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Message personalization and real-time adaptation as next innovations in sport sponsorship management? How run-of-play and team affiliation affect viewer response

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A B S T R A C T

The digitization of sports content and technological innovations in sports media offer disruptive new ways to adapt sponsor messages to real-time events during live broadcasts. To date, sponsorship management mostly ignores the run-of-play and viewers' team affiliation. This paper seeks to demonstrate how a dynamic management approach can contribute to greater sponsor message efficiency. For this purpose, real-time data were collected during live broadcasts of the 2018 soccer World Cup. Arousal was captured using changes in heart rate, attention to sponsor brands was measured via eye tracking, and in-play betting odds were continuously obtained from a sports betting website. Mixed models predict viewer arousal and sponsor brand attention from biometric and betting data. Evidence is provided for how run-of-play and viewer characteristics affect sponsor message communication outcomes. The applicability of the models for distinctive sponsor exposure tactics is demonstrated, and the theoretical and managerial implications are outlined.

1. Introduction

Over the last two decades, sponsorship has become a major marketing communication tool and a significant market with a global volume of $62.7 billion in 2017. With approximately 70% of that spending dedicated to sponsorships in the sports sector (IEG, 2018), expenditures for sports sponsorship alone were estimated to amount to over $46 billion globally in 2019 before this growth was abruptly halted by the outbreak of the Covid-19 pandemic in 2020 (Two Circles, 2020). Given its subliminal, 'below-the-line' mode of communication, sponsorship tackles the challenges of today's consumer targeting in information-overloaded environments. In addition, marketing managers are calling for reliable approaches to solve the return on investment (ROI) and return on objective (ROO) puzzles (Jensen & White, 2018).

From its very beginning, sponsorship has been an area of creative and technological innovations. However, despite its innovative power, sponsorship still suffers from inflexible management approaches. More precisely, the location and content of sponsor messages are fixed *before* a game starts. Since sport games are full of unpredictable events that are likely to impact communication efficiency, dynamic management approaches should consider the run-of-play of a game and relevant viewer characteristics such as team affiliation.

The digitization of sports content and technological innovations in sports media offer disruptive new ways in which sponsor messages can be adapted to real-time events during a game. Since almost all major sport venues are equipped with LED perimeter boards, the technological prerequisites for real-time adaptations are already in place. In addition, the growing availability of real-time match data provides completely new analytical opportunities for dynamic modeling.

As a major innovation in the sponsorship area, the digital overlay technique allows sponsor messages to be adapted to TV audiences in different territories and is likely to soon allow personalized sponsor messages (Rumpf & Breuer, 2016). Briefly, digital overlays are virtual inserts in live broadcasts that replace the on-site messages on perimeter boards. In this way, sponsors can present different messages to different geographical markets at the same time to reflect the different strategies in these markets and to address different audiences effectively without increasing the amount or size of sponsor signage. Combined with individual consumer data (e.g., team affiliation), personalized sponsor messages and real-time adjustments of sponsor exposure seem to be technically feasible. However, to exploit such new opportunities, deeper knowledge on how the mediated sports content affects sponsor message processing is needed.

Against this backdrop, this paper aims to show how a dynamic management approach can contribute to higher sponsorship efficiency, such as by adjusting the exposure of sponsor messages to run-of-play and viewer characteristics. This paper further expands our understanding of sponsorship effectiveness by examining to what degree match-related

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variables influence viewers' responses to sponsor messages over the course of live sport broadcasts.

Viewer responses to sponsorship are shaped by sponsor messages' unique capability to present brands to consumers in appealing and emotionally charged environments such as exciting sport events (Bal, Quester, & Plewa, 2010). Importantly, the formation of outcomes such as sponsor brand attitudes has been shown to be influenced by sport viewers' emotional responses and event-related emotions (e.g., Bal et al., 2010; Boronczyk & Breuer, 2020). Additionally, any processing of sponsor information and subsequent outcomes such as brand recall requires sponsor messages to attract viewers' visual attention (e.g., Breuer & Rumpf, 2012). Therefore, for the purpose of this study, viewer response is conceptualized in two ways: first, as the degree of emotional arousal elicited by the broadcast; and second, as visual attention directed at sponsor signage.

The remainder of the paper is structured as follows. The next section summarizes the theoretical rationale for the study's framework focusing on the interplay between run-of-play and sport viewer arousal, the impact of run-of-play on attention to sponsor messages, and the capabilities of message personalization and real-time adaptation in sponsorship management. This is followed by the empirical methodology and then the results of the quantitative analysis. The discussion section is built around the key findings followed by the implications, limitations, and avenues for future research.

2. Theoretical framework

2.1. Interplay between run-of-play and sport viewer arousal

Watching sports competitions is well known to create internal states of arousal that grow if the sport teams involved are relevant to viewers (Olsen, 2010). Given the availability of large screen televisions with high picture quality and even three-dimensional viewing, the experience of watching sports at home is increasingly more aligned to the on-site situation (Rowe, 2014). Hence, mediated sports content – particularly live broadcasts of personally important sport events – can cause high levels of viewer arousal (Kim, Magnusen, & Lee, 2017).

