with previous arguments from Dietz-Uhler and Murrell[37] who proposed that supporters with low levels of identification enjoy football games less as they are not as emotionally attached to a particular football club, and hence do not want or need their team to win as badly as highly identified supporters. Another element from the SSSM is the importance of winning for spectator satisfaction. Leeuwen et al.[38] suggest that winning influences spectator satisfaction and that highly identified spectators whose team win report higher level of satisfaction compared to those who support a team that lose. Dietz-Uhler and Murrell[39] went further suggesting that highly identified supporters would be more likely to accept one of their team's players breaking the rules if it

results in their team winning. Arguing sport spectatorship is a service, Leeuwen et al.[40] distinguished between core and peripheral services where the game itself is the core service, and non-game extras such as parking, catering and half-time entertainment are peripheral services. The importance of peripheral services for supporters satisfaction is stressed by Leeuwen et al.[41] as well as the levels of identification spectator have towards their team and the importance of winning. The SSSM model allows one to investigate whether highly identified supporters have greater or lower satisfaction levels towards the introduction of a component of the game such as GLT which could impact the win/lose element and supporters expectations at a sport event.

Factors Influencing Supporter Satisfaction at Football Matches

The match day atmosphere is a positive indicator of supporter satisfaction along with services during the game.[42] Charleston[43] suggests that the 'atmosphere' at a football match is created by two sets of supporters who engage each other through various courses of singing and chanting, history between opponents and connection between supporters. Although goals scored were not the strongest influence on the atmosphere, they had an effect as they generate either positive or negative reactions.[44] Also, wrong decisions made by referees have been highlighted as influencing match day atmosphere,[45] but the impact of these errors on supporters has not been further examined. According to FIFA,[46] supporters might perceive a contentious goal, i.e. when the ball has not crossed the line but a goal is still given, to improve the atmosphere at a football match, although no evidence is offered to support such an argument. FIFA's argument is that '*Fans love to debate any given incident in a game. It is part of the human nature of our sport'*.[47] According to FIFA, by removing contention and thus debate, supporters will no longer get to experience the element of doubt is something they may enjoy. Therefore, the introduction of GLT removes contentious goal line decisions

which might influence the match day atmosphere and supporter satisfaction. Even though technology may minimise bad decisions being made, football supporters may actually miss the debate which stem from refereeing decisions[48] and which contributes to the overall experience for football supporters.[49] The atmosphere during the game and the debate after the game seem to be key factors that might influence supporters' satisfaction towards GLT. This is important given that a satisfactory experience from attending a game can also impact supporters' likelihood of attending future games.[50]

Decision-Aid Technology in Sport

The introduction of decision-aid technology not only reduces the authority of match officials but also undermines the ability of referees to make the right decisions during the crucial moments of a match.[51] Generally supporters accept that referees will make bad decisions from time to time and that refereeing controversies are part of football.[52] In tennis, the authority is transferred from the referee to the technology when a player challenges a referee's call. The problem, according to Collins[53], is that the technology is less accurate than it appears which leads to false transparency that is condemned by the author. Likewise in football, Ryall[54] believes caution is required with the technology by suggesting that 'the weather' and 'goal line scrambles' with players covering not only the ball but the goal line are issues that may impair the accuracy of the technology. The issues highlighted have probably been taken into consideration during the testing phase, but there is a tolerable degree of statistical errors with all technologies. Collins and Evans[55] suggest that supporters be educated by sport commentators about how decisions are made using decision-aid technology and the inherent margin of errors.

The first goal validated by GLT at the World Cup 2014 in Brazil which saw Karim Benzema from France scoring against Honduras has encountered some confusion when big screen in stadium first showed 'No Goal' when the ball hit the inside of the post which was then followed by another GLT replay showing 'Goal' when the ball went slightly over the line after it bounced against the keeper. This confusion has resulted in FIFA changing the guidelines on showing GLT replays to avoid any further confusion and "enhance the viewing experience for fans".[56] Unless competition organisers decide otherwise, the only individuals in the football stadium that will see whether or not the ball has crossed the line are the match officials through the use of their watch. The technology would hence only be used to aid referees and not for entertainment purposes. The influence of technology and screen viewing in the stadium has been discussed by Cairns[57] who warned that spectators' engagement at live sporting event might be transformed with spectators potentially being disturbed by information related to the game (e.g. instant replays, tactical analysis, players' interview and betting odds) resulting in their attention shifted out of the game itself. However, the aspect of viewing on screen the decision of whether or not the ball has crossed the line should be asked to supporters themselves. Therefore, it is of interest to know whether spectators appreciate viewing the decision on screens and whether it adds to the atmosphere at particular events.

The introduction of decision-aid technology into football may open the door for further innovation.[58] In particular, Bal and Dureja[59] propose that if GLT is successful, FIFA may consider technology for offside or penalty decisions. Recent declarations by FIFA president Gianni Infantino advocate for the use of video refereeing at the 2018 World Cup in Russia.[60] However, Michel Platini, former head of UEFA (Union of European Football Associations) is concerned about the prospect of further technical innovations within the game. Although it is

a concern from key and influential figures in governing bodies of football, no study has yet investigated supporters' perceptions of the inclusion of further technology in football.

Since the introduction of GLT in 2012, a lack of academic literature relating to supporters perspectives is evident. Two studies[61] conducted through surveys posted on football forums have been undertaken posing a singular question to football supporters: are you in favour of GLT? The results from both studies showed that the majority of football supporters- in excess of 75% in both surveys - were in favour of GLT. In contrast, another survey undertaken by Hattrick Global Football Voice[62] showed that only 49% of supporters were in favour of GLT. There is clearly a need for supporters opinions on the various aspects of GLT to be heard.

