|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Title | Authors | Year | Journal | | Latex citation | Topics | Summary |
| HRR in Soccer: Analysis of UEFA EURO 2012  and FIFA World Cup Tie-breaking Systems | Yannick Berker | 2014 | European Sport Management Quarterly | | berker2014tie | HRR (Heteronomous Relative Ranking) | HRR is more likely under UEFA regulations due to the head-to-head prioritization  FIFA’s tie-breaking system is more robust in preventing HRR by emphasizing overall team performance |
| The importance of suspense and surprise in entertainment demand: Evidence from Wimbledon | Paolo Bizzozero, Raphael Flepp, Egon Franck | 2016 | Journal of Economic Behavior & Organization | | bizzozero2016importance | Suspense and surprise | Suspense and surprise are complementary and demand for entertainment is stronger for higher levels of suspense and surprise. Surprise seems to be more important than suspense. |
| How to avoid uncompetitive games? The importance of tie-breaking rules | László Csató | 2023 | European Journal of Operational Research | | csato2023avoid | Tournament design, uncompetitive/unnecessary games | Tie-breaking rules might affect the occurrence of uncompetitive games.  Collusion opportunities created in the matches played.  **preferring goal difference to head-to-head results in tie-breaking is unambiguously beneficial for the excitement**  **of the games.** |
| UNSCRIPTED DRAMA: SOCCER AUDIENCE RESPONSE TO SUSPENSE,  SURPRISE, AND SHOCK | BABATUNDE BURAIMO, DAVID FORREST, IAN G. MCHALE and J.D. TENA | 2020 | Economic Inquiry | | buraimo2020unscripted | Demand pl, surprise and suspense. | Suspense measure is driven by event on the field.  Short time inertia in viewing  Suspense, surprise, and shock all contribute to demand for broadcast.  Shock plays a role in determining demand only in the second half of a football game |
| Suspense and Surprise | Jerey Ely  Alexander Frankel  Emir Kamenica | 2015 | Journal of Political Economy | | ely2015suspense | Definition of surprise and suspense |  |
| On the Edge of Your Seat: Demand  for Football on Television and the  Uncertainty of Outcome Hypothesis | Kevin Alavy, Alison Gaskell, Stephanie Leach, and Stefan Szymanski | 2010 | International Journal of Sport Finance | | Alavy2010edge | Relationship between television demand for English football and outcome uncertainty.  The model links the measures of outcome uncertainty to minute-by-minute viewership data | What matters most is the progression of the game  As drawing looks increasingly likely, interest drops.  Viewers are attracted to unexpected |
| Competitiveness in Formula One | Ronald Peeters, Dennis Wesselbaum | 2023 | Sport Economic Review | | Peeters2023competitiveness | Competitiveness | The paper develops a new measure (Kemeny distance) to measure competitiveness in F1. According to this measure, F1 reduces its competitiveness over time. |
| Increasing competitiveness by imbalanced groups:  The example of the 48-team FIFA World Cup | Laszlo Csató, Andras Gyimesi | 2025 |  | | Csato2025imbalanced | OR in sports; fairness; FIFA World Cup; simulation; tournament design | This paper addresses the problem of **stateless (non-competitive) matches** in international football tournaments, particularly under the newly approved format for the 2026 FIFA World Cup. It highlights how such matches—where teams have already qualified or been eliminated—can undermine fairness and viewer interest. The authors propose a **novel weighting scheme** to evaluate the cost of stateless matches, taking into account team strength and tournament context. They show that by **intentionally creating imbalanced groups** during the draw, the tournament design can reduce the number of stateless matches, especially for top teams, while increasing uncertainty and competitiveness in later stages. |
| The evolution of seeding systems and the impact  of imbalanced groups in FIFA Men’s World Cup  tournaments 1954–2022 | Michale Lapré, Elizabeth Palazzolo | 2023 | Journal of Quantitative Analysis in Sports | | Lapre2023evolution | competitive balance, group stage, seeding systems, Elo rating, FIFA World Cup, logistic regression, draw fairness, tournament design | The paper empirically examines competitive imbalance in FIFA World Cup group stages (1954–2022) using Elo ratings, showing that group assignment significantly affects a team's probability of reaching the quarterfinals. They demonstrate that **FIFA’s seeding systems have consistently failed to mitigate this imbalance.** |
| Quantifying the Impact of Imbalanced Groups in FIFA Women’s World Cup Tournaments 1991–2019 | Michale Lapré, Elizabeth Palazzolo | 2022 | Journal of Quantitative Analysis in Sports | | Lapre2022quantifying | FIFA Women’s World Cup, group imbalance, tournament fairness, draw effects, FIFA ranking flaws, quarterfinal probability, seeding impact | The paper finds that group **imbalance**—measured by the average ranking of opponents—**substantially reduces a team’s chances of reaching the quarterfinals** in the FIFA **Women’s** World Cup, underscoring how draw design undermines competitive fairness even before tiebreaks apply. |