The degree of arousal that sport viewers experience is further associated with the uncertainty of the game outcome (Carrillat, d'Astous, Bellavance, & Eid, 2015; Knobloch-Westerwick, David, Eastin, Tamborini, & Greenwood, 2009). The so-called 'uncertainty-of-outcome hypothesis' has attracted considerable scientific attention in the sport economics literature with a focus on spectator demand (for a review, see Borland & MacDonald, 2003). Very few studies, however, have analyzed intragame variations in demand. In this regard, Mutz and Wahnschaffe (2016) provide evidence that viewership directly responds to run-of-play in the sense that the TV audience grows as long as the outcome of the game is highly uncertain.

Tracking TV audience ratings can serve as an indicator of outcome uncertainty and thus suspense. Furthermore, the extraction of biometric features can help to capture viewers' emotional state in real time. Since emotional states fluctuate over the course of a game, it would be interesting to predict the impact of the run-of-play on the sport viewers' arousal. By considering the run-of-play, brands could match their sponsorship exposure with predictably high levels of viewer arousal. This approach would be effective for brands aiming for emotionally charged communication. Thus, we formulate the first research question:

RQ 1: How does the run-of-play affect sport viewer arousal?

2.2. Impact of run-of-play on attention to sponsor messages

Over the last two decades, the construct of attention has gained importance in marketing research (Orquin & Wedel, 2020; Romaniuk & Nguyen, 2017). Visual attention is defined as the allocation of an individual's processing capacities to stimuli in their visual field (Bundesen, Habekost, & Kyllingsbæk, 2005). Individuals must employ attention as a coping mechanism within information-rich environments (Isaacowitz, 2006).

In the marketing literature, there is solid evidence that consumers' visual attention facilitates downstream processes such as brand consideration (Pieters & Warlop, 1999), brand preference (Janiszewski, Kuo, & Tavassoli, 2013), and purchase decision making (Chandon, Morwitz, & Reinartz, 2005). Similarly, various scientific contributions from the sponsorship literature have provided evidence that attention plays an important role in the formation of consumer responses. Studies show that viewer attention to sponsor signage that is visible during sport broadcasts contributes to important outcomes such as brand recall, emotionalization, or choice (e.g., Breuer & Rumpf, 2012; Rumpf & Breuer, 2018). Hence, viewer attention to sponsor brands can be used as a valid indicator of sponsor message effectiveness.

Research on sponsorship effectiveness has identified important drivers of attention including media exposure variables such as duration, size and clutter (Rumpf, Breuer & Boronczyk, 2020) and saliency factors such as the color or animation of sponsor messages (Breuer & Rumpf, 2015). Importantly, using manipulated highlight clips, previous research also showed that sponsor brands were less likely to attract viewer attention during exciting sport broadcasts compared to less exciting broadcasts (Rumpf, Noel, Breuer, & Memmert, 2015). The perceptual load might be greater in more exciting scenes than in less exciting scenes, which could result in a lower probability of brand information being picked up. Surprisingly, little is known, however, about how the run-of-play changes viewers' allocation of attention over the course of a game. Thus, we formulate the second research question:

RQ 2: To what degree does the run-of-play influence attention to sponsor brands?

2.3. Message personalization and real-time adaption in sponsorship management

It is well known from psychological research that matching messages with recipients' personality profiles facilitates the persuasion process (Hirsh, Kang, & Bodenhausen, 2012). Findings from advertising research have shown that personalized brand communication has positive effects on attitude formation and behavioral intentions (e.g., Deng, Tan, Wang, & Pan, 2019; Orazi & Nyilasy, 2019). Given the availability of big data and the huge trend of watching sports via online streaming platforms, it seems technically feasible to tailor sponsor messages to both viewers' dispositions and the game context. For example, a brand could present distinct sponsor messages at different times to soccer fans who support opposing teams. However, sponsor messages remain non-personalized as to date, all viewers are exposed to identical sponsor messages while watching sport broadcasts. This neglect is likely to cause inefficiencies.

Notably, Kim et al. (2017) offer evidence that the performance of sports viewers' favorite teams is an important predictor of sport viewers' emotions. Feelings-as-information theory (Schwarz, 1990) suggests that consumers unknowingly tend to attribute their emotional state or the feelings that they experience to contextual stimuli, which do not necessarily need to be the source of their feelings. Indeed, consumers appear to rely on the emotions elicited by contextual stimuli such as the sponsored event when evaluating sponsors and forming brand attitudes (Bal et al., 2010; Boronczyk & Breuer, 2020). Therefore, sponsors that seek to build their brand through sponsorship could see varying effects, depending on viewers' team affiliations and their ensuing emotional reaction.