Method

Research Design

The research focuses on the perceptions of Scottish football supporters towards GLT. A quantitative approach based on an online questionnaire has been chosen to collect information on supporters' opinions. The online questionnaire uses Qualtrics online survey software and was posted on football supporters forum in Scotland and on Scottish professional football clubs social media pages. The questionnaire was accessible from the 1st of January 2014 until the 1st of February 2014. At the time of data collection, GLT had officially been introduced in four different competition formats: the 2012 FIFA Club World Cup in Japan, the 2013 FIFA Confederations Cup in Brazil, the 2013/14 English Premier League season and 2013/14 Football league Cup in England from the quarter finals. GLT is now used in four major European leagues such as English Premier League (England), Serie A (Italy), Ligue 1 (France), and Bundesliga (Germany). It has been used at the 2014 FIFA World Cup and the 2016 UEFA Euro tournament and will be introduced in European

competitions such as the 2016/17 UEFA Champions League from the play-offs onwards. [63]

According to IFAB, the decision to display replays of GLT results in-stadium is taken by each competition organiser. [64]

Supporters of Scottish football clubs were asked to provide background information such as gender, age, number of years they had supported their favourite team, whether they had a membership with their favourite team and the number of times a season they watch their team at the stadium (Table 1). Perceptions of supporters towards the use of GLT and its accuracy were evaluated by asking respondents to answer yes, no or do not know to questions such as *'Are you in favour of GLT?'* ; *'Do you trust referees to use GLT properly?'* or *'Is GLT accurate?'*. Level of Scottish supporters' commitment (i.e. supporter identification) and perceptions towards GLT (e.g. satisfaction and viewing) are assessed by asking respondents to rate their level of agreement on a 7 point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), where 4 is neither agree nor disagree. This was deemed preferable to a 5 point Likert scale as it offers greater range of opinion and is deemed more reliable.[65]

Instruments

Wann and Branscombe's Sport Spectator Identification Scale (SSIS)[66] has been applied to the present study to measure Scottish supporters identification, i.e. their level of commitment to their team. Respondents provided their level of agreement on 7 items from strongly disagree to strongly agree (7 point Likert scale), e.g. *The football team's successes are my successes.* An exploratory measure of supporters' satisfaction towards GLT adapted from the SSSM was developed consisting of 5 items on a 7pt Likert scale such as *'I am satisfied by G.L.T in football'*. Other exploratory scales have been created to measure 'Enjoyment from referee's error' (5 items), 'Atmosphere enhanced by contentious goal' (4 items), 'Enjoyment from

debate' (5 items), 'GLT viewing in the stadium' (5 items), and 'Future decision-aid technology' (4 items).

Statistical Analysis

An overview of the opinions of supporters on GLT has been established by providing the percentage of supporters surveyed favouring GLT, trusting referees to use it and deeming it to be accurate.

Confirmatory factor analysis (CFA) and Cronbach's alpha (>.7) have been used to evaluate the factor structure of the SSIS using IBM SPSS 19 and AMOS 19.0 programs. To assess whether the tested model demonstrated 'good fit' to the data set, we used the comparative fit index (CFI >.9) and the root mean square error of approximation (RMSEA <.07).[67] Average of respondents' scores (7pt scale) for supporter identification is computed in order to highlight groups of supporters according to their commitment to their team: lowly (score of 3 or fewer), moderate (scores between 3 and 5) and highly (scores of 5 or higher) identified supporters.

Exploratory factor analysis, using principal component analysis (factor loadings >.4), validated by Cronbach's alpha (>.7) has been used to extracts reliable scales for 'Satisfaction towards GLT' ; 'Enjoyment from referee's error' ; 'Atmosphere enhanced by contentious goal' ; 'Enjoyment from debate' ; 'GLT viewing in the stadium' and 'Future decision-aid technology'. Average scores of items per factor have provided overall scores for each factor under investigation on a scale from 1 (strongly disagree) to 7 (strongly agree) where 4 is neutral.

Using IBM SPSS 19, the following statistical analyses have been performed. Correlational analysis has been used to measure relationships between factors, and ANOVA with Tukey's post-hoc test is used to measure mean differences between groups of supporters identified.

Finally, multiple linear regression analysis is used to explain supporter satisfaction towards GLT.

[Insert Table 1 about here]

Descriptive Statistics

Among the 313 surveys returned, 43 were incomplete and were eliminated, reducing the usable sample to 270. Table 1 sets out the profile of respondents. Among the 270 respondents, 193 (71.5 percent) were male and 77 (28.5 percent) female; 108 (40 percent) were under the age of 33, 93 (34.5 percent) were between 34 and 49, and 59 (25.5 percent) were 50 or older (see Table 1). A hundred and forty-nine respondents (54.2 percent) have supported their favorite team for more than 20 years and a hundred and twenty-nine (44.8 percent) have supported their favorite team for up to 20 years. A majority of respondents have indicated they have a membership with their favorite team. Thirty-one respondents (11.5 percent) have not seen their team at the stadium during the previous season.

Results

Confirmatory factor analysis (CFA) was used to evaluate the factor structure of the supporter identification model. The 7 supporter identification items are listed in table 2. The supporter identification model demonstrates a 'good fit' to the data measured in the present study, according to the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). The ration of χ^2 to the degree of freedom (χ^2/df=1.6) and the remaining commonly used goodness-of-fit indices (CFI=.994, RMSEA=.047) were in line with the recommended criteria.[68] As indicated in Table 2, factor loadings were comparably high and statistically significant, ranging from .69 to .82, which in accordance with the adequacy of the fit indices, supported the hypothesized structure of the supporter identification model. Cronbach's alpha of .91 validate the consistency of the 7 items (>.7).

[Insert Table 2 about here]

Table 2 shows that participants in the survey have, on average, a moderate supporter identification score (*M*=4.09; *SD*=1.48) which can be split between three main categories according to participants' average score on the 7 supporter identification items as shown in Table 3. According to the 7pt Likert scale, sixty-two participants (23 percent) show scores below 3 which reveals they are lowly identified supporters, a hundred and forty-two (52.6 percent) are moderate identified supporters with scores between 3 and 5, and sixty-six (24.4 percent) are highly identified supporters with scores higher than 5.

[Insert Tables 3 and 4 about here]

As shown in table 4, a very large majority of participants perceives that GLT is accurate, trust referees to use GLT and trust that referees will make correct decisions using GLT, respectively 93, 74.4 and 88.5 percent. Two third of participants are in favour of GLT compared to 30 percent who disfavour it. Despite its accuracy being largely endorsed by supporters, it seems that a non-negligible proportion of participants are against the use of the decision-aid technology in football. There is no evidence that lowly or highly identified supporters are more or less in favour of GLT.

