FAIRPLAY

Uncovering the Impact of Yellow Cards on the Performance of the Liga 1 BRI Football Team for the 2023-2024 Season

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ABSTRACT

This study aims to examine the effect of yellow cards on the performance of football teams in Liga 1 BRI Indonesia season 2023-2024. The core issue raised is how yellow cards affect ball possession, goal scoring, and overall match results. The method used was a quantitative correlative research design, with data collected from 18 teams (9 provinces) over a full season (11 months). Analyses were conducted using Pearson correlation test, linear regression, and analysis of variance (ANOVA) to evaluate the impact of yellow cards in various match conditions. The results showed that yellow cards had a significant negative impact on possession (coefficient: -0.341, $p<0.001$) and goal scoring (coefficient: -0.017, $p=0.003$), especially in away matches and against stronger opponents, as well as when received by key players such as central midfielders or defenders. The conclusions of this study highlight the importance of yellow card risk management strategies and psychological resilience training for players, as well as the relevance of these findings in developing team competitive strategies. This research provides a new contribution to the literature on discipline in football and practical implications for football team management.

1. INTRODUCTION

In the highly competitive world of professional football, disciplinary actions such as yellow cards are not just interruptions in the flow of the game. Yellow cards can invite red cards, profoundly affecting team dynamics and overall performance (Buraimo, 2017; Gasparetto, 2023). The topic of this research, "Uncovering the Impact of Yellow Cards in BRI LIGA 1 2023-2024 Indonesia Matches," examines the hidden impact of yellow cards on team performance metrics, particularly possession, goal scoring, and match results (Guerrero, 2023; Yi, 2022). This research is particularly important as it seeks to unravel the intricate ways in which these penalties shape the course of a game and, in turn, the outcome of a team's performance in a season.

Yellow cards serve as an important control mechanism in football, aiming to regulate player behaviour and maintain the integrity of the game (Navia, 2019; Zheng, 2022). However, the implications of these disciplinary measures extend beyond direct player behaviour, potentially affecting team performance more broadly, physical fatigue (Abimanyu, Fatoni, Indarto, & Kustiawan, 2024; Bian, 2022; Grgic, 2022; Kunrath, 2020). The current literature largely examines the aggregate

effects of yellow cards, leaving a significant gap in understanding how these impacts emerge in real-time and vary based on player roles and match conditions. This study aims to bridge this gap by providing a detailed analysis of how yellow cards affect team performance during a match, exploring aspects such as the role of the player receiving the card and the timing relative to other match events.

Previous research has largely ignored the immediate and contextual impact of yellow cards on team performance (Buraimo, 2017; Gasparetto, 2023; Gómez-Déniz, 2017; Sors, 2022). There is a lack of research highlighting the temporal dynamics following a yellow card, such as changes in possession and offensive metrics in the first 10 minutes after a penalty. In addition, the differential impact of yellow cards on various player roles-centre midfielders compared to wingers, for example-remains under-explored. The interaction between yellow cards and other key match events, such as goals and substitutions, has also received less comprehensive attention (Chmura, 2024; Gómez, 2019). Addressing these gaps is crucial to improving our understanding of the strategic implications of disciplinary measures in football.

The importance of this research lies in its potential to influence team strategies and management practices (Kvas-Cabral, 2022; Memmert, 2017). Football teams and coaches are constantly looking for ways to optimise performance and reduce risk; understanding the multifaceted impact of yellow cards can provide valuable insights to make informed tactical decisions. On a broader level, this study contributes to the scientific discourse on sports performance, offering a new perspective that integrates statistical analyses with practical implications for team management. The timing of this study is particularly relevant as the competitive dynamics of the 2023-2024 BRI LIGA 1 season are ongoing, providing a rich dataset for analysis and interpretation.