Furthermore, the two-component framework of attention (Itti & Koch, 2000; Treisman & Gelade, 1980) can be used to explain how viewer characteristics may determine visual attention to sponsor signage. According to this framework, attention can be the result of a bottom-up (i.e., automatic) or a top-down (i.e., controlled) mechanism (Pieters & Wedel, 2004). The bottom-up mechanism automatically guides attention to objects based on factors such as their saliency whereas the viewer can allocate top-down attention in a more deliberate manner based on, for example, the relevance of an element within a stimulus (Parkhurst, Law, & Niebur, 2002). When applied to sponsor messages that are visible during a sport broadcast, viewer identification with a team could act as such a top-down characteristic that determines how relevant the sponsor information is perceived and thereby result in more or less controlled attention to the element (Potter & Keene, 2012). Using eye tracking data to examine attention to digital inserts in sport broadcasts, Cummins, Gong and Kim (2016) indeed show that the efficiency of message processing changes with viewers' interest in the sport competition.

In summary, viewers' dispositions towards the teams involved and whether they are losing or winning may well influence the potential of a sponsor message to emotionalize the brands or attract visual attention. Against this background, it would be interesting to better understand the role of team affiliation as a determinant of sport viewer arousal and sponsor brand attention:

RQ 3: How does the consideration of team affiliation change viewer response?

By adapting communication messages to viewers' situations, the effectiveness of the messages can be significantly enhanced (e.g., Gardner, 1985). Nevertheless, the sponsorship literature still lacks knowledge on the correct timing to deliver sponsor messages most effectively. This is partly due to the dominance of self-reported measures, which suffer from the time lag between the moment of perceiving a message *during* a game and the reporting about the perception of the message *after* the game in the form of a survey. In response to this shortcoming, biometric approaches have the capacity to track a test person's changing state in real time (Orazi & Nyilasy, 2019).

In an eye tracking study, Pieters, Rosbergen, and Wedel (1999) reveal that viewer attention towards ads decreases significantly from the first to the third exposure, a phenomenon called attention wear-out. Over the course of a game, viewers are exposed repeatedly to the same sponsor messages. Whereas sponsor messages might benefit from a novelty effect early in a game, attention to sponsors can be assumed to diminish over time (Lardinoit & Derbaix, 2001). Sport viewer arousal might change in the opposite direction since the level of excitement increases when the game is about to be decided. Therefore, the fourth research question addresses the time effect in sponsorship management:

RQ 4: How much does the viewer response change with playing time?

3. Methodology

3.1. Research design

A lab study was conducted to answer the research questions at hand. Highly involved soccer fans were exposed to soccer live broadcasts. Arousal was captured through changes in heart rate, attention to sponsor brands was measured via eye tracking, and match data were obtained from a sports betting website. In the remainder of this section, the methodological details of the stimulus material, participant selection, measurements, study procedure, and data analysis will be provided.

3.2. Stimulus material

Live broadcasts of the 2018 soccer World Cup served as stimulus material since this event provided clear sponsor visibility and was expected to create intense emotions among fans. Sponsor messages were presented in a predefined order on the LED perimeter board. While high-tier sponsors appeared exclusively, low-tier sponsors shared the perimeter board with another sponsor message (i.e., two brands were visible side by side). During the regular playing time, the LED board shifted every 30 s from one board configuration to another. During overtime, all sponsor brands were presented simultaneously, which created a significantly different appearance. Therefore, the data collection was limited to the regular playing time (i.e., 90 min).

3.3. Participants

Twelve international students who were enrolled in sport science programs and indicated high interest in the 2018 soccer World Cup were recruited. Participants' level of involvement was further increased by assigning them games of their favorite national team, which in most cases was their home country. Due to problems with accurately tracking the gaze direction, one participant was excluded from the analysis, which led to a smaller final sample size ($n = 11$). The final data set included one case for each participant ($n = 11$) and a 30-s time slot (based on the shifting LED board configuration) during the regular playing time (90 min). In other words, the data contained 11 clusters (i.e., valid subjects) with 180 observations each, leading to 1,980 cases in total. All participants provided written consent prior to the experiment, were treated in accordance with the local institution's ethical guidelines, and reported normal or corrected-to-normal vision.

3.4. Measurements

In-play betting odds served as an objective indicator of the run-of-play while real-time biometric measures captured dynamic changes in viewer response. All data were collected in real time during live soccer broadcasts.

3.4.1. Measures of run-of-play

So-called live or in-play betting odds are updated continuously over the course of a match and immediately reflect changes in the win probabilities of the teams. An algorithm was programmed to automatically request the data second-by-second from a leading online bookmaker that provided decimal odds (also known as European odds).

In the sport economics literature, betting odds have been used as a proxy of outcome uncertainty (Borland & MacDonald, 2003). In-play betting odds reflect factors influencing the outcome of a game on a real-time basis and thus provide information on how 'closely fought' a game is. The absolute distance between the team odds (so-called 'odds differential') served as a measure of game outcome uncertainty, with smaller values indicating higher degrees of outcome uncertainty.