| FIFA ranking: Evaluation and path forward | Szczecinski, Leszek and Roatis, Iris-Ioana | 2022 | Journal of Sports Analytics | | Szczecinski2022fifa | FIFA ranking, Elo algorithm | The paper evaluates the FIFA ranking algorithm introduced in 2018, showing that **some design choices**—particularly the weighting of match “importance”—**reduce its predictive accuracy**. It proposes grounding the algorithm in a formal probabilistic model (Davidson model), while improving it through the inclusion of home-field advantage, explicit treatment of draws, and possibly goal differential. |
| On head-to-head results as tie-breaker and consequent opportunities for collusion | Laszlo Csató | 2025 | IMA Journal of Management Mathematics | | csato2025head | FIFA, head-to-head | This paper analyzes the **use of head-to-head r**esults as a tie-breaking rule in round-robin football tournaments and shows that it significantly **increases the probability of collusion between teams**. Using simulations based on the UEFA Euro 2024 format, the authors find that prioritizing head-to-head raises collusion risk by 11.5–14.8%, recommending goal difference as a more robust primary criterion. |
| A new competition format to avoid collusion in three-team sports tournaments | Troyano, Jose | 2023 | arXiv preprint arXiv:2308.02507 | | troyano2023new |  | redesigned three-team group format with a dynamic match order that significantly lowers the risk of collusion without altering qualification criteria. Using Monte Carlo simulations, the study shows that this scheduling innovation makes three-team groups nearly as safe as traditional four-team formats in terms of collusion risk, offering a practical alternative to FIFA’s discarded 3-team proposal. |
| The psychology of suspense in dramatic exposition | Zillmann, Dolf | 2013 | Suspense (book) | | zillmann2013psychology |  |  |
| Enjoyment: At the heart of media entertainment | Vorderer, Peter and Klimmt, Christoph and Ritterfeld, Ute | 2004 | | Communication theory | vorderer2004enjoyment | media consumption and entertainment theory literature, | In football tournaments are a form of media entertainment where suspense is a primary driver of enjoyment, and thus rules that sustain suspense matter for both psychological and economic reasons. |
| Fixing match-fixing: Optimal schedules to promote competitiveness | Chater, Mario and Arrondel, Luc and Gayant, Jean-Pascal and Laslier, Jean-Francois | 2021 | | European Journal of Operational Research | chater2021fixing | Scheduling, collusion | deterministic optimal scheduling that reduces collusion and stake-less games |
| Armchair fans: Modelling audience size for televised football matches | Buraimo, Babatunde and Forrest, David and McHale, Ian G and Tena, Juan de Dios | 2022 | | European Journal of Operational Research | buraimo2022armchair | Audience, demand, suspense | Demand cannot be explained solely by uncertainty of outcome but also depends on players' quality and the significance of the match (e.g., title races, European qualification, or relegation battles). |
| The use of head-to-head records for breaking ties in round-robin soccer contests |  |  | |  | pakaslahti2019use |  | It argues that while head-to-head may appear fair, it can lead to inconsistencies and perverse outcomes compared to alternatives like goal difference. |
| When neither team wants to win: A flaw of recent UEFA qualification rules | Laszlo Csató | 2020 | | International Journal of Sports Science & Coaching} | csato2020neither | UEFA rules, collusion | The paper identifies a flaw in UEFA’s qualification rules by showing that, under certain repechage and tie-breaking conditions, two teams may find it optimal to avoid winning and instead collude by securing a mutually beneficial draw. Using a real-world example from the 2016 UEFA Under-17 Championship, the author formalizes the concept of forced collusion and argues for strategy-proof tournament designs that prevent situations where teams are incentivized not to score. |
| A double-elimination format for a 48-team FIFA World Cup | Renno Costa, Cesar | 2023 | | arXiv preprint | renno2023double |  | The paper proposes a double-elimination tournament format as an alternative to the 3-team and 4-team group structures considered for the 2026 World Cup, showing through Monte Carlo simulations that it is fairer, more strategy-proof, and generates more competitive and high-interest matches. Unlike round-robin formats that allow collusion and produce stake-less games, this design ensures that every match has direct consequences, reducing manipulation incentives while remaining feasible within the tournament calendar. |

**Suspense**

* bizzozero2016importance : feeling of excitement or anxiety while waiting for something uncertain to happen . A forward-looking approach that evolves through the assessment of future events.
* ely2015suspense: suspense focuses on anticipated variance in belief about the future, the agent derives utility from expecting large changes in belief, even if those changes do not materialize

**Surprise**

* bizzozero2016importance: an unexpected event, or the feeling cause when something unexpected happens. A backward-looking approach that evolves by assessing past events/predictions.
* ely2015suspense: surprise focuses on realized variance in beliefs. The agent derives utility from the actual, observed shifts in belief over time.

Bayesian setting: people transform their prior beliefs into posteriori beliefs when new and relevant information arrives

**Shock**

* buraimo2020unscripted**:** difference between current outcome probabilities and pre-match outcome probabilities.

Literature that **relates uncertainty of outcomes to suspense**