[Insert Table 5 about here]

Principal component analysis shown in Table 5 reveals six variables that could give insights into the perceptions of supporters about GLT. Each variable has factor loading >.4 and is validated by Cronbach's alpha (>.7). Participants do not particularly seem satisfied with GLT (*M*=3.62; *SD*=1.66). On average, they enjoy the debate resulting from a contentious goal (*M*=4.74; *SD*=1.58) and believe that the atmosphere is enhanced by a contentious goal being awarded (*M*=4.34; *SD*=1.41). Average score for the enjoyment of referee's human error is neutral (*M*=3.95; *SD*=1.23). They do not favor GLT viewing in stadium (*M*=3.41; *SD*=1.36) and are against the introduction of future aid decision technology (*M*=3.00; *SD*=1.45).

[Insert Table 6 about here]

The relationship between variables has been investigated using correlational analysis (Table 6). Negative significant correlational relationships are observed between 'Satisfaction with GLT' and variables favouring contentious goals: enjoyment from referee's error (r=-.28; p<.01), atmosphere enhanced by contentious goal (r=-.57; p<.01) and enjoyment from debate r=-.74; p<.01). These three variables are correlated with one another. Participants who enjoy referees' error, believe the atmosphere is enhanced by a contentious goal being awarded and enjoy debating about contentious goal are dissatisfied with GLT. Positive significant correlational relationships are observed between 'Satisfaction with GLT' and the introduction of GLT viewing in stadium (r=.19; p<.01) and future decision-aid technology (r=.18; p<.01). Negative significant correlational relationships are observed between 'Enjoyment from debate' and 'GLT viewing' in the stadium (r=-.23; p<.01) and 'Future decision-aid technology' (r=-.27; p<.01), while the two latter outcomes are positively correlated (r=.27; p<.01). The more supporters enjoy debating after a football game, the less they seem to favour GLT viewing in the stadium and the less they would welcome further decision-aid technology in football.

[Insert Table 7 about here]

Significant differences appear when comparing average score of the different categories of supporter on their enjoyment from referee's error, GLT viewing in stadium and introduction of future decision-aid technology in football (Table 7). Lowly identified supporters do enjoy referees' errors compared to moderate and highly identified supporters. Furthermore, lowly identified supporters are more supportive of GLT viewing in stadium compared to highly identified supporters, and they are less reluctant towards the introduction of decision-aid technology in football compared to moderate and highly identified supporters. No significant difference emerges between moderate and highly identified supporters.

[Insert Table 8 about here]

Table 8 shows the result of a multiple regression analysis predicting supporters'
(dis)satisfaction towards GLT by using control variables such as gender, age, number of
years supporters have supported their favourite team, whether they had a membership with
their favourite team and the number of times a season they watch their team at its home
stadium. The three variables favouring contentious goals, i.e. Enjoyment from referee's error,
Atmosphere enhanced by contentious goal and Enjoyment from debate, have been used to
predict supporters' (dis)satisfaction. Model 3 (Table 8) predicts 58 percent of the variance in
supporters' (dis)satisfaction through 'Atmosphere enhanced by contentious goal' ($r=-.25$;
$p<.001$) and 'Enjoyment from debate' ($r=-.65$; $p<.001$). Dissatisfaction of supporters towards
GLT is thus partly explained by the fact that supporters enjoy the atmosphere resulting from
contentious goals and enjoy even more discussing this after a football game.

Discussion

The rigorous testing procedures put in place by FIFA, and its communication seemed to have
been effective given the high level of trust supporters have in the new decision-aid
technology and its proper use by referees. The ability of the technology to determine whether
the ball has crossed the line was not questioned by supporters.

Findings are in line with previous statements from FIFA[69] arguing that supporters enjoy
debating. Furthermore, the more supporters enjoy the atmosphere resulting from contentious
goal and debate after the game, the more they seem to be dissatisfied with GLT.

Regression analysis has shown that the atmosphere enhanced by contentious goal and in
particular enjoyment from debate after the game play a significant role in explaining why
supporters might be dissatisfied with GLT. The present study supports Singh[70] suggestion
that supporters would object to decision-aid technology in sport as it removes the enjoyment

of debating decisions. Indeed, a technology that predicts whether the ball has crossed the line removes the debate during and after the game, and ultimately a key part of the football supporter experience and satisfaction at sport event as suggested by researchers.[71] Debate is therefore an important component of supporters' satisfaction at a sport event that is partially removed by decision-aid technology. Many high profile instances, including Frank Lampard's disallowed goal at the 2010 World Cup, have been greeted with mixed receptions surrounding the need for decision-aid technology. Although the match official made the wrong decision, Nlandu[72] argues that the controversy surrounding the decision enhanced many football supporters enjoyment after the match. The introduction of GLT removes such enjoyment and potentially influence sport spectator behaviour as suggested by Collins and Evans.[73]

According to social identify theory,[74] highly identified supporters are concerned about their team best interests, whereas lowly identified supporters are more concerned about their self-interest. Although it could have been expected that highly identified supporters might be opposed to GLT[75] as it removes part of their satisfaction and experience at a football game which they value more than lowly identified supporters,[76] no differences in supporters' satisfaction towards GLT have been shown between groups of low, moderate and highly identified supporters. Dietz-Uhler and Murrell's suggestion that highly identified supporters would have different satisfaction towards GLT compared to lowly identified supporters[77] is also not supported in the present research. However, we suggest that lowly identified supporters have different expectations from football games. Lowly identified supporters enjoy referees' error more, are more in favour of GLT viewing in the stadium and of future decision-aid technology in football as compared to moderate and/or highly identified supporters. Lowly identified supporters are less emotionally attached to their team,[78]