Furthermore, to analyze the role of team affiliation in addition to overall outcome uncertainty, the win probability of the participant's favorite team was continuously tracked and added as the additional variable 'favorite team odds'. Smaller values of this variable represent a greater probability that the participant's favorite team would win the game, and vice versa. In addition, the bookmakers make match event data such as goals, shots on and off the target, ball possession, player position, yellow and red cards, injuries, substitutions, etc. available. For the purpose of this study, we focus on the in-play odds and the playing time to predict viewer arousal and sponsor brand attention.

3.4.2. Measures of viewer response

An optical pulse signal was captured to estimate the participant's heart rate using the Shimmer 3 GSR + ear clip with a Bluetooth 4.0 connection. The heart rate is controlled by the autonomous nervous system with the sympathetic part accelerating and the parasympathetic part slowing the heart's activity. Hence, the heart rate can reflect the current state of arousal (e.g., Fowles, 1980).

Since heart rate is largely associated with individual differences, the raw data were transformed into a mean-centered variable called 'heart rate change'. This was performed by subtracting the individual mean from the absolute (i.e., raw) value (see Iacobucci, Schneider, Popovich, & Bakamitsos, 2016 for a review). Thus, negative values indicate below-average heart rates, and positive values indicate a test person's above-average values.

Following the basic tenets of attention-based marketing research (Orquin & Wedel, 2020; Pieters & Wedel, 2007), eye tracking provides valuable insights into the effectiveness of marketing communication. Accordingly, an eye tracking approach was used to measure the attentional response to sponsorship stimuli. An infrared eye tracking device (SMI REDn, 60 Hz) was used to measure the participant's visual attention to sponsor messages appearing on screen. The eye tracking device was connected via USB 3.0 to a Windows 8 computer (i5, 16 GB RAM) running the iViewRED recording software. A 9-point calibration with subsequent validation was performed until both the x and y deviations were below 0.5 deg.

Data synchronization and analysis were conducted using the iMotions screen-based eye tracking module. All visible sponsor messages on the perimeter boards were detected and marked as so-called areas of interest. By matching the participant's fixations (fixation filter = 100 ms) with these areas of interest in each time frame, the algorithm was able to determine the duration of gaze hits on the sponsor brand (so-called 'glance duration') as a measure of visual attention (Duchowski, 2007).

3.5. Procedure

The study took place in a quiet room equipped with a 42-in TV screen, an armchair and an operator desk. Participants sat in the armchair and were offered water or noncaffeinated soft drinks in an attempt to create a close-to-realistic and relaxing atmosphere. After briefing the participant about the general procedure, the eye tracking device was adjusted and calibrated. Except for the halftime break, the participant remained seated over the course of the game.

3.6. Data analysis

While the biometric variables (i.e., 'heart rate change' and 'glance duration') were tracked at relatively high frequencies (128 Hz and 60 Hz, respectively), the betting data (i.e., 'odds differential' and 'favorite team odds') were measured only once per second. Before merging the different data sources, the original cases were pooled based on the LED board configuration that shifted every 30 s. In other words, grouped cases were created by aggregating data from each time slot. For this purpose, mean values were computed for 'heart rate change', 'odds differential', and 'favorite team odds' while sum values were computed for 'glance duration'.

The longitudinal clustered data structure was predestined for multilevel modeling with random effects to compensate for the violation of the independence assumption of traditional regression that occurs when observations are clustered (Laird & Ware, 1982). Typically, multilevel models such as GLMM (Generalized Linear Mixed Model) are estimated with maximum likelihood methods. Given the small sample size on the higher level (i.e., 11 clusters), downwardly biased estimates of both the variance components and the fixed effect standard errors cannot be excluded, which would result in inflated Type-I error rates (McNeish, 2017).

For this reason, restricted maximum likelihood estimation should be preferred as it considers the degrees of freedom used for estimating the fixed effects, providing improved small sample properties and working well with sample sizes in the single digits (McNeish, 2017). Restricted maximum likelihood generates the best performance if it is used in combination with the Kenward-Roger adjustment to minimize the Type-I error rate (Bell, Morgan, Schoeneberger, Kromrey, & Ferron, 2014; McNeish & Stapleton, 2016). In this regard, several simulations have shown good performance of restricted maximum likelihood estimation with Kenward-Roger adjustment for studies with ten clusters or even less (Kowalchuk, Keselman, Algina, & Wolfinger, 2004; Spilke, Piepho, & Hu, 2005; Baldwin & Fellingham, 2013).

Based on this reasoning, two GLMMs with restricted maximum likelihood estimation and Kenward-Roger adjustment were estimated for the dependent variables 'heart rate change' and 'glance duration'. All models were estimated with IBM SPSS Statistics 26.

4. Results

Before presenting the analytical results, the database is briefly described. As a measure of game outcome uncertainty, the variable 'odds differential' varied between zero (i.e., no team is more likely to win than the other is; and thus, game outcome uncertainty was high) and 499.98 (i.e., large gap between the teams odds; and thus, game outcome uncertainty is low). The win probability of the participant's favorite team was indicated by the 'favorite team odds' ranging from 1 (high chance to win) to 501 (high chance to lose).

