

Home advantage bias in yellow card allocation in Brazilian soccer.

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Published online: July 31, 2025

Accepted for publication: July 15, 2025

DOI:10.7752/jpes.2025.07164

Abstract

Home Advantage is a relevant research topic across various sports, including soccer. It refers to the tendency for the home team to perform better than the visiting team, influenced by factors such as match performance and environmental variables such as referees' decisions on yellow cards. However, the factors influencing yellow card bias favoring home teams in Brazilian soccer remain unclear. This study aimed to determine whether variables such as a new stadium format, championship structure, crowd presence, and differences in team rankings affect referees' yellow card bias. To investigate this, 2,242 official match summaries from the Brazilian National Championships during the 2014–2018 seasons were analyzed. The number of yellow cards was analyzed according to (i) geography (visiting vs. home team), stadium format (pure soccer vs. track & field stadiums; traditional vs. arena stadiums), championship configuration (cup vs. league), and (iv) ranking team difference calculated accordingly: visiting ranking – home ranking. The visiting teams received more yellow cards than the home teams in both championships ($p < 0.001$), but the public crowd did not affect yellow card referees' bias ($p = 0.114$). In contrast, ranking team differences significantly affect yellow card referees' bias ($p < 0.001$), with a greater yellow card referees' bias in matches with greater ranking team differences. The stadium format just affects yellow card referees' bias when classified as traditional or arena stadiums ($p = 0.010$), and yellow card referees' bias was greater in the Arena than in Traditional Stadiums. In addition to these results, independent of the ranking team differences, the yellow card referees' bias is around 80% greater in Cup than League. Therefore, yellow card referees' bias is present in the Brazilian National Championships, and stadium format, championship configuration, as well as ranking team differences, affect this bias.

Key Words: Referee bias, stadium, decision-making, league, cup.

Introduction

Home advantage is a widely studied phenomenon across various sports, including soccer (Clarke, 2005; Staufenbiel et al., 2015). It typically refers to the superior performance of home teams compared to the visiting teams, which may be attributed to performance-related factors (Armatas & Pollard, 2014; Pollard et al., 2008; Pollard & Gómez, 2014), and/or environmental variables of the match (Dosseville, 2007; Goumas, 2014). One such environmental variable is referee behavior, which has been influenced by home advantage (Boyko et al., 2007; Goumas, 2014; Sutter & Kocher, 2004). For instance, decisions regarding extra time tend to favor the home team, particularly when the home team is behind or tied late in the game (Lago-Peñas & Gómez-López, 2016; Sutter & Kocher, 2004). Similarly, yellow card decisions have also been reported to favor home teams over visiting teams (Boyko et al., 2007; Downward & Jones, 2007).

In this context, crowd presence is believed to play a significant role in such referee biases (Bilalić et al., 2021; Leitner & Richlan, 2021; Scoppa, 2021). However, it was only during the COVID-19 pandemic that it became possible to assess the effect of crowd absence as a natural control condition (McCarrick et al., 2021). Soccer leagues worldwide were suspended and later resumed under strict health protocols, including matches played without spectators. For instance, in the Brazilian National First Division, all matches during the 2020 season and the first 22 rounds of the 2021 season were played without crowds. A study comparing these matches to those from previous seasons with spectators found no evidence of yellow card referee bias in the absence of crowd attendance (Silva et al., 2022), challenging earlier findings that suggested a significant influence of crowd presence (Boyko et al., 2007; Downward & Jones, 2007). These conflicting findings may be attributed to differences in methodology. Before the COVID-19 period, most evidence for referee bias was based on regression models, which allowed the investigation of multiple influencing factors without the benefit of a control condition (Goumas, 2014; Lago-Peñas & Gómez-López, 2016). In contrast, Silva et al. (2022) utilized the unique opportunity presented by the pandemic to directly compare matches with and without spectators. Studies using regression models in English leagues have reported that greater crowd size and density (i.e., the

ratio between attendance and stadium capacity) increase the likelihood of yellow cards being issued to visiting teams (Boyko et al., 2007; Downward & Jones, 2007). Additionally, the physical proximity of the crowd to the pitch has also been shown to influence referee decisions (Unkelbach & Memmert, 2010). However, these findings are limited to European contexts, and their applicability to Brazilian championships remains unclear.