therefore they attach less importance to victories. Referees' error might hence be more enjoyable to them as they are less concerned about the end result of the game compared to moderate and highly identified supporters. At the same time, lowly identified supporters are less opposed to GLT viewing and to the introduction of new technology in football. Results suggest that supporters have different expectations from a sport event according to their level of identification with the team they support. Fans and supporters who are highly identified to their team would be traditionally focussed on the game and its result whereas flâneurs and followers who are lowly identified to their team[79] would like to be entertained with less concern about the end result. Entertaining components of the games such as GLT viewing in the stadium, which has been discouraged by Collins and Evans,[80] would be favoured by the latter. These findings can be placed in perspective with Carins[81] who argued that the use of technology and availability of screen viewing at live sporting event would alter the sport spectatorship experience. However, we would suggest it mainly impacts those spectators who do not have a strong attachment to either of the teams being watched. Further investigation need to be undertaken to identify whether lowly identified supporters favour GLT for entertainment purpose, which is not the aim of the technology but might be a deviant consequence. Ryall[82] believes that spectators at sports events have become fixated on viewing replays on big screens such as in tennis and cricket and that football supporters will be no different in terms of their demand for and reaction to technology in the stadium. The present study shows, however, that supporters are, on average, against GLT viewing in the stadium although differences exist between groups of supporters. Supporters who disfavour GLT viewing in the stadium are also significantly less opened to the introduction of new decision-aid technology. Interestingly, these supporters are less satisfied with GLT, in line with Ryall[83] who suggests that sports supporters will only be in favour of technology broadcasting verdicts on a screen if they are primarily supportive of technology.

Lowly identified supporters enjoy wrong decisions made by referees which is a component of the game satisfaction.[84] Collins further suggests that the introduction of decision-aid technology would remove the enjoyment of human error in decision making by referees, but the present study does not support that notion that supporters' dissatisfaction towards GLT would be explained by enjoyment of referee's error. Nevertheless, given supporters strong opposition to future decision-aid technology in sport, especially moderate and highly identified supporters, it could be argued that the introduction of more technology in football, such as 'offside' or 'penalty decision', would lead not only to further eradication of referee human error, but also to greater supporter dissatisfaction. FIFA therefore has to be cautious that this is not the beginning of an up intensification of technology in football as warned of by, for example, Michel Platini, the former head of UEFA. From GLT debut, UEFA has strongly objected to the technology and, for some time, has taken a different approach by only implementing match officials around the goal line, to finally surrender to the use of GLT – alongside additional assistant referees around the penalty area– in European competitions such as Euro 2016 and Champions League.[85] As argued by Collins[86], and supported by the views of moderate and highly identified supporters in the present study, the introduction of new decision-aid technology should not be aimed at entertaining, but to maintain justice of decisions, which Collins[87] argued is different from accuracy.

Conclusion

The present study contributes to the research on technological innovation in sport by providing evidence of supporters' perceptions on the introduction of decision-aid technology. Although a majority of supporters trust the new decision-aid technology applied in football and favours its use, evidence is provided that two key elements impact on supporters' dissatisfaction of the technology, atmosphere resulting from contentious goals and the debate

that follows, both of which are partly removed by GLT and could ultimately lessen the football supporters' experience.

As a contribution to customer satisfaction and sport spectator behaviour at sport event, enjoyment from debate has proved to be a strong element that explains dissatisfaction towards GLT. We suggest that the introduction of decision-aid technology influences supporters' behaviour and satisfaction at sport event as it partially removes the debate they enjoy. Further research needs to investigate the importance of debate in terms of match day atmosphere and supporter satisfaction overall. At the same time, football supporters are against GLT viewing in the stadium and do not welcome future decision-aid technology in football. This result suggests that supporters do not accept any further alteration of the live experience.

Contributing to social identity theory, a difference in game expectations has been highlighted between types of supporters which would suggest that lowly identified supporters expect more entertainment during games compared to highly identified supporters. Further research would need to be undertaken in order to analyse differences in supporters' expectations according to their level of identification and the role of components of the game in supporter satisfaction.

The present exploratory study is limited to Scottish supporters' perceptions, and the sample size has been limited to 270 supporters. Further research needs to be undertaken in other countries and with a larger sample size. Ideally this should also include other key stakeholders such as players, managers and referees. The time frame during which the study

has been undertaken (i.e. before the use of GLT at the 2014 World Cup) might also have impacted the results.

Implications can be highlighted for FIFA, sport competition organisers and other sport institutions such as International Sports Federations. FIFA has to understand that while it is imperative to award a goal being scored, reducing any part of a supporter's experience might lessen the satisfaction they derive from the game. Although decision-aid technology may be the answer for less controversy, the risk of reducing supporters' enjoyment is very much evident. Dissatisfied supporters may be less likely to attend matches[88]. Implementing match officials around the goal line can minimise poor refereeing decisions, and at the same time keep the atmosphere and debate valued by supporters.

Additionally, as noted by Collins[89] decision-aid technology leads to false transparency as it is less accurate than it appears. Sport spectators should be educated on how decisions are taken with the use of the technology which might bring back the debate for supporters at live events. Sport commentators could assume this educating role.

The balance between entertainment at games and use of the technology should be carefully managed as supporters do not favour GLT viewing at the stadium and do not favour future decision-aid technology, particularly moderate and highly identified supporters. Indeed, GLT viewing also plays a part in removing the atmosphere from contentious goal. It is unlikely that FIFA will in the near future go back on its decision to use GLT, and therefore care should be taken using decision-aid technology so that it does not take much more importance as compared to the game itself. Supporters' live experience in stadium should not be altered by technology moving closer to the experience one has at home watching a game at risk of dissatisfying supporters at live events.

Findings from this study are to some extent applicable to other sports that have seen the introduction of decision-aid technology such as Basketball, Cricket, Hockey, Rugby, and Tennis. Although International Federations of these sports recognise the importance of supporters at sport events, the latter are not consulted when these institutions consider the introduction of new rules. We recommend a clear and transparent consultative process of key stakeholders, including supporters, when considering changing rules that can alter supporters' experience of games.

Notes

1. Collins and Evans, *Public Understanding of Technology,* 135.

2. Bal and Dureja, *Hawk Eye*, 107; Collins, *Philosophy of Umpiring*, 135; Collins and Evans, *Public Understanding of Technology,* 135; Li, Lin, and Zhang, *Hawkeye and Football Development*, 44; Nlandu, *Goal-Line Technology in Soccer, 451*; Royce, *Refereeing and Technology–Reflections*, 53; Ryall, *Arguments against Goal-Line Technology, 439.*

3. Surujlal and Jordaan, Referees and technology in soccer, 245.

4. Collins and Evans, 2008, *Public Understanding of Technology,* 135.

5. Blatter, FIFA's position on technology. Source: https://dl.dropboxusercontent.com/u/1819534/FIFA.com%20-%20%20FIFA%E2%80%99s%20position%20on%20technology%20in%20football%20.htm (accessed January 7, 2014).