'Heart rate change', which served as a measure of arousal, took values between −18.458 and 35.363 beats per minute with an average of zero and a standard deviation (*SD*) of 5.758 beats per minute. The variable 'glance duration' reflected the sum of all gaze hits for a sponsor message during a 30-s time slot and varied between zero (i.e., no gaze hit with sponsor brand) and 7,977 ms. On average, sponsor messages captured the viewer's attention for 178.59 ms ($SD = 487.337$). Table 1 provides a summary of the descriptive statistics.

Fig. 1 provides an example of the data collected for each participant. To make the data comparable across sources, a Z-transformation was applied. In the upper chart, the in-play betting data are displayed over the course of a game with the solid black graph showing the 'odds differential' and the dashed red graph showing the 'favorite team odds'. In this particular game, the 'odds differential' started at a low level, which means that the game outcome uncertainty was highest during the first few minutes. The 'favorite team odds' remained quite stable during the first halftime and increased significantly towards the end of the game, indicating that the favorite team was finally losing the game.

The second chart displays the biometric data, more precisely, the 'glance duration' (normal, black graph) and the 'heart rate change' (dashed, red graph). While 'glance duration' is characterized by several spikes (the higher the vertical line, the longer the 'glance duration'), the 'heart rate change' fluctuates throughout the game with a tendency towards higher values at the beginning of each halftime.

Two GLMMs with restricted maximum likelihood estimation and Kenward-Roger adjustment were built to estimate (1) the sport viewer's arousal and (2) attention to sponsor brands. Three interval-scaled variables were entered into the GLMMs as fixed effects, and the subjects served as random effects to control for individual biases. In the remainder, the arousal model will be discussed first before outlining the attention model. Whereas 'odds differential' had a significant negative effect ($B = -0.020$, $p < .001$) on the dependent variable 'arousal', the effects of 'favorite team odds' ($B = 0.012$, $p < .001$) and 'minute of play' ($B = 0.030$, $p < .001$) were significantly positive. This implies that the degree of sport viewer arousal diminishes with higher 'odds differentials' (i.e., outcome uncertainty is lowered) and increases with higher 'favorite team odds' (i.e., win probability is decreased). Not very surprisingly, sport viewer arousal increases the closer the game is to the end. There was considerable variation between subjects, as indicated by the wide confidence interval of the random effect ($LL = < 0.001$, $UL = 19.711$). Thus, the effects can be much stronger or weaker depending on the participant (and the live soccer game to which the participant was exposed).

The second GLMM is based on the same set of predictors and was computed for the dependent variable 'glance duration', reflecting the degree of attention devoted to sponsor messages. The fixed effect 'odds differential' was significantly negative ($B = -0.032$, $p = < 0.05$) while

Table 1
Descriptive statistics.

Variable	k	min	max	M	SD
Odds differential	1969	.000	499.980	46.629	91.801
Favorite team odds	1969	1.000	501.000	31.558	80.773
Heart rate change	1968	-18.458	35.363	.000	5.758
Glance durations (ms)	1896	.000	7,977.000	178.590	487.337