Regarding crowd proximity, stadium design is often used as a proxy indicator—specifically, the presence (i.e., track and field stadium) or absence (i.e., pure soccer stadium) of a running track separating the crowd from the pitch (Goumas, 2014; Unkelbach & Memmert, 2010). However, this classification may not accurately reflect the true spatial configuration in Brazilian stadiums. Some venues classified as “pure soccer” may still feature large semicircular gaps between the stands and the field, mimicking the separation found in track and field stadiums. According to Unkelbach & Memmert (2010) definition, these would be misclassified, despite providing similar pitch-crowd distance (please see figure 1 in the supplementary files). To address this limitation, we propose a new classification based on the geometric configuration of the stands relative to the pitch. We define *Arena Stadiums* as those with rectangular or shallow semicircular layouts, indicating closer crowd proximity. In contrast, *Traditional Stadiums* include those with either running tracks or large, deep semicircular gaps, indicating greater separation (see Figure 2 in supplementary materials). It is worth exploring whether this revised classification correlates with yellow card referee bias similarly—or more effectively—than the traditional dichotomy proposed by Unkelbach & Memmert, (2010).

Beyond crowd-related variables (e.g., noise, density, proximity), team ranking differences have also been shown to affect referee decisions. Higher-ranked teams are less likely to receive yellow cards than lower-ranked teams (Downward & Jones, 2007). Accordingly, match type and competition format may also play a role. National competitions typically include two main types: the national league, with matches between teams in the same division, and the national cup, which may include matches between teams from different divisions (Confederação Brasileira de Futebol, 2020a, 2020b). Moreover, these competitions differ in structure. The national league follows a round-robin format in which all teams play each other both home and away throughout the season, with the team accumulating the most points declared the champion (Confederação Brasileira de Futebol, 2020a; Premier league, 2020). Conversely, the national cup is a knockout tournament, with teams playing home-and-away legs in each round, and the loser being eliminated (Confederação Brasileira de Futebol, 2020b; Downward & Jones, 2007). This difference may affect the stakes of each match, and potentially influence referee behavior. Nevertheless, the specific impact of competition format on referee bias—particularly when statistically controlling for team ranking differences—remains to be determined.

Therefore, considering all the above-mentioned features that may affect yellow card referees’ bias. The first aim of the present study was to verify whether the yellow card referees’ bias is present in Brazilian soccer competitions, and if the yellow card referees’ bias in Brazilian Soccer is related to competition format, public crowd, and ranking team differences. The second aim was to verify if the stadium configuration, independent of a classification of the crowd proximity to the pitch according to the definition proposed by Unkelbach & Memmert (2010) or the new one proposed by our manuscript, reports a relationship with yellow card referees’ bias in Brazilian Soccer. The third aim was to certify if the competition format, even when statistically controlled for team ranking differences (i.e., considered as a statistical co-variable), may affect the yellow card referees’ bias.

Materials & Methods

Procedures

Data from 2,442 matches were collected from official statistical summaries available on the Brazilian Soccer Confederation (CBF) website (www.cbf.com.br). The competitions analyzed included the Brazilian Cup and the Brazilian National League – Division A, covering the seasons from 2014 to 2018. The extracted data for each match comprised the number of yellow cards awarded to home and visiting teams, referees’ names, attendance figures, and stadium names. To minimize potential biases due to inexperience or competition type (Boyko et al., 2007), only matches officiated by referees who had worked in both national tournaments and officiated at least six matches were included. Data collection was carried out by five novice researchers and subsequently verified by two experienced researchers.

Yellow card referees’ bias

Only the first yellow card issued to a player in a match was included in the analysis (Boyko et al., 2007; Downward & Jones, 2007). The Second yellow cards that led to red cards were excluded. The home advantage bias related to yellow card distribution was calculated as the difference between the number of yellow cards awarded to the visiting and home teams. A positive index indicates a home advantage bias—i.e., more yellow cards awarded to the visiting team—while a negative index suggests a potential bias in favor of the away team (Boyko et al., 2007).

Stadium configuration

The stadium configuration was defined using two criteria. The first followed Unkelbach & Memmert (2010), categorizing stadiums as either track and field or pure soccer venues, depending on the presence or absence of a running track separating the crowd from the pitch (see Introduction for details). The second

classification was based on the geometric arrangement of the stands relative to the pitch, categorized as either accentuated semicircle or rectangular/flat semicircle formats. Accordingly, stadiums were labeled as either Traditional or Arena stadiums (see Introduction for definitions). Stadium types were identified using satellite imagery from Google Maps and official city websites. Each stadium was independently evaluated by two experienced researchers. The complete classification is available in the supplementary material.