6. Ibid.

7. BBC Sport, Blatter on Disallowed Goal. Source: http://news.bbc.co.uk/sport1/hi/football/world_cup_2010/8771294.stm (accessed October 21, 2013).

8. FIFA, IFAB on goal-line technology, http://www.fifa.com/aboutfifa/organisation/ifab/media/news/newsid=1320761/ (accessed May 22, 2015).

9. FIFA, Goal-Line Technology. Source: http://quality.fifa.com/en/Goal-Line-Technology/ (accessed May 22, 2015).

10. BBC Sport, Confederations Cup. Source: http://www.bbc.co.uk/sport/0/football/22921076 (accessed October 21, 2013).

11. FIFA, Goal-Line Technology, http://quality.fifa.com/en/Goal-Line-Technology/

    (accessed May 22, 2015).

12. FIFA, IFAB on goal-line technology, http://www.fifa.com/aboutfifa/organisation/ifab/media/news/newsid=1320761/ (accessed May 22, 2015).

13. Blatter, FIFA's position on technology. Source: https://dl.dropboxusercontent.com/u/1819534/FIFA.com%20-%20%20FIFA%E2%80%99s%20position%20on%20technology%20in%20football%20.htm (accessed January 7, 2014).

14. Hunt, Bristol, and Bashaw, *Classifying Sports Fans*, 439.

15. Hogg, 'Social identity theory', 555; Turner, 'Redefinition of the social group', 15.

16. Albert, Ashforth, and Dutton, *Organizational identity and identification, 13*.

17. Haynes, The Football Imagination; Potter and Keene, *Sports Fan Identification,* 348.

18. Haynes, The Football Imagination

19. Hunt, Bristol, and Bashaw, *Classifying Sports Fans*, 439

20. Ibid.

21. Vallerand et al., *Passion and Sports Fans,* 1279.

22. Giulianotti*, Taxonomy of spectator identities, 25.*

23. Giulianotti*, Taxonomy of spectator identities, 25.*; Hunt, Bristol, and Bashaw, *Classifying Sports Fans*, 439; Vallerand et al., *Passion and Sports Fans,* 1279.

24. Giulianotti*, Taxonomy of spectator identities, 25.*

25. Brickson, *Identity orientation*, 82; Leeuwen, Quick, and Daniel, *Sport Spectator Satisfaction Model*, 99; Scott and Lane, *Organizational identity*, 43.

26. Trail and James, *Sport Consumption Motivation Scale*, 241.

27. Wann and Branscombe, *Sports Fans*, 1.

28. Fink and Parker, *Spectator Motives*, 210; Hoye and Lillis, *Travel Motivations of Fans*, 13; Woo et al., *Motives among football spectators*, 38.

29. Gayton, Coffin, and Hearns, *Sports Spectator Identification Scale*, 1137; Jones, *Football Fandom*, 123.

30. See Norris, Wann, and Zapalac, *Sport fan maximizing*, 157; Parry, Jones, and Wann, *Sport Fandom*, 251.

31. Wann and Branscombe, *Sports Fans*, 1.

32. Gayton, Coffin, and Hearns, *Sports Spectator Identification Scale*, 1137; Jones, *Football Fandom*, 123.

33. Hogg, 'Social identity theory', 555; Turner, 'Redefinition of the social group', 15.

34. McCollough, Berry, and Yadav, *Customer satisfaction*, 121; Patterson, Expectations and product performance, 449.

35. Leeuwen, Quick, and Daniel, *Sport Spectator Satisfaction Model*, 99

36. Ibid.

37. Dietz-Uhler and Murrell, Fan Reactions to Game Outcomes, 15.

38. Leeuwen, Quick, and Daniel, *Sport Spectator Satisfaction Model*, 99

39. Dietz-Uhler and Murrell, Fan Reactions to Game Outcomes, 15.

40. Leeuwen, Quick, and Daniel, *Sport Spectator Satisfaction Model*, 99

41. Ibid.

42. Charleston, *Determinants of Home Atmosphere*, 1150; Uhrich and Benkenstein, *Sport Stadium Atmosphere*, 211; Yoshida and James, *Customer Satisfaction with Game*, 338.

43. Charleston, *Determinants of Home Atmosphere*, 1150.

44. Uhrich and Benkenstein, *Sport Stadium Atmosphere*, 211

45. Ibid

46. FIFA, 'Keeping Football Human', 17.

47. Ibid

48. Li, Lin, and Zhang, *Hawkeye and Football Development*, 44; Singh, *Level Playing Field*, 81.

49. Ross, Sport Technology; Stone, *Football in Everyday Life*, 169.

50. Madrigal, *Satisfaction with Sporting Event*, 205.

51. Li, Lin, and Zhang, *Hawkeye and Football Development*, 44; Collins, *Philosophy of Umpiring*, 135.

52. Ryall, *Arguments against Goal-Line Technology, 439;* Nlandu, *Goal-Line Technology in Soccer, 451.*

53. Collins, *Philosophy of Umpiring*, 135.

54. Ryall, *Arguments against Goal-Line Technology, 439.*

55. Collins and Evans, 2008, *Public Understanding of Technology,* 135.

56. BBC Sport, 2014

57. Cairns, 2015, *The hybridization of sight in sport*, 745.

58. Ross, Sport Technology; Gillis (2001)

59. Bal and Dureja, *Hawk Eye*, 107

60. BBC Sport, 2016

61. by Football Fans Census, Goal Line Technology. Source: http://www.footballfanscensus.com/FCBgoallinetech.pdf (accessed September 17, 2013); YouGov, Goal Line Technology. Source: http://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/n8btkavhir/YG-Archive-210612-football-goal-line-technology.pdf (accessed October 18, 2013).

62. Hattrick Global Football Voice, Global Football Survey. Source: http://www.sportindustry.biz/news/view/11194/over-half-of-england-fans-favour-goal-line-tech (accessed October 4, 2013).