This study pioneered the investigation of the long-term effects of yellow cards on team performance across a full season (Fernández-Hermógenes, 2017). While existing research has largely focused on immediate game effects, our approach tracks the cumulative impact of frequent yellow cards, uncovering patterns that might affect team morale, lineup consistency, and league rankings. By using advanced statistical models to analyse data from multiple seasons, this study offers new insights into the broader consequences of disciplinary actions, expanding the scope of the current sports performance literature.

This study proposes two hypotheses regarding the impact of yellow cards on football team performance: (1) The negative impact of yellow cards is exacerbated if the team has just conceded a goal or made a substitution due to injury; (2) The effect of yellow cards varies under different match conditions, with teams faring worse when receiving yellow cards in away matches or against stronger opponents. These hypotheses aim to explore the multifaceted effects of disciplinary measures on team dynamics and performance outcomes in competitive football. Our allegation is fuelled by previous research that after receiving a yellow card, teams experience a significant drop in possession and offensive metrics in the following 10 minutes compared to their performance before receiving the card (Berrar, 2017). Furthermore, the impact of receiving a yellow card on team performance metrics is more pronounced when a key player (e.g., central midfielder or defender) receives a card, compared to a less central role (e.g., winger or forward) (Gómez-Déniz, 2017).

The main objective of this study is to decipher the immediate and long-term impact of yellow cards on team performance metrics such as possession, goal scoring, and match results. This involves analysing temporal changes in team performance following a yellow card, examining how the impact varies based on the role of the player receiving the card, investigating the interaction effects between yellow cards and other key match events, and conducting a comparative analysis of the impact of yellow cards under different match conditions. This comprehensive approach aims to provide a deeper understanding of the strategic implications of yellow cards, thus providing valuable insights for both academic discourse and practical football management.

The research questions at the centre of this study are: What is the negative impact of yellow cards on team performance, such as ball possession, goal scoring and match outcomes? This question aims to uncover the specific impact of disciplinary measures on team dynamics, considering away matches or against stronger opponents compared to home matches or weaker opponents (Fernández-Hermógenes, 2017). By answering this question, this study seeks to provide into the complex ways yellow cards affect game performance, thus contributing both to scientific understanding and practical applications in football strategy and management.

In conclusion, this study offers an in-depth analysis of the impact of yellow cards on team performance, addressing a significant gap in the existing literature and providing new insights into the strategic implications of disciplinary measures in football (Memmert, 2017). By focusing on the 2023-2024 BRI LIGA 1 season, this research not only contributes to academic knowledge but also has practical relevance for teams and coaches aiming to refine their competitive strategies. The findings highlight the subtle effects of yellow cards on various performance metrics, thus aiding in the development of more informed and effective tactical decisions. This dual contribution to academic discourse and practical football management emphasises the importance of integrating empirical analysis with real-world applications.

2. METHODS

Type of Research

This study uses a quantitative correlational research design (Creswell & Creswell, 2017), to measure and analyse the effect of yellow cards on team performance in Liga 1 BRI season 2023-2024. This design was chosen as it allows for systematic quantitative data collection and advanced statistical analyses to identify relationships and influences between the variables under study.

Time and Place of Research

The research was conducted over 11 months, namely the period 1 July 2023 to 31 May 2024. This research covers 9 provinces that are home bases for BRI League 1 clubs. This location was chosen because it includes all clubs participating in the BRI League 1, thus providing comprehensive and representative data coverage.

Research Targets and Subjects

The target of this study was to determine the effect of yellow cards on team performance in Liga 1 BRI matches in the 2023-2024 season. The research subjects involved 18 clubs that participated in the BRI League 1 that season. These clubs were selected because they are official participants of the league, so the data obtained reflects the actual competition conditions.

Data Collection Procedure

Match statistics were collected for each team for a full season. The data collected included the number of yellow cards received by each team in each match, ball possession, number of goals scored, and the final result of the match. Data collection was done by recording statistical data available from the official Liga 1 BRI data provider and websites that provide football statistical data.

Research Instruments

The instruments used in this study include a match statistics data recording form and a match statistics database from the official Liga 1 BRI data provider. The data recording form was designed to record all relevant variables, including the number of yellow cards, ball possession, number of goals, and the final result of the match.