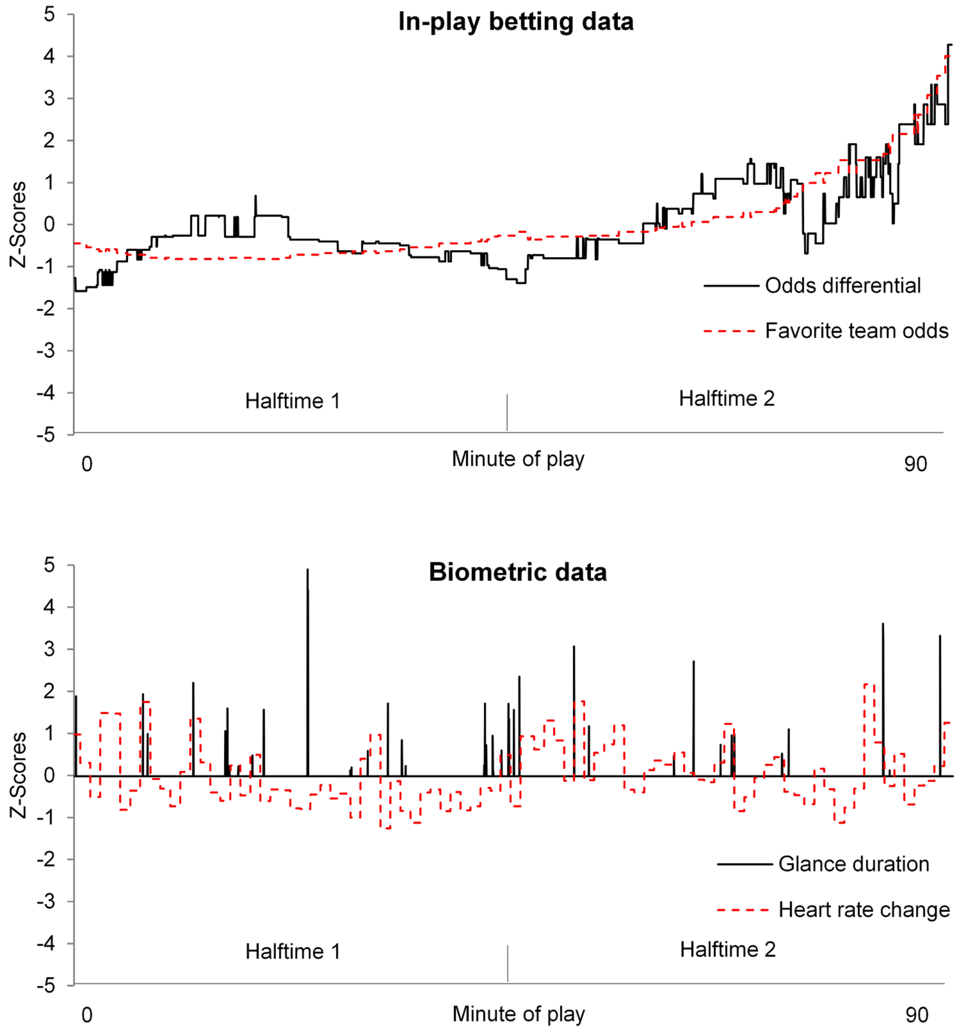

Fig. 1. Sequence charts example (Subject 1).

the favorite team odds had a significantly positive effect on 'glance duration' ($B = 0.033$, $p = < 0.05$). In other words, attention to sponsor brands decreases when the game outcome becomes predictable (i.e., the differential between team odds is high), and the attention to sponsor brands increases if the favorite team is about to lose the game (i.e., higher odds for the favorite team). Furthermore, attention to sponsor brands decreases with the 'minute of play' ($B = -0.006$, $p = < 0.01$), that is, attention is higher in the first halftime than in the second halftime (see Table 2).

5. Sport business application

An application to a separate match (Portugal vs. Spain) from the same event (2018 soccer World Cup) demonstrates the practical use of

Table 2
Generalized linear mixed-models.

Variable	Arousal				Attention			
	B		95% CI		B		95% CI	
			LL	UL			LL	UL
Fixed effects								
Intercept	−.794	**	−1.331	−.257	5.411	***	4.862	5.959
Odds differential	−.020	***	−.025	−.015	−.032	*	−.059	−.005
Favorite team odds	.012	***	.006	.018	.033	*	.005	.060
Minute of play	.030	***	.018	.041	−.006	**	−.010	−.002
Random effect								
Covariance (subj.)	.036		<.001	19.711	.539		.191	1.522
Information criterion								
Akaike corrected	12,444				11,012			
Bayesian	12,455				11,023			

Note: DV = 'Heart rate change' (Arousal) and 'Glance duration (ms)' (Attention); n = 11 with 1,969 (Arousal) and 1,896 (Attention) observations; Link function: Identity (Arousal), Log (Attention); Testing of fixed effects: Kenward-Roger approximation; Information criteria: -2 log likelihood; CI = Confidence interval; LL = Lower level; UL = Upper level; *** $p < .001$, ** $p < .01$, * $p < .05$.

the statistical models. The model outputs (i.e., heart rate change and glance duration) were estimated from the absolute difference in the winning odds of both teams (i.e., odds differential), the winning odds of either Portugal or Spain (i.e., favorite team odds), and playing time (i.e., minute of play). The in-play betting odds were automatically tracked via an online bookmaker and entered into the GLMM of arousal and attention.

Data envelopment analysis with the sponsorship of the 2018 soccer World Cup as the decision-making unit was conducted. In this way, the relative efficiency of three distinct exposure tactics was revealed:

(1) The exposure tactic 'arousal' strives for sponsor brand exposure in situations when the sport viewer feels highly excited. The sponsor attempts to charge its brand emotionally by being perceived during very intense time slots.

(2) The exposure tactic 'attention' focuses on the maximization of sponsor brand attention by the audience. Thus, the sponsor brand needs to be exposed during time slots that provide the highest probability to capture attention.

(3) The third exposure tactic 'arousal × attention' combines the goals of the former two tactics, that is, the maximization of both sport viewer arousal and sponsor brand attention. Therefore, time slots need to be identified that provide a good probability to be visible during arousing time periods that leave sufficient capacity for sponsor brands to attract attention.

The relative efficiency is expressed by the exposure efficiency score (EES), which ranges between zero and one. For the exposure tactic 'arousal', the score increases with the playing time, reaching the maximum EES during the last minutes of the game in both target groups (see Fig. 2). With regard to the exposure tactic 'attention', the highest EES was provided early in the game, when the odds for a win of Spain increased after a goal for Portugal. The lowest EES was given from minutes 83 to 87 when the viewer expected Spain to win (but then Portugal tied the game in minute 88). During this period, the model predicted a total glance duration of 1,459 ms for the Portuguese target group compared to just over 200 ms for the Spanish target group. Such a difference is highly significant, considering that Breuer and Rumpf (2012) find that a one-second increase in attention to a sponsor message could increase the odds of sponsor recall versus no recall by over 300%.