63. UEFA, UEFA backs Infantino for FIFA presidency. Source: http://www.uefa.org/mediaservices/newsid=2325766.html (accessed May 2, 2016).

64. FIFA, GLT replays. Source: http://quality.fifa.com/en/Goal-Line-Technology/Install-goal-line-technology/Replays (accessed May 2, 2016).

65. Gob, McCollin and Ramalhoto, *Likert Scales*, 601.

66. Wann and Branscombe, *Sports Fans*, 1.

67. Hu and Bentler, 'Covariance structure analysis', 1; Kline, Structural Equation Modeling.

68. Ibid.

69. FIFA, 'Keeping Football Human', 17.

70. Singh, *Level Playing Field*, 81.

71. Cairns, *The hybridization of sight in sport*, 745; Li, Lin, and Zhang, *Hawkeye and Football Development*, 44; Stone, *Football in Everyday Life*, 169; Uhrich and Benkenstein, *Sport Stadium Atmosphere*, 211; Ross, Sport Technology.

72. Nlandu, *Goal-Line Technology in Soccer, 451.*

73. Collins and Evans, 2008, *Public Understanding of Technology,* 135.

74. Hogg, 'Social identity theory', 555; Turner, 'Redefinition of the social group', 15.

75. Dietz-Uhler and Murrell, Fan Reactions to Game Outcomes, 15.

76. Leeuwen, Quick, and Daniel, *Sport Spectator Satisfaction Model*, 99; Ross, Sport Technology; Stone, *Football in Everyday Life*, 169.

77. Dietz-Uhler and Murrell, Fan Reactions to Game Outcomes, 15.

78. Ibid.

79. Giulianotti*, Taxonomy of spectator identities, 25.*

80. Collins and Evans, *Public Understanding of Technology,* 135.

81. Cairns, *The hybridization of sight in sport*, 745

82. Ryall, *Arguments against Goal-Line Technology, 439.*

83. Ibid.

84. Uhrich and Benkenstein, *Sport Stadium Atmosphere*, 211; Collins, *Philosophy of Umpiring*, 135

85. Platini, 'GLT at Euro 2016'. Source: http://www.football.co.uk/fifa/platini-may-use-glt-at-euro-2016/4514515/#ejdTdRDMUqFc4c83.97 (accessed May 1, 2015); UEFA, UEFA backs Infantino for FIFA presidency. Source: http://www.uefa.org/mediaservices/newsid=2325766.html (accessed May 2, 2016).

86. Collins, *Philosophy of Umpiring*, 135.

87. Ibid.

88. Madrigal, *Satisfaction with Sporting Event*, 205.

89. Collins, *Philosophy of Umpiring*, 135.

Bibliography

Albert, S., Ashforth, B.E., and Dutton, J.E. "Organizational identity and identification: Charting new waters and building new bridges." *Academy of Management Review, 25* (2000): 13–17.

Bal, B., and Dureja, G. "Hawk Eye: A Logical Innovative Technology Use in Sports for Effective Decision Making". *Sport Science Review*, *15* (2012): 107-119.

BBC. "Goal-line technology Q&A", BBC website. http://www.bbc.co.uk/sport/0/football/17725886 (accessed June 1, 2015).

BBC Sport. "Blatter Apologises for Disallowed Goal", BBC Sport website. http://news.bbc.co.uk/sport1/hi/football/world_cup_2010/8771294.stm (accessed on January 21, 2013).

BBC Sport. "Confederations Cup: Goal-Line Technology ready for use", BBC Sport website, http://www.bbc.co.uk/sport/0/football/22921076 (accessed October 21, 2013).

BBC Sport. "Gianni Infantino: Video referees 'to be used at 2018 World Cup'", BBC Sport website, http://www.bbc.co.uk/sport/football/36085289 (accessed May 2, 2016)

BBC sport. "World Cup 2014: Goalline technology TV process reviewed", BBC Sport website, http://www.bbc.com/sport/0/football/27864393 (accessed December 31, 2014).

Blatter, S. "FIFA's position on technology in football", FIFA.com, 11 March. Available at https://dl.dropboxusercontent.com/u/1819534/FIFA.com%20-

%20%20FIFA%E2%80%99s%20position%20on%20technology%20in%20football%20.
htm (accessed on January 1, 2014).

Brickson, S. "The impact of identity orientation on individual and organizational outcomes in demographically diverse settings." *Academy of Management Review, 25* (2000): 82–101.

Cairns, G. "The hybridization of sight in the hybrid architecture of sport: the effects of television on stadia and spectatorship." *Sport in Society*, *18* (2015): 734-749.

Carifio, J., and Perla, R. "Resolving the 50-year Debate Around Using and Misusing Likert Scales." *Medical Education, 42* (2008): 1150-1152.

Charleston, S. "Determinants of Home Atmosphere in English Football: A Committed Supporter Perspective." *Journal of Sport Behaviour, 31* (2008): 312-328.

Collins, H. "The Philosophy of Umpiring and the Introduction of Decision-Aid Technology." *Journal of the Philosophy of Sport*, *37* (2010):135-146.

Collins, H., and Evans, R. "You cannot be Serious! Public Understanding of Technology with Special Reference to Hawk-Eye." *Public Understanding of Science*, *17* (2008): 283-308.

Dietz-Uhler, B., and Murrell, A. "Examining Fan Reactions to Game Outcomes: a Longitudinal Study of Social Identity." *Journal of Sport Behaviour*, *22* (1999): 15-27.

FIFA 'Keeping Football Human' *FIFA World,* 1, num. 10 (2010): 14-20.

FIFA "IFAB agrees to re-examine goal-line technology."

http://www.fifa.com/aboutfifa/organisation/ifab/media/news/newsid=1320761/ (accessed May 22, 2015).

FIFA "Goal-Line Technology." http://quality.fifa.com/en/Goal-Line-Technology/ (accessed May 22, 2015).

FIFA "Goal Line Technology replays." http://quality.fifa.com/en/Goal-Line-Technology/Install-goal-line-technology/Replays (accessed May 2, 2016).

Fink, J. S., and Parker, H. M. "Spectator Motives: Why do we watch when our Favourite Team is not Playing?" *Sport Marketing Quarterly*, *18* (2009): 210-218.