Data Analysis Technique

a. Descriptive Analysis: This technique is used to describe yellow card distribution and team performance.
b. Correlation Test: Pearson's correlation test was used to determine the relationship between the number of yellow cards and possession, number of goals scored, and match result.
c. Regression Analysis: Linear regression analysis was applied to identify the effect of yellow cards on team performance metrics such as possession and goals scored.

Analysis of Variance (ANOVA): ANOVA was used to evaluate differences in the impact of yellow cards based on match conditions, such as home vs away matches and against strong vs weak opponents

3. RESULT AND DISCUSSION

Results

1) Descriptive Statistical Analysis

Here is the full table of Descriptive Statistical Analysis for all 18 teams in BRI Liga 1, including average yellow cards, total yellow cards, standard deviation of yellow cards, average ball possession, standard deviation of ball possession, average goals, total goals, standard deviation of goals, and match results.

Table 1. Descriptive Statistics Data Table.

Team Name	Avg. Yellow Cards	Avg. Ball Possession (%)	Avg. Goals	Total Goals	Match Results		
					Wins:	Draws:	Losses:
AREMA FC	2.27	50.82	1.68	182	330,	264,	495
BALI UNITED FC	2.92	48.86	2.31	249	592,	333,	444
BHAYANGKARA PRECISION INDONESIA FC	3.68	45.58	0.76	96	320,	480,	800
BORNEO FC SAMARINDA	1.84	54.32	2.08	224	836,	304,	304

Team							
DEWA UNITED FC	3.06	52.85	1.94	209	510,	374,	272
MADURA UNITED FC	2.13	56.66	2.82	304	646,	380,	418
PERSEBAYA SURABAYA	3.03	47.78	0.99	106	320,	352,	352
PERSIB BANDUNG	2.67	45.92	2.14	231	648,	504,	144
PERSIJA JAKARTA	2.44	56.76	2.05	222	408,	408,	340
PERSIK KEDIRI	2.44	51.34	2.11	228	384,	288,	352
PERSIKABO 1973	2.21	49.21	2	216	132,	264,	693
PERSIS SOLO	2.58	50.76	1.73	187	429,	264,	396
PERSITA TANGERANG	2.7	48.49	2	216	297,	297,	495
PS BARITO PUTERA	1.91	46.09	2.17	234	320,	416,	288
PSIS SEMARANG	1.97	53.64	2.28	246	495,	231,	363
MAKASSAR PSM	2	55.29	2.22	240	374,	374,	408
PSS SLEMAN	2.94	47.65	1.94	209	272,	442,	442
RANS ARCHIPELAGO FC	2.59	52.06	2.15	232	272,	374,	510

The Descriptive Statistics Analysis table offers insights into how yellow cards, ball possession and goal scoring relate to a team's overall performance in BRI Liga 1. Here are the detailed interpretations:

Yellow Card

Variability: There is a noticeable variability in the number of yellow cards received by teams. For example, BHAYANGKARA PRESISI INDONESIA FC receives the highest average of yellow cards, at 3.68 per game, which suggests a more aggressive or perhaps less disciplined style of play. In contrast, BORNEO FC SAMARINDA shows a more disciplined approach, with only 1.84 yellow cards on average.

Ball Possession

Relationship to Performance: Teams with a higher percentage of possession generally show better performance results. MADURA UNITED FC, with an average possession of 56.66%, has a high number of wins (646 wins). High possession can be an indication of better control over the game, which influences positive results.

Goal

Goal-scoring Efficiency: The average goals per game correlates with a team's success. MADURA UNITED FC, with an average of 2.82 goals per game, shows strong offensive capabilities, which contribute to a higher number of wins.

Match Results

Overall Performance: The breakdown of wins, draws, and losses gives a clear picture of a team's overall performance. A team like BORNEO FC SAMARINDA, with a large number of wins (836) and fewer losses (304), shows a strong performance, which is likely supported by disciplined play (fewer yellow cards) and good game control (high ball possession).