Competition format and ranking team difference

Competitions were categorized as either Cup (Brazilian Cup; see Introduction) or League (Brazilian National League – Division A; see Introduction). Team ranking was determined based on the division each club participated in during the corresponding year, with Divisions A, B, C, and D assigned values of 1, 2, 3, and 4, respectively (Confederação Brasileira de Futebol, 2020a). A value of 5 was assigned to teams not participating in any Brazilian National League division during the year considered (Downward & Jones, 2007). For each Brazilian Cup match, the division of the home and visiting teams was extracted from the CBF website, and the ranking difference was calculated using the formula: visiting team division - home team division. A positive Index indicates a technical advantage for the home team. While the opposite indicates a technical advantage to visiting team (Downward & Jones, 2007).

Statistical Procedures

The data were reported as mean and standard deviation (SD). The Mann-Whitney test was used to verify the differences between yellow cards awarded to home and visiting teams in the Cup and the League championships. Two multiple linear regression models were performed to verify the relationship of the dependent variable, yellow card referees' bias index, from the co-variables, competition format, stadium configuration, public crowd, and ranking team differences. In the first model, the competition format (League = 0; Cup = 1) and stadium configuration classified according to Unkelbach & Memmert (2010) - (i.e., Pure soccer stadium = 0; Track and field stadium = 1), were considered categorical variables, and ranking team difference, public crowd, and yellow home referees' bias index were classified as continuous variables. In the second model, the variables were the same as the first model, except stadium format which was classified according to our proposed definition (Traditional stadium = 0; Arena stadium = 1). The two different models were applied to verify if the classification of stadium format according to our proposition reports a relationship with yellow card referees' bias index, similarly, as already reported with the classification of stadium configuration according to Unkelbach & Memmert (2010). Since team ranking differences theoretically may impact yellow card referees' bias (Downward & Jones, 2007; Nevill & Holder, 1999) and the one-off both championships analyzed (i.e., the cup) have matches with teams of the different rankings, Analysis of Covariance (ANCOVA) with the *Bonferroni posthoc* was performed to verify the effect of competition configuration on yellow card referees' bias index considering ranking team differences as a statistical co-variable. All statistical analyses were conducted using JASP (version 0.16, JASP Team 2020, University of Amsterdam). The alpha level of statistical significance adopted for all analyses was 0.05.

Results

A greater number of yellow cards was awarded to visiting (2.19 ± 1.40) over the home (2.54 ± 1.46) teams in the league ($p < 0.001$). Also, a greater number of yellow cards was awarded to visiting (2.18 ± 1.33) compared to the home (2.80 ± 1.57) teams in the cup ($p < 0.001$). The regression coefficients and standard errors of the first and second multiple regression models are shown in Tables 1 and 2, respectively. In the first model, the competition format reported a significant relationship with yellow card referees' bias ($p < 0.001$), with yellow card referees' bias being 0.339 greater in Cup than in League. Moreover, ranking team differences also show a significant relationship with yellow card referees' bias ($p < 0.001$). In this sense, with yellow card referees' bias being 0.189 greater to each unit increase in the ranking team differences. In contrast, the public crowd ($p = 0.113$), and stadium configuration (i.e., pure soccer, and track and field stadiums; $p = 0.079$) did not report a significant relationship with yellow card referees' bias.

Table 1. Model 1 - Multiple Regression for yellow card referees' bias with stadium format classified as pure soccer or track and field.

	B	SE B	b
Home Advantage	0.133	0.097	
Competition Format	0.364	0.088	0.085*
Stadium Configuration	0.162	0.092	0.036
Team Ranking Difference	0.189	0.039	0.099*
Crowd Size	4.627×10^{-6}	2.917×10^{-6}	0.033

$R^2 = 0.015$. B = Unstandardized coefficient. SE B = standard error of the coefficient. b = Standardized regression coefficient. * $p < 0.001$.

In the second model, the results were similar, except for the stadium configuration. The competition format reported a significant relationship with yellow card referees' bias ($p < 0.001$), with yellow card referees' bias being 0.355 greater in Cup than in League. Moreover, ranking team differences also show a significant relationship with yellow card referees' bias ($p < 0.001$). In this sense, with yellow card referees' bias being 0.195 greater to each unit increase in the ranking team differences. In contrast to the first model, the stadium format reported a significant relationship with yellow card referees' bias, with yellow card referees' bias being 0.187 greater in the Arena than in Traditional Stadiums ($p = 0.010$). Similarly, to the first model, the public crowd did not report a significant relationship with yellow card referees' bias ($p = 0.127$).