Football Fans Census "Goal Line Technology." Football Fans Census website,

    http://www.footballfanscensus.com/FCBgoallinetech.pdf (accessed September 17, 2013).

Gayton, W. F., Coffin, J. L., and Hearns, J. "Further Validation of the Sports Spectator

    Identification Scale." *Journal of Sport Psychology*, *87* (1998): 1137 -1138.

Gillis, R. "Time for the Umpire to Strike back: Richard Gillis asks if the Debate on

    Technology as an Aid to On-Field Decision Making has Shifted from "could we?" to

    "should we?"" *Sports Business International*, Vol. 1, No. 64 (2001): pp. 38-39.

Giulianotti, R. "Supporters, followers, fans, and flaneurs A taxonomy of spectator identities

    in football." *Journal of Sport & Social Issues*, *26* (2002): 25-46.

Gob, R., McCollin, C., and Ramalhoto, F. M. "Ordinal Methodology in the Analysis of

    Likert Scales." *Quality and Quantity, 41* (2007): 601-626.

Hattrick Global Football Voice "Global Football Survey- Goal Line Technology", Hattrick

    Global Football Voice website, http://www.sportindustry.biz/news/view/11194/over-

    half-of-england-fans-favour-goal-line-tech (accessed October 4, 2013).

Haynes, R. *The Football Imagination: the Rise of Football Fanzine Culture,* U.S.A: New

    York Press, 1995.

Hogg, M.A. "Social identity theory." In A.S.R. Manstead and M. Hewstone (Eds.), *The

    Blackwell encyclopedia of social psychology* (pp. 555–560). Oxford, England:

    Blackwell, 1995.

Hoye, R., and Lillis, K. "Travel Motivations of Australian Football League Fans: an

    Exploratory Study." *Managing Leisure*, *13* (2008): 13-20.

Hu, L. T., and Bentler, P. M. "Cutoff criteria for fit indexes in covariance structure analysis:

    Conventional criteria versus new alternatives." *Structural Equation Modeling: A

    Multidisciplinary Journal*, *6* (1999): 1-55.

Hunt, K. H., Bristol, T., and Bashaw, R. E. "A Conceptual Approach to Classifying Sports Fans." *Journal of Services Marketing, 13* (1999): 439-542.

Jones, I. "Football Fandom: Football Fan Identity and Identification at Luton Town Football Club." *Journal of Sport Marketing, 12* (1998): 123-135.

Kline, R. B. *Principles and Practice of Structural Equation Modeling* (3rd Ed). New York: NY: The Guilford Press, 2011.

Leeuwen, V. L., Quick, S., and Daniel, K. "The Sport Spectator Satisfaction Model: A Conceptual Framework for Understanding the Satisfaction of Spectators." *Sport management Review, 5* (2002): 99-128.

Li, Z.Z., Lin, B.P., and Zhang, Z. "Influence of Hawkeye System on Football Development." *Journal of Guangzhou Physical Education Institute*, *1* (2011): 44-65.

Madrigal, R. "Cognitive and Affect Determinants of Fan Satisfaction with Sporting Event Attendance." *Journal of Leisure Research, 27* (1995): 205-227.

McCollough, M.A., Berry, L.L., and Yadav, M.S. "An empirical investigation of customer satisfaction after service failure and recovery." *Journal of Service Research, 3* (2000): 121–137.

Nlandu, T. "The Fallacies of the Assumptions Behind the Arguments for Goal-Line Technology in Soccer." *Sports, Ethics and Philosophy*, *6* (2012): 451-466.

Norris, J. I., Wann, D. L., and Zapalac, R. K. "Sport fan maximizing: following the best team or being the best fan?" *Journal of Consumer Marketing*, *32* (2015): 157-166.

Parry, K. D., Jones, I., and Wann, D. L. "An Examination of Sport Fandom in the United Kingdom: A Comparative Analysis of Fan Behaviors, Socialization Processes, and Team Identification." *Journal of Sport Behavior*, *37* (2014): 251-267.

Patterson, P.G. "Expectations and product performance as determinants of satisfaction for a high-involvement purchase." *Psychology and Marketing, 10* (1993): 449–465.

Platini, M. "Platini 'may use GLT at Euro 2016'" http://www.football.co.uk/fifa/platini-may-use-glt-at-euro-2016/4514515/#ejdTdRDMUqFc4c83.97 (accessed May 1, 2015).

Potter, R.F., and Keene, J.R. "Effect of Sports Fan Identification on the Cognitive Processing of Sports News." *International Journal of Sport Communication, 5* (2012): 348-367.

Rice, W. R. "Analysing Tables of Statistical Tests." *Journal of Evolution,* 43 (1989): 201-223.

Ross, S. *Sport Technology*, London: Evan Brothers, 2010.

Royce, R. "Refereeing and Technology–Reflections on Collins' Proposals." *Journal of the Philosophy of Sport*, *39* (2012): 53-64.

Ryall, E. "Are there any Good Arguments against Goal Line Technology?" *Journal of Sport, Ethics and Philosophy*, *6* (2012): 439-450.

Scott, S.G., and Lane, V.R. "A stakeholder approach to organizational identity." *Academy of Management Review, 25* (2000): 43–62.

Singh, H. "In Search of a Level Playing Field: Rules, Morals and the Jurisprudence of Sport." *International Journal of Sport and Society*, *3* (2012): 81-100.

Stone, C. "The Role of Football in Everyday Life." *Soccer and Society*, *8* (2007): 169-184.

Surujlal, J., and Jordaan, D. B. "Goal line technology in soccer: are referees ready for technology in decision making?: technology and innovation." *African Journal for Physical Health Education, Recreation and Dance*, *19* (2013): 245-257.

Trail, G. T. and James, J. "Motivation Scale for Sport Consumption: Assessment of the Scale's Psychometric Properties." *Journal of Sport Behaviour, 24* (2001): 241-256.

Turner, J.C. "Towards a cognitive redefinition of the social group." In H. Tajfel (Ed.), Social identity and intergroup relations (pp. 15–40). London, England: Cambridge University Press, 1982.

UEFA "UEFA Executive Committee unanimously backs Gianni Infantino for FIFA presidency." http://www.uefa.org/mediaservices/newsid=2325766.html (accessed May 2, 2016).