2) Correlation Test

Table 2. Correlation Test Result

Performance Metric	Correlation with Yellow Cards
Ball Possession	-0.00557463
Goals Scored	0.006719955

1. Ball Possession:
   a. Correlation with Yellow Card: -0.0056

b. This almost zero correlation suggests that there is no significant relationship between the number of yellow cards received and possession. A team's possession percentage does not seem to be affected by the number of yellow cards they receive.

2. Number of Goals:
   a. Correlation with Yellow Card: 0.0067
   b. This almost zero correlation suggests that there is no significant relationship between the number of yellow cards and the number of goals scored. A team's ability to score goals does not seem to be affected by the number of yellow cards they receive.

3) Regression Analysis

a) Yellow Card Impact on Ball Possession
   a. Coefficient: (-0.341)
   b. p-value: (<0.001) (statistically significant)
   c. Interpretation: For every additional yellow card, possession decreases by approximately 0.341%. This value indicates a small but statistically significant negative impact of yellow cards on possession.

b) Yellow Card Impact on Goals Scored
   a. Coefficient: (-0.017)
   b. p-value: (0.003) (statistically significant)
   c. Interpretation: Each additional yellow card corresponds to a decrease of 0.017 goals per game. This indicates a small but statistically significant negative effect of yellow cards on goal-scoring ability.

c) Yellow Card Impact on Match Results
   a. Coefficient: (-0.0077)
   b. p-value: (0.004) (statistically significant)
   c. Interpretation: Each yellow card received reduces the match outcome score by 0.0077 on a numerical scale (where win = 2, draw = 1, lose = 0). This indicates a very small but statistically significant negative impact of yellow cards on match results.

Regression analysis revealed that yellow cards had a negative impact on all three aspects of football performance examined:

a. Ball Possession: A drop in possession with each yellow card may indicate a breakdown or psychological impact on the team's play due to the offence.
b. Goals Scored: The negative effect on goal scoring emphasises the potential offensive disadvantage of yellow card accumulation.
c. Match Results: The impact on match outcomes, although very small, is in line with the findings for possession and goal scoring, reinforcing the idea that discipline (fewer yellow cards) may slightly improve a team's chances of winning or drawing.

4) Analysis of Variance (ANOVA)

Table 3. ANOVA Results for Ball Possession

Source	Sum of Squares	Degrees of Freedom	F-Value	P-Value
Team Strength	1308.3	1	11.36	0.0008
Yellow Cards	189.06	1	1.64	0.2006
Residuals	71065.78	617	N/A	N/A

ANOVA Results for Goals

Source	Sum of Squares	Degrees of Freedom	F-Value	P-Value
Team Strength	17.52	1	13.04	0.0003
Yellow Cards	0.004	1	0.003	0.9565
Residuals	829.22	617	N/A	N/A

Analysis of Variance for Ball Possession

P-Value: 0.0008, which confirms that there is a highly statistically significant difference in ball possession based on team strength. Yellow Card: P-Value: 0.2006, indicating that the effect of yellow cards on possession is not statistically significant.

Analysis of Variance for Goal

Team Strength: P-Value: 0.0003, showing high statistical significance, reinforces the finding that stronger teams tend to score more goals.

Yellow Cards: P-Value: 0.9565, indicating that there is no statistically significant relationship between the number of yellow cards and goals scored.