The EES for the exposure tactic 'arousal × attention' appears quite stable for the Portuguese target group since the predicted degrees of arousal and attention cancel each other out. Nevertheless, four periods can be identified that slightly enhance sponsor message efficiency. For example, it becomes obvious that large parts of the second halftime are less likely to accomplish the goal for the Spanish target group due to the negative impact of the odds differential on sponsor brand attention.

Fig. 2 illustrates the computed EES along with the odds differentials and favorite team odds for the particular soccer match. It becomes obvious that the efficiency of sponsor message exposure varies considerably depending on the exposure tactic, the key target group, and the run-of-play. Therefore, the implementation of a dynamic management approach can significantly enhance communicative sponsorship success.

6. Discussion

This paper contributes to the body of knowledge as it shows how the run-of-play and sport viewers' team affiliation can influence sponsorship outcomes. The findings emphasize the potential of emerging innovations in sport sponsorship management, namely, personalizing sponsor messages and real-time adaption to the run-of-play as ways to enhance sponsorship efficiency. In the remainder of this paper, the study's

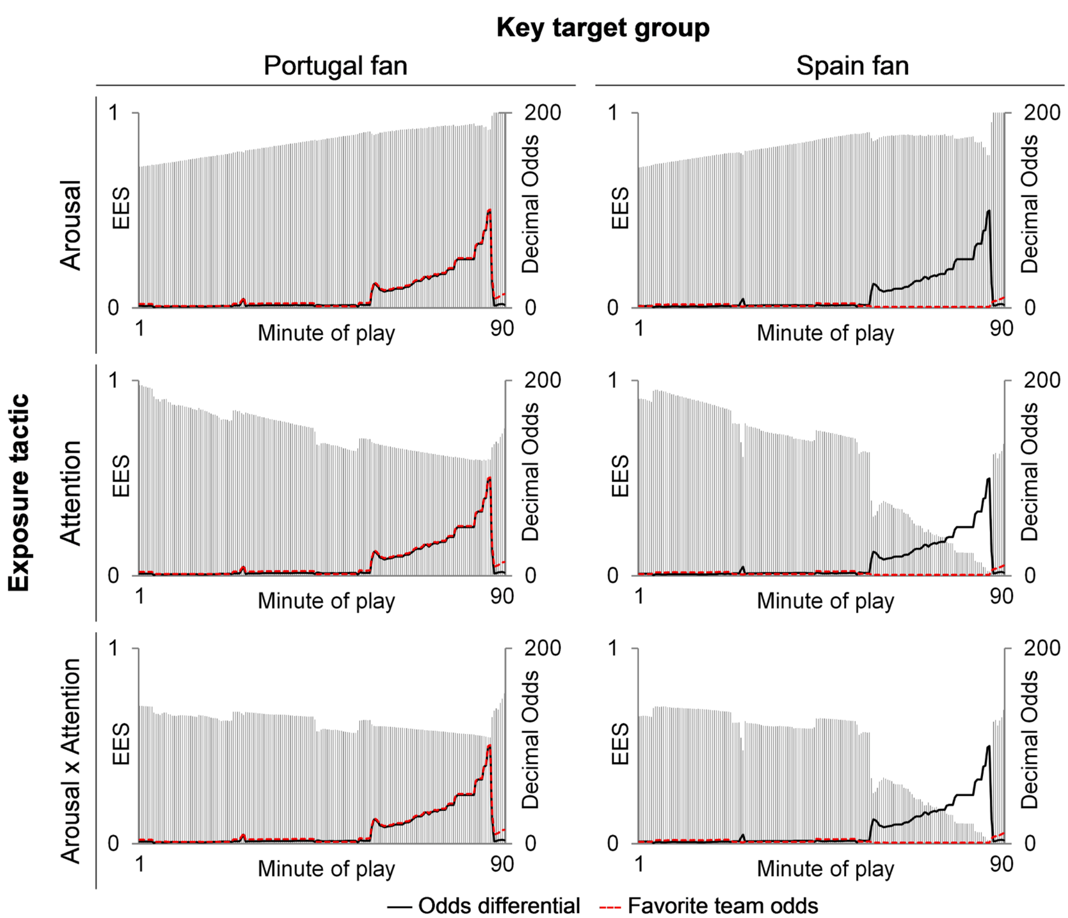

Fig. 2. Computed exposure efficiency scores (EES).

contributions will be discussed in more detail, and managerial implications will be provided before critically reflecting the limitations and avenues for further research.

Based on the study data and in line with previous research (Carrillat et al., 2015; Knobloch-Westerwick et al., 2009), it appears that sport viewer arousal is dependent on the degree of game outcome uncertainty. Consequently, sponsors aiming to present their message in highly arousing situations should prefer exposure during periods with high outcome uncertainty. The Exposure Efficiency Score (EES) indicates the most exciting periods in real time as a function of outcome uncertainty. Since viewership numbers increase with game outcome uncertainty (Mutz & Wahnschaffe, 2016), sponsors following this exposure tactic can also benefit from higher audience reach.