Uhrich, S., and Benkenstein, M. "Sport Stadium Atmosphere: Formative and Reflective Indicators for Operationalizing the Construct." *Journal of Sport Management*, *24* (2010) : 211-237.

Vallerand, R. J., Ntoumanis, N., Philippe, F. L., Lavigne, G. L. Carbonneau, N., Bonneville, A., Lagace, C., et al. "On Passion and Sports Fans: A look at Football." *Journal of Sport Sciences*, *26* (2008): 1279-1287.

Wann, D. L., and Branscombe, N. R. "Sports Fans: Measuring Degree of Identification with the Team." *International Journal of Sport Psychology, 24* (1993): 1-17.

Woo, B., Trail, G. T., Kwon, H. H., and Anderson, D. "Testing Models of Motives and Points of Attachment among Spectators in College Football." *Sport Marketing Quarterly, 18* (2009): 38-41.

Yoshida, M., and James, J. D. "Customer Satisfaction with Game and Service Experiences: Antecedents and Consequences." *Journal of Sport management, 24* (2010): 338-361.

YouGov "What the World Thinks- Goal Line Technology", YouGov website, http://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/n8btkavhir/YG-Archive-210612-football-goal-line-technology.pdf (accessed October 18, 2013).

Table 1: Profile of the Respondents (N=270).

	Frequency	Percent
Gender		
Male	193	71.5
Female	77	28.5
Age		
18-25	48	17.8
26-33	60	22.2
34-41	52	19.3
42-49	41	15.2
50-59	29	10.7
60-69	27	10.0
70+	13	4.8
Number of years supporting the favourite team		
Up to 10	28	10.4
11-20	93	34.4
21-30	82	30.4
31-40	49	18.1
41+	18	6.7
Membership with the favorite team		
Yes	148	54.8
No	122	45.2
Number of time a season watch the favorite team at the stadium		
None	31	11.5
1- 5	89	33.0
6-10	57	21.1
11-15	47	17.4
16+	46	17.0

Table 2: Confirmatory Factor Analysis of the fan identification model on 7pt Likert scale (N = 270)

	Factor Loadings	Cronbach's alpha	Mean	SD
Fan identification model		.91	4.09	1.48
I am very interested in what others think about my football team	.82			
The football team's successes are my successes	.81			
When someone praises my football team, it feels like a personal compliment	.80			
When someone criticizes my football team, it feels like an insult	.77			
I wear my sports teams clothing as much as possible	.74			
I strongly dislike my team's rivals	.69			
If a story in the media criticized my football team, I would feel embarrassed	.69			

Note. All factor loadings are statistically significant (p<.001).
Model fit indices (CFA): χ^2/df= 1.6 ; CFI= .994 ; RMSEA= .047

Table 3: Fan identification type (N=270).

	Frequency	Percent
Lowly identified supporters (3 or fewer)	62	23
Moderate identified supporters (between 3 and 5)	142	52.6
Highly identified supporters (5 or higher)	66	24.4

Note: Fan identification scale is measured on a 7pt Likert scale

Table 4: Supporters' perceptions (%) on Goal Line Technology (GLT) (N = 270)

	Yes	*No*	*DNK*
GLT is accurate?	93	1.5	5.6
Trust referees to use GLT properly?	74.4	18.1	7.4
Trust referees to make correct decision using GLT?	88.5	5.2	6.3
In favour of GLT?	66.3	30	3.7

Table 5: Exploratory factor analysis (PCA) and factors' mean (N = 270)

	Range of items' factor loadings	Cronbach's alpha	Mean	SD
Satisfaction with GLT (5 items)	.84 - .87	.97	3.62	1.66
Enjoyment from referee's error (5 items)	.85 - .90	.94	3.95	1.23
Atmosphere enhanced by contentious goal (4 items)	.80 - .84	.96	4.34	1.41
Enjoyment from debate (5 items)	.82 - .85	.98	4.74	1.58
GLT viewing in the stadium (5 items)	.88 - .92	.95	3.41	1.36
Future decision-aid technology (4 items)	.90 - .93	.95	3.00	1.45

Note. Extraction Method: Principal Component Analysis (PCA)
Rotation Method: Varimax with Kaiser Normalization (Rotation converged in 6 iterations)
87.3% of variance is explained
GLT: Goal Line Technology

Table 6: Correlational analysis between variables (N = 270)

	D1	D2	D3	D4	D5
D1: Satisfaction with GLT					
D2: Enjoyment from referee's error	-.28**				
D3: Atmosphere enhanced by contentious goal	-.57**	.49**			
D4: Enjoyment from debate	-.74**	.27**	.57**		
D5: GLT viewing in the stadium	.19**	-.08	-.11	-.23**	
D6: Future decision-aid technology	.18**	-.03	-.12	-.27**	.27**

*** $p<.01$*

Table 7: Results of the ANOVAs

	Enjoyment from referee's error		GLT viewing in the stadium		Future decision-aid technology	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Lowly identified supporters	4.45	1.34	3.75 [a]	1.37	3.47	1.78
Moderate identified supporters	3.75[a]	1.18	3.37 [a,b]	1.37	2.91 [a]	1.32
Highly identified supporters	3.90 [a]	1.13	3.18 [b]	1.36	2.75 [a]	1.28
Significance level	*		*		*	
Total	3.95	1.23	3.41	1.36	3.00	1.45

Note. *SD*: Standard deviation
[a] and [b] indicate the result of a Tukey's post-hoc test.
Clusters with the same letter in superscript do not significantly differ.
* $p<.05$

Table 8: Hierarchical multiple regression (n=270) predicting football supporters satisfaction towards Goal Line Technology from referee's error, atmosphere and debate.

Predictor variables	Model 1	Model 2	Model 3
Gender	-.01	-.03	-.01
Age	-.05	-.06	.05
Years supporters		.01	.001
Membership with team		.02	.08
Frequency watching at the stadium		.01	-.002
Enjoyment from referee's error			-.02
Atmosphere enhanced by contentious goal			-.25***
Enjoyment from debate			-.65***
R^2	.00	.01	.58
R^2 change	.00	.01	.57
Significance of F Change	.96	.72	<.001

*** $p<.001$