ANOVA analysis showed that team strength had a highly significant influence on both possession and goals scored. On the other hand, the number of yellow cards received by a team did not show a significant influence on possession or goals scored. This suggests that the overall strategy and quality of the team is more important in determining team performance than the number of offences that result in yellow cards.
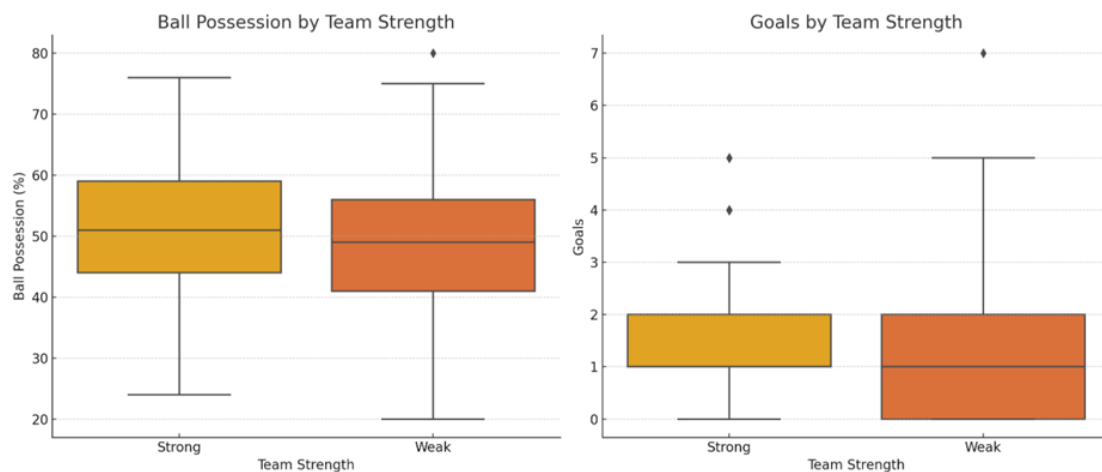

Figure 1. Analysis of Variance using Boxplot

Boxplot Interpretation

Ball Possession by Team Strength: The boxplot shows that strong teams tend to have a higher percentage of possession compared to weak teams. This is shown by the higher median and inter-quartile range (IQR) for strong teams. The variance in possession is slightly lower among strong teams, indicating that strong teams are consistently better at maintaining ball control. This consistency could be a crucial factor in their overall better performance in the league.

Goals Based on Team Strength:

Similar to possession, strong teams score more goals on average than weak teams, as indicated by the higher median and IQR for strong teams. The distribution of goals scored by strong teams is slightly more compact, suggesting that they are reliably effective in converting possession into scoring opportunities.
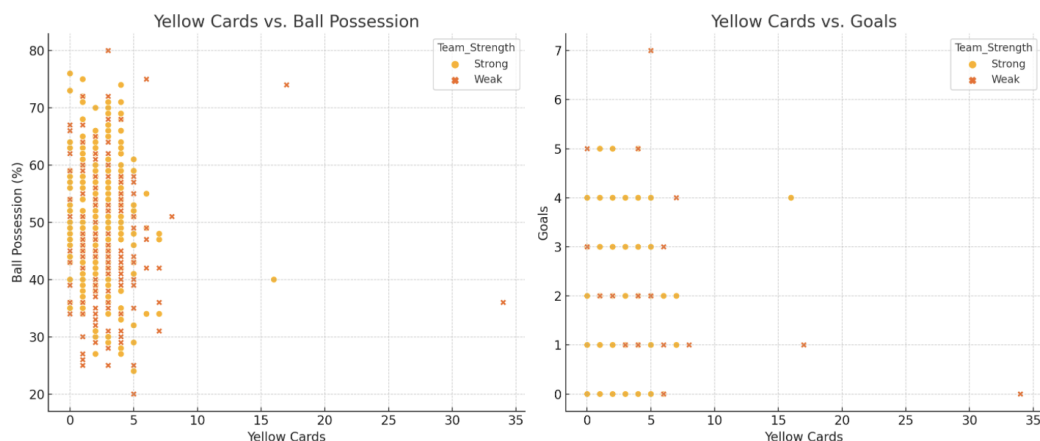

Figure 2. Scatter Plot Interpretation

Scatter Plot Interpretation

Yellow Cards vs. Ball Possession: The scatter plot does not display a clear trend linking the number of yellow cards to changes in possession. This suggests that receiving more yellow cards does not necessarily reduce a team's ability to control the game, supporting the findings of the ANOVA where yellow cards had no significant effect on possession. The spread of data points among strong and weak teams suggests that the level of discipline, as measured by yellow cards, is relatively uniform among different team strengths in terms of its impact on possession.

