

Exploring Ball Recovery Times in Professional Football: Insights and Patterns

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A. Motivation

Problem Statement:

- Limited understanding of how key match events (e.g., substitutions, injuries) influence ball possession [1-3].
- Coaches still depend on handwritten notes to develop and archive strategies, creating inefficiencies [4].
- The vast volume of raw match data prevents extraction of clear, actionable insights, underscoring the need for a digital, simple, and interactive dashboard [5].

Solution:

- Interactive visual dashboard that consolidates and displays match events and ball-possession data.
- Delivers novel insights into how ball possession correlates with goals, substitutions, injuries, and other pivotal scenarios.

B. Research Question

What **match key events**¹ impact the time required to **recover ball possession** in elite football?

1. events include goals, own goals, substitutions, yellow/red cards, injuries, and tactical shifts

C. Methodology

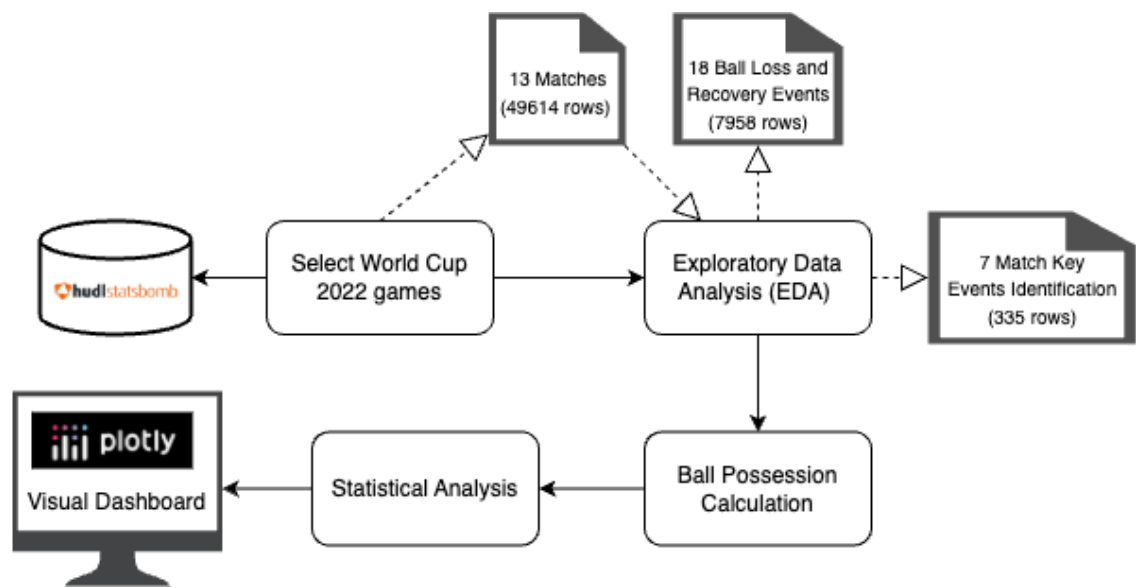


Figure 1. Overview of the research workflow

- Rule-based Event Classification Algorithm
- Statistical Analysis:
 - Shapiro-Wilk (normality)
 - Mann-Whitney U (group difference)
 - Cliff's Delta (effect size and direction)
- Visual Dashboard