Table 2. Model 2 - Multiple Regression for yellow card referees' bias with stadium format classified as traditional or arena.

	B	SE B	b
Home Advantage	0.171	0.074	
Competition Format	0.355	0.088	0.083*
Stadium Configuration	0.187	0.073	0.052**
Team Ranking Difference	0.195	0.039	0.102*
Crowd Size	4.449×10^{-6}	2.914×10^{-6}	0.032

$R^2 = 0.019$. B = Unstandardized coefficient. SE B = standard error of the coefficient. b = Standardized regression coefficient. * $p = 0.001$. ** $p = 0.01$.

The competition format, even with ranking team differences considered as a co-variable, remains to affect yellow card home referees' bias (0.624 ± 1.845 and 0.347 ± 1.783 for Cup and League championships, respectively), as reported in ANCOVA analysis ($p < 0.001$).

Discussion

The main findings were that: i) Yellow card referee bias exists in Brazilian soccer championships and is associated with competition format and team ranking differences. However, crowd size was not found to be significantly related to this bias; (ii): Stadium configuration showed a significant association with yellow card referee bias only when classified as Traditional versus Arena stadiums. Specifically, visiting teams received more yellow cards in Arena stadiums, where the crowd is situated closer to the pitch; (iii): Team ranking differences were associated with yellow card referee bias, and even when ranking differences were included as a covariate, championship format still influenced the bias—visiting teams received more yellow cards in Cup matches than in League matches.

These results are consistent with those of (Downward & Jones, 2007) who found that in 857 FA Cup matches in England between 1996 and 2002, first yellow cards were more frequently awarded to visiting teams. Similarly, Goumas (2014) reported that visiting teams in the UEFA Champions League and Europa League received 10% more yellow cards than home teams. These findings suggest that yellow card referee bias is present in Brazilian soccer, as in European competitions. However, unlike European studies, which found crowd size to be a significant factor (Boyko et al., 2007; Downward & Jones, 2007), our results indicate that crowd size does not influence yellow card referee bias in Brazilian competitions.

This discrepancy may be explained by differences in the statistical models used. For example, our study employed a linear regression model, as the dependent variable was continuous. In contrast, Downward & Jones (2007) used a binary logistic regression, and Boyko et al. (2007) used an ordinal regression that incorporated additional independent variables, including the season-long tendency of teams to receive yellow cards. Furthermore, a previous study also found that crowd attendance did not significantly affect yellow card bias in the First Division of the Brazilian National League (Silva et al., 2022), supporting our results.

Regarding crowd proximity, our findings suggest that classifying stadiums as Traditional or Arena may better capture the influence of spectator proximity on referee behavior than the classification proposed by Unkelbach & Memmert (2010), which is based on the presence or absence of a running track. As discussed in the Introduction and shown in Supplementary files Figure 1, some stadiums with running tracks were still classified as pure soccer stadiums. This observation suggests that running track presence may not accurately reflect crowd proximity in the Brazilian context.

Supporting our findings, previous research has shown that crowd proximity can affect yellow card referee bias (Goumas, 2014; Unkelbach & Memmert, 2010). Our study found that Arena stadiums—where fans are closer to the field—were associated with more yellow cards for visiting teams. This could be explained by increased crowd noise and pressure in such venues. Crowd noise has been shown to increase referees' anxiety and mental strain (Nevill et al., 2017), and louder reactions to visiting team fouls may heighten social pressure

on referees. This aligns with the idea that referees under social pressure may rely on heuristic decision-making (Nevill & Holder, 1999), which could explain the observed bias in Arena stadiums.

With respect to team ranking differences, our findings align with Downward & Jones (2007), who reported greater yellow card bias in favor of better-ranked home teams in FA Cup matches. One plausible explanation is that higher-ranked teams (i.e., from superior divisions) tend to play more offensively and maintain greater ball possession, leading to more fouls committed by lower-ranked opponents, and thus more yellow cards awarded to them. The greater disparity in team quality in Cup matches compared to League matches could also explain why championship format influences yellow card referee bias. However, even after controlling for team ranking differences, Cup matches still showed a stronger bias. This might be due to the inherently higher stakes in Cup matches. Anecdotal evidence from a Division A coach suggests that Cup games require greater mental focus due to their decisive nature (Esportiva, 2022). Furthermore, a previous study reported higher technical performance indicators in long-stage matches compared to knockout games (Magni et al., 2023).