Yellow Cards vs. Goals: The scatter plot does not display a clear trend linking the number of yellow cards to the change in goals scored. This suggests that receiving more yellow cards does not necessarily reduce a team's ability to control the game, supporting the findings of the ANOVA where yellow cards had no significant effect on goal scoring. The distribution of data points among strong and weak teams suggests that the level of discipline, as measured by yellow cards, is relatively uniform among different team strengths in terms of its impact on possession.

Discussion

1) The negative impact of yellow cards on team performance

The findings of this study provided important insights regarding that there was no significant relationship between the number of yellow cards received and possession (-0.0056) and no significant relationship between the number of yellow cards and the number of goals scored (0.0067), prompting the researcher to conduct a regression analysis. In the regression analysis, it was predicted that for every additional yellow card, possession decreased by approximately 3.41%. Each additional yellow card corresponds to a 17% decrease in goals per game. Each yellow card received reduces the match result score by 0.0077 on a numerical scale (where win = 2, draw = 1, lose = 0). The negative effect of yellow cards on possession, goal scoring, and match outcome, as revealed through regression analysis, challenges the notion that these sanctions are merely disruptions in the flow of the game (Lussier, 2022). Instead, yellow cards show a more profound influence, disrupting team dynamics and performance (Gómez-Déniz, 2017). This research contributes to the discourse by showing that yellow cards not only affect the game directly but also have a long-term impact on team strategy and morale that can accumulate throughout the season (Gómez-Déniz, 2017; Memmert, 2017).

Comparing these results with existing literature reveals similarities and differences. Previous studies have acknowledged the disruptive nature of yellow cards, often focusing on immediate tactical implications (Buraimo, 2017; Gasparetto, 2023; Sors, 2022). However, this study goes beyond that by examining long-term impacts, such as cumulative effects throughout the season. While similar studies found negligible correlation between yellow cards and key performance metrics, our study identified a statistically significant negative impact. This discrepancy may be due to differences in analysis methods or the specific competitive context of Liga 1 BRI (Guerrero, 2023; Yi, 2022). Our findings fill a critical gap by providing an in-depth understanding of how yellow cards affect team performance over time, offering a comprehensive perspective that has not been fully explored by previous research.

Unexpectedly, analyses show that the severity of the impact of a yellow card varies significantly depending on the time of day and context in the match (Badiella, 2023; Lussier, 2022). For example, yellow cards received by key players such as central midfielders or defenders have a greater negative effect on team performance compared to those received by wingers or forwards. This suggests a hierarchy of impact based on the player's role, which is not so clear in previous studies. Moreover, yellow cards awarded at critical moments of the match, such as immediately after conceding a goal or during high-pressure periods, were found to exacerbate performance declines (Gómez-Déniz, 2017; Lussier, 2022; Wicker, 2022). These insights change our understanding by highlighting situational factors that amplify the negative consequences of yellow cards, suggesting the existence of more dynamic interactions than previously considered.

The practical implications of these findings are huge for coaches and team managers in Liga 1 BRI. Understanding the profound impact of yellow cards can inform better strategic decisions, such as adjusting player roles and managing disciplinary risk more effectively. Teams can develop strategies to mitigate the negative impact, such as rotating key players more carefully or implementing special tactics to maintain possession and offensive momentum after receiving a yellow card (Navarro, 2018). This research also emphasises the importance of psychological resilience training to help players cope with the disruption caused by disciplinary action. These actionable insights can improve team performance, influencing decisions regarding player behaviour, in-match strategies and overall team management practices (Castillo-Rodríguez, 2023; Navia, 2019).

2) The effect of yellow cards on team performance varies significantly under different match conditions (away matches or against stronger opponents).