D. Results

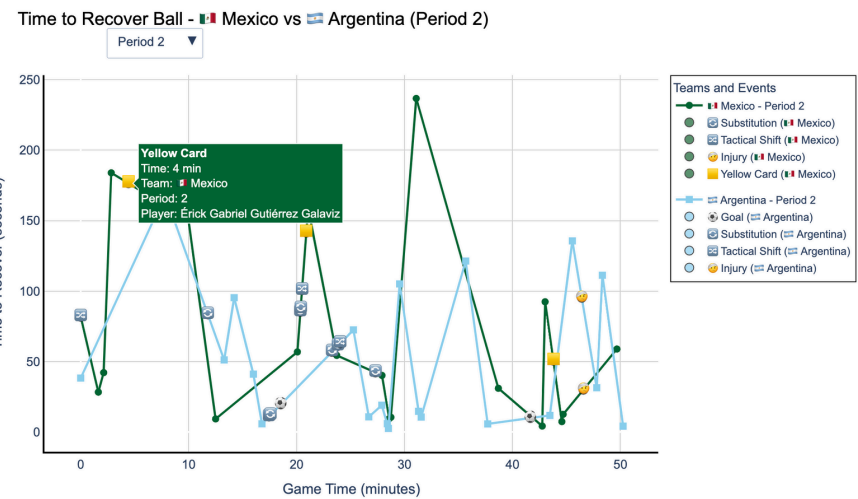


Figure 2. Recovery-game time curve

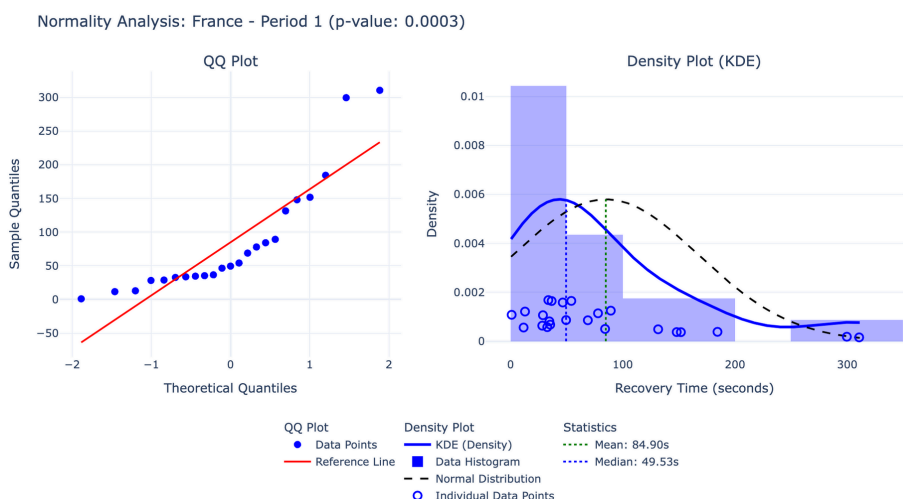


Figure 3. Normality assessment for the time to recover the ball

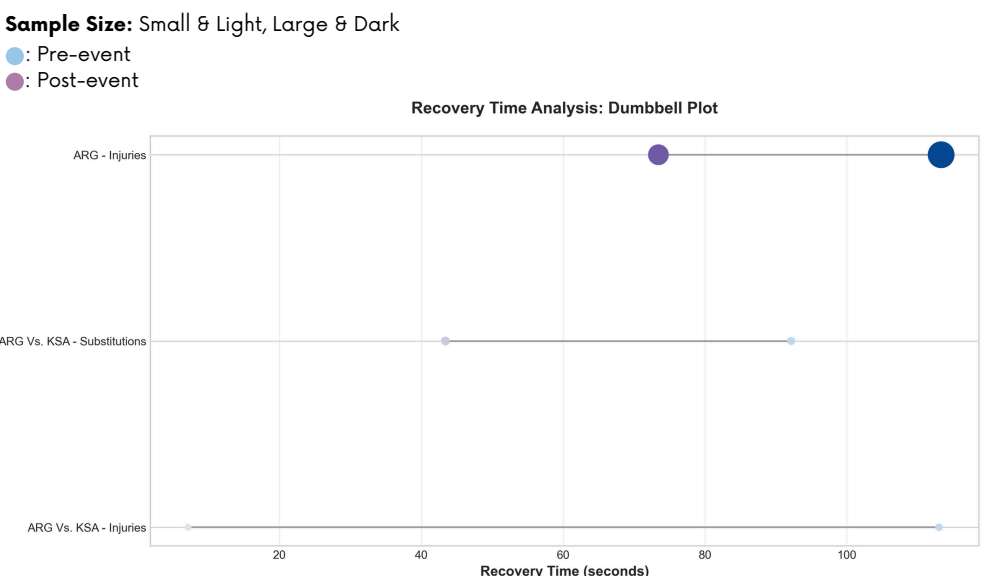


Figure 4. Statistically significant events dumbbell plot

Argentina - Team Analysis	
Key Findings	
• Injuries: Recovery times are significantly faster after injuries.	
• Substitutions: Recovery times are significantly faster after substitutions.	
• Injuries: Recovery times are significantly faster after injuries.	
Detailed Event Analysis (All Matches)	
All Goals: No significant overall impact found for all goals, though there was an increase in average recovery time (42.31 to 86.46).	
Injuries: Across all matches, the team has significantly faster recovery times after injuries with a small effect size (Cliff's Delta: 0.2838). Average recovery time decreased from 113.31 seconds before to 73.44 seconds after injuries.	
Substitutions: No significant overall impact found for substitutions, though there was a decrease in average recovery time (79.04 to 63.11).	
Tactical Shifts: No significant overall impact found for tactical shifts, though there was a decrease in average recovery time (79.80 to 61.47).	
Yellow Cards: No significant overall impact found for yellow cards, though there was an increase in average recovery time (66.43 to 79.33).	

Figure 5. Statistical analysis key findings

Statistical Summary: Recovery Time Analysis					
Analysis	N (pre → post)	Δ (mean)	Cliff's δ	95% CI	p(BH)
ARG - Injuries	79 → 60	-39.9 s	0.28	[0.11, 0.46]	0.021
ARG Vs. KSA - Substitutions	14 → 18	-48.7 s	0.49	[0.13, 0.79]	0.030
ARG Vs. KSA - Injuries	12 → 6	-105.9 s	1.00	[1.00, 1.00]	0.003

Table 1. Events with statistically significant impact

References

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