Most sponsors do not assess their activities based on efficiency but use the mere visibility of their message on the media – so-called media exposure – as a measure of success (Meenaghan & O'Sullivan, 2013). However, there are important problems with tracking media exposure as it simply reflects the opportunities-to-be-seen instead of the communication outcome. Shilbury, Westerbeek, Quick, and Funk (2009) state that 'exposure is one thing, but what really matters is the impact of exposure' (p. 270). Given that in the context of sponsorship communication, not information but attention is scarce – thus, the economic problem – real-time approaches predicting the audience's receptiveness can help to solve the ROI and ROO puzzle (Jensen & White, 2018).

In line with findings from advertising research (Bee & Madrigal, 2012; Sanbonmatsu & Kardes, 1988), the current findings show that sponsor message processing becomes more likely when a match is closely fought. Tight and suspenseful periods of a game capture high degrees of cognitive capacity, which also benefits the visual processing of embedded sponsor messages. Consequently, brands can expect less attention to their sponsor messages when the game outcome becomes more predictable and viewers are likely to lose interest.

Previous findings from psychological research (e.g., Hirsh et al., 2012), advertising research (e.g., Deng et al., 2019; Orazi & Nyilasy, 2019), and sponsorship research (Cummins et al., 2016; Kim et al., 2017) have underlined the importance of consumer characteristics. From an individual sports fan's perspective, not only game outcome uncertainty but also the changing win probability of their favorite team define the run-of-play. As indicated by the increase in EES, lower winning probabilities seem to leave greater attentional capacity for sponsor messages and thus appear to be a driver of sponsorship efficiency. In other words, considering the sports viewer's team affiliation can significantly facilitate message communication.

Furthermore, viewer response varies depending on the timing of the sponsor message exposure as arousal increases with playing time while sponsor brand attention diminishes over time. The latter effect has been described as attention wear-out in previous eye tracking studies (Pieters et al., 1999).

6.1. Implications

The current findings suggest that managers should be aware that their sponsor messages could result in varying outcomes, depending on the timing of their exposure, the run-of-play, and the target group they seek to address. Managers can use this knowledge to increase the efficiency of their sponsorships in several ways.

For instance, the correct timing of delivering sponsor messages plays an important role. The EES clearly shows that the correct timing depends on the exposure tactic of the sponsor: if the sponsor strives to charge the brand emotionally, messages should be exposed rather late in the game; however, the sponsor message should be exposed early in the game if the sponsor attempts to maximize attention.

Theoretically, the widespread availability of LED board signage in stadiums and the emergence of virtual advertising in sport broadcasts allow for rapid adjustments of the messages that are displayed based on the run-of-play and the sponsors' target markets. Although sponsorship rights holders currently do not provide the flexibility to place sponsor messages based on real-time approaches, technological developments could soon pave the way for more innovative ways to exploit sponsorship rights. Machine learning-driven algorithms could detect time periods of high sponsor message efficiency throughout a game immediately, and time slots with a high EES could be allocated to top-tier sponsors. Additionally, new pricing schemes could contain a variable component, which could depend on the quality of the exposure as assessed postgame. In a further step, the most valuable time slots on the board could be auctioned in real time and then assigned to the highest bidding sponsor brand.

As a complementary innovation, we expect sponsorship communication to become more targeted in the near future. Similar to personalized ads in social media, the placement of sponsor messages will be linked to personal user data. In this regard, the models in this study already consider the effect of team affiliation on the viewer's arousal and attention. Adding more viewer characteristics to the equation could further enhance the current predictions of viewer response. Given that (1) increasingly more sports content is being watched online via streaming services and (2) the technique of digital overlays within live broadcasts is already used in some major leagues, personalized sponsor messages are likely to become a game-changing innovation very soon.

6.2. Limitations and further research

After discussing the study's contribution and its implications, the shortcomings need to be reflected critically. First, data on critical match events should be added to the analysis. While in-play betting odds globally reflect the run-of-play, live match data such as ball possession or player positions could help to enhance the predictive power of the models. Second, viewer-related variables should be explored further since the models indicated significant interindividual differences (i.e., random effects in the GLMMs). This could be achieved by increasing the sample size and then assessing moderating constructs such as involvement with sports or preferences for specific sponsor brands. Deeper knowledge into interindividual effects could be of particular relevance to the use of digital overlays as a step towards message personalization. Moreover, future studies should include additional variables that may influence attention to sponsor signage, including bottom-up factors such as exposure duration and size or potential top-down factors such as participants' brand familiarity.

7. Conclusion

This study aimed to contribute to the literature by providing evidence on how run-of-play (RQs 1–2), viewers' team affiliation (RQ 3), and playing time (RQ 4) affect viewer responses in the form of arousal and attention to sponsor signage. In doing so, this study is the first to consider the dynamics of live sports in the analysis of sponsorship communication outcomes. Integration of this knowledge into managerial practice offers the opportunity to optimize sponsorship management in innovative ways. While further research is required, we could confirm that the real-time adaption and personalization of sponsor messages lead to a boost in sponsorship efficiency.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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