We therefore speculate that Cup matches impose greater mental strain, social pressure, and cognitive load on referees, which could affect decision-making. Referees under pressure may be more likely to avoid making unpopular decisions (Nevill & Holder, 1999), which in turn could lead to a bias favoring home team—possibly contributing to the yellow card discrepancies observed in Cup versus League matches (Nevill et al., 2017). This hypothesis, however, warrants further investigation.

The present study has a limitation that must be mentioned, the data were extracted from 2014 to 2018 when there were no video assistant referees in the national tournaments. Since video assistance may impact the referees' decisions (Spitz et al., 2021), future studies should be conducted to verify the effect of video assistant referees on yellow card referees' bias. Despite the limitations, this study has some practical applications. For instance, monitoring the bias on the referee's performance may help to know the tendencies and develop specific training to avoid these tendencies and improve their performance. Furthermore, the knowledge of the bias on referee's performance may contribute to coaches better instructing their teams to avoid disadvantages regarding this bias. At least, in the world, there was a crescent of soccer betting marketing with the number and tendency of yellow cards applied to home and away teams included in the bets. Therefore, the knowledge of the components of yellow card referees' bias could help bettors with their bets.

Conclusion

Referees' bias in yellow card allocation was present in the Brazilian National Championships, and stadium format, championship configuration, as well as raking team differences, affect this bias. Referees' bias in yellow card allocation was greater in arena than traditional stadiums. Additionally, it was also greater in cup than league matches.

Conflict of interest - The authors declare no conflict of interest.

Supplementary materials

<https://doi.org/10.5281/zenodo.16421369>

Funding

The study was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq (grant number: 304136/2020-4, 200391/2022-4, and 446576/2024-7), and Fundação de Apoio a Pesquisa do Distrito Federal – FAP/DF (00193.0001372/2024-82; and 00193.00001661/2024-81).

Institutional board review

Ethical review and approval were waived for this study, due to it is a retrospective study from public data available in website of the Brasilia Soccer Confederation, and it did not impose any experimental protocol to humans just the analysis of public data previously published on the website of the Brasilia Soccer Confederation.

References

- Armatas, V., & Pollard, R. (2014). Home advantage in Greek football. *European Journal of Sport Science*, 14(2), 116–122. <https://doi.org/10.1080/17461391.2012.736537>
- Bilalić, M., Gula, B., & Vaci, N. (2021). Home advantage mediated (HAM) by referee bias and team performance during covid. *Scientific Reports*, 11(1), 21558. <https://doi.org/10.1038/s41598-021-00784-8>
- Boyko, R. H., Boyko, A. R., & Boyko, M. G. (2007). Referee bias contributes to home advantage in English Premiership football. *Journal of Sports Sciences*, 25(11), 1185–1194. <https://doi.org/10.1080/02640410601038576>
- Clarke, S. R. (2005). Home advantage in the Australian football league. *Journal of Sports Sciences*, 23(4), 375–385. <https://doi.org/10.1080/02640410500074391>
- Confederação Brasileira de Futebol. (2020a). *Regulamento Campeonato Brasileiro 2020*. https://conteudo.cbf.com.br/cdn/202003/20200304095332_562.pdf
- Confederação Brasileira de Futebol. (2020b). *Regulamento específico da competição Copa do Brasil 2020*. https://conteudo.cbf.com.br/cdn/201912/20191213163946_89.pdf