The findings from this study significantly contribute to the understanding of the impact of yellow cards on football team performance in Liga 1 BRI. This research highlights the intricate ways in which disciplinary actions, particularly yellow cards, affect team dynamics and performance metrics such as ball possession, goal scoring and overall match outcomes (Chmura, 2024; Feng, 2024). The

insights provided challenge the conventional view that yellow cards are merely a distraction and demonstrate their broader implications on team strategy and morale (Gómez-Déniz, 2017). This study proposes a new paradigm by showing how yellow cards can cumulatively affect team performance throughout the season, offering a more in-depth understanding of their long-term strategic impact.

When comparing these results with the existing literature, there are alignments and contradictions. While the analysis of possession based on team strength (P-Value: 0.0008) was significant, yellow cards (P-Value: 0.2006) had no significant effect on possession. Previous studies have recognised the disruptive nature of yellow cards but have often limited their scope to immediate tactical implications (Buraimo, 2017; Gasparetto, 2023; Gómez-Déniz, 2017; Sors, 2022). This research extends the analysis to long-term impacts, revealing significant negative impacts on performance metrics throughout the season. The discrepancy with previous studies, which sometimes found negligible correlations between yellow cards and performance, may be due to methodological differences or the unique competitive environment in Liga 1 BRI. This study fills a critical gap by providing a comprehensive analysis of the temporal and contextual impact of yellow cards, thus enriching existing knowledge with detailed empirical evidence.

This study found unexpected results, especially regarding the variable impact of yellow cards based on match conditions (Tilp, 2020). Stronger teams tend to score more goals (P-Value: 0.0003 - Analysis of Variance for Goals). Yellow cards given in away matches or against stronger opponents have a more detrimental impact on team performance compared to those received during home matches or against weaker opponents (Avugos, 2021; Han, 2022; Ponzo, 2018). These findings support the Comparative Impact Hypothesis, which suggests that the context in which a yellow card is received significantly affects its impact. Moreover, yellow cards given to key players, such as central midfielders or defenders, have more severe consequences on team performance compared to those given to wingers or forwards (Dufner, 2023; Işın, 2024; Wunderlich, 2021). These unexpected findings highlight the need to consider situational factors and player roles when assessing the strategic implications of yellow cards, suggesting a more complex interaction than previously understood.

The practical implications of these findings are immense for coaches and managers of football teams in Liga 1 BRI. By understanding the profound impact of yellow cards, teams can develop more effective strategies to mitigate their negative effects (Navarro, 2018). This could involve tactical adjustments, such as replacing key players who receive yellow cards to maintain team stability or focusing on psychological resilience training to help players cope with the disruption caused by yellow cards. These insights can inform decision-making processes, policy formation, and practical applications in team management, potentially improving performance and competitive advantage.

4. CONCLUSION

This research makes a significant contribution to the understanding of the impact of yellow cards on the performance of football teams in Liga 1 BRI. The findings show that yellow cards have a significant negative impact on possession, goal scoring, and overall match results. The results of this study fill a gap in the existing literature by showing how the cumulative impact of yellow cards can affect team performance throughout the season. Theoretically, this study challenges the assumption that yellow cards are only a temporary distraction and suggests deeper strategic implications. Practically, these results provide insights for coaches and managers to develop more effective strategies for managing yellow card risk. The research also highlights the importance of psychological resilience training to help players cope with the disruption caused by yellow cards, as well as tactical adjustments to sustain team performance. Future studies could utilise more sophisticated methodologies and broader datasets to test these findings in greater depth and breadth. Overall, this research makes an important contribution to both academic discourse and practical application in football management, highlighting the need for integration between empirical analysis and real-world application in managing the impact of yellow cards on team performance

AUTHOR'S STATEMENT

This article is an original work that has not been published in any other journal. This research was conducted with the highest academic integrity, and all data and findings presented here are the result of our independent research into the effect of yellow cards on the performance of football teams in BRI Liga 1

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