- Dosseville, F. E. M. (2007). Influence of Ball Type on Home Advantage in French Professional Soccer. *Perceptual and Motor Skills*, 104(2), 347–351. <https://doi.org/10.2466/pms.104.2.347-351>
- Downward, P., & Jones, M. (2007). Effects of crowd size on referee decisions: Analysis of the FA Cup. *Journal of Sports Sciences*, 25(14), 1541–1545. <https://doi.org/10.1080/02640410701275193>
- Esportiva, G. (2022, November 10). <https://www.bol.uol.com.br/esporte/2022/11/10/dorival-junior-justifica-queda-de-rendimento-do-flamengo.htm?cmpid=copiaecola>. Dorival Júnior Justifica Queda de Rendimento Do Flamengo.
- Goumas, C. (2014). Home advantage and referee bias in European football. *European Journal of Sport Science*, 14(SUPPL.1), 37–41. <https://doi.org/10.1080/17461391.2012.686062>
- Lago-Peñas, C., & Gómez-López, M. (2016). The Influence of Referee Bias on Extra Time in Elite Soccer Matches. *Perceptual and Motor Skills*, 122(2), 666–677. <https://doi.org/10.1177/0031512516633342>
- Leitner, M. C., & Richlan, F. (2021). No Fans–No Pressure: Referees in Professional Football During the COVID-19 Pandemic. *Frontiers in Sports and Active Living*, 3. <https://doi.org/10.3389/fspor.2021.720488>
- Magni, M., Zago, M., Vago, P., Vandoni, M., Carnevale Pellino, V., & Lovecchio, N. (2023). Technical Differences over the Course of the Match: An Analysis of Three Elite Teams in the UEFA Champions League. *Sports*, 11(2), 46. <https://doi.org/10.3390/sports11020046>
- McCarrikk, D., Bilalic, M., Neave, N., & Wolfson, S. (2021). Home advantage during the COVID-19 pandemic: Analyses of European football leagues. *Psychology of Sport and Exercise*, 56, 102013. <https://doi.org/10.1016/j.psychsport.2021.102013>
- Nevill, A. M., Hemingway, A., Greaves, R., Dallaway, A., & Devonport, T. J. (2017). Inconsistency of decision-making, the Achilles heel of referees. *Journal of Sports Sciences*, 35(22), 2257–2261. <https://doi.org/10.1080/02640414.2016.1265143>
- Nevill, A. M., & Holder, R. L. (1999). Home Advantage in Sport. *Sports Medicine*, 28(4), 221–236. <https://doi.org/10.2165/00007256-199928040-00001>
- Pollard, R., & Gómez, M. A. (2014). Comparison of home advantage in men’s and women’s football leagues in Europe. *European Journal of Sport Science*, 14(SUPPL.1), 37–41. <https://doi.org/10.1080/17461391.2011.651490>
- Pollard, R., Silva, C. D. da, & Medeiros, N. C. (2008). Home advantage in football in Brazil : differences between teams and the effects of distance traveled. *The Brazilian Journal of Soccer Science*, 01(1), 3–10. <http://www.seer.ufv.br/seer/rbf/index.php/RBFutebol/article/viewFile/6/4>
- Premier league. (2020). *Premier League Competition Format & History* | Premier League. Premierleague.Com. <https://www.premierleague.com/premier-league-explained>
- Scoppa, V. (2021). Social pressure in the stadiums: Do agents change behavior without crowd support? *Journal of Economic Psychology*, 82, 102344. <https://doi.org/10.1016/j.joep.2020.102344>
- Silva, A. C., Amaral, A. S., Facundo, L. A., Wiprich, M. T., Rechenchosky, L., & Rinaldi, W. (2022). Two Years of COVID-19 Pandemic: How the Brazilian Serie A Championship Was Affected by Home Advantage, Performance and Disciplinary Aspects. *International Journal of Environmental Research and Public Health*, 19(16), 10308. <https://doi.org/10.3390/ijerph191610308>
- Spitz, J., Wagemans, J., Memmert, D., Williams, A. M., & Helsen, W. F. (2021). Video assistant referees (VAR): The impact of technology on decision making in association football referees. *Journal of Sports Sciences*, 39(2), 147–153. <https://doi.org/10.1080/02640414.2020.1809163>
- Staufenbiel, K., Lobinger, B., & Strauss, B. (2015). Home advantage in soccer – A matter of expectations, goal setting and tactical decisions of coaches? *Journal of Sports Sciences*, 33(18), 1932–1941. <https://doi.org/10.1080/02640414.2015.1018929>
- Sutter, M., & Kocher, M. G. (2004). Favoritism of agents – The case of referees’ home bias. *Journal Of Economic Psychology*, 25, 461–469. [https://doi.org/10.1016/S0167-4870\(03\)00013-8](https://doi.org/10.1016/S0167-4870(03)00013-8)
- Unkelbach, C., & Memmert, D. (2010). Crowd noise as a cue in referee decisions contributes to the home advantage. *Journal of Sport & Exercise Psychology*, 32(4), 483–498. <https://doi.org/10.1123/jsep.32.4.483>