BYU Men's Soccer Statistical Research

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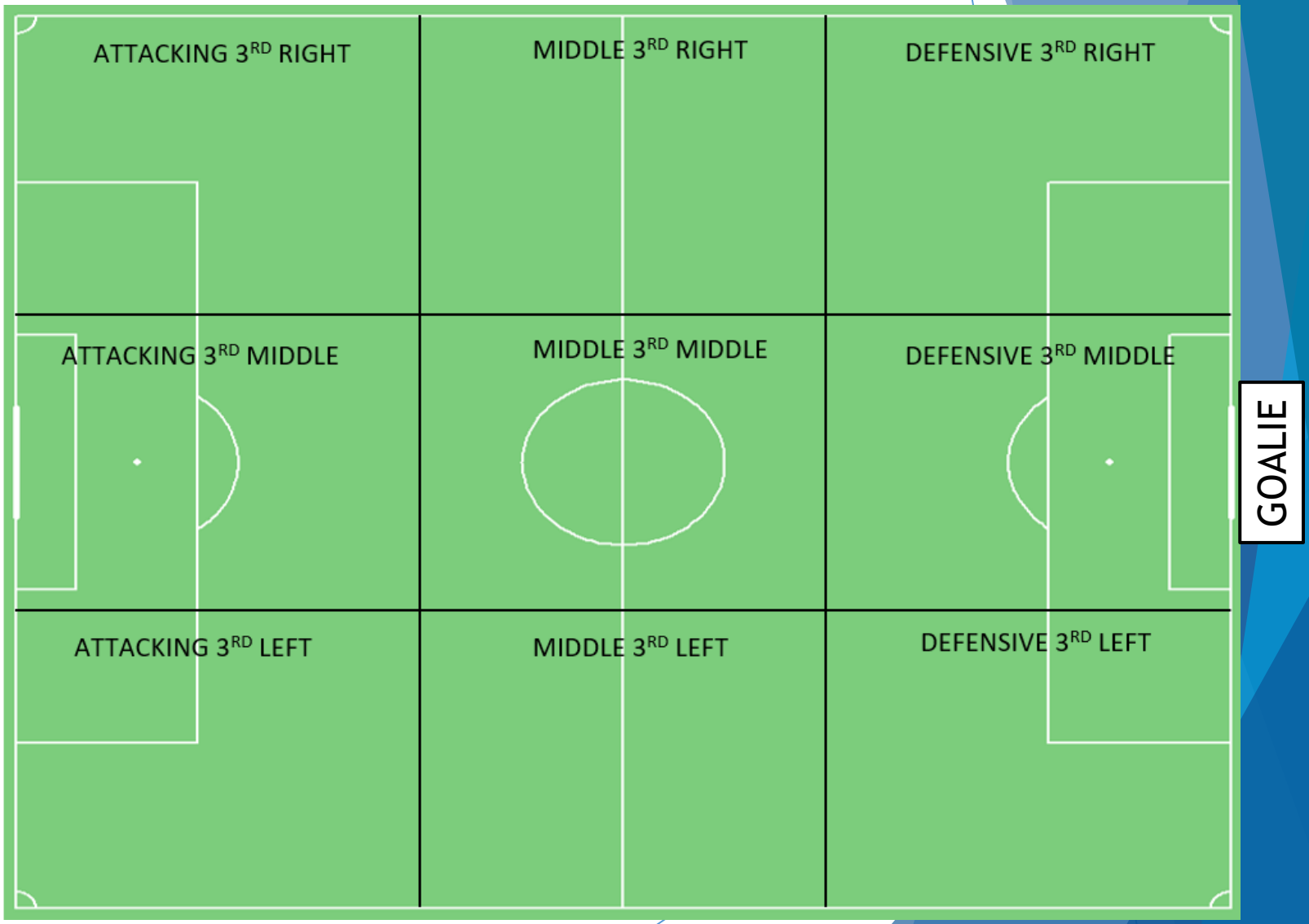
Background on BYU's Performance

- BYU plays in the *Collegiate Club Division* of soccer and have put up an impressive performance over the last two years since joining this division:
  - They remain undefeated in Club play with an unbeaten streak of 31 games in their league alone
  - After winning the 2017 national championship, BYU made another great run in the *National Intramural and Recreational Sports Association* (NIRSA) Tournament this past season where they advanced to the Elite 8.

Location of Play Zone Breakdown

- ***Important Terms:***
- **Attacking 3rd** = the third of the pitch with the opponent's goal
- **Middle 3rd** = the middle third of the pitch
- **Defensive 3rd** = the third of the pitch where a team defends their own goal



Scoring Zone Breakdown

- ***Important Terms:***
- **Inside 6** = The area inside the 6-yard box
- **Inside 18** = The area inside the 18-yard box
- **Outside 18** = The area outside the 18-yard box

Research Inquiries/Methods

- Hypothesis Questions:
  - Where in the Attacking 3rd is BYU most effective at taking shots on goal? At scoring goals?
  - What type of play is the most effective start of build-up to lead to a score?
  - Where on the pitch is BYU most effective at creating goals?

- Data collection methods:
  - Data collected from watching film of BYU's 6 home games in the Collegiate Club Division
  - R, Plotly, Excel, CSV, YouTube Film

Methods of Data Collection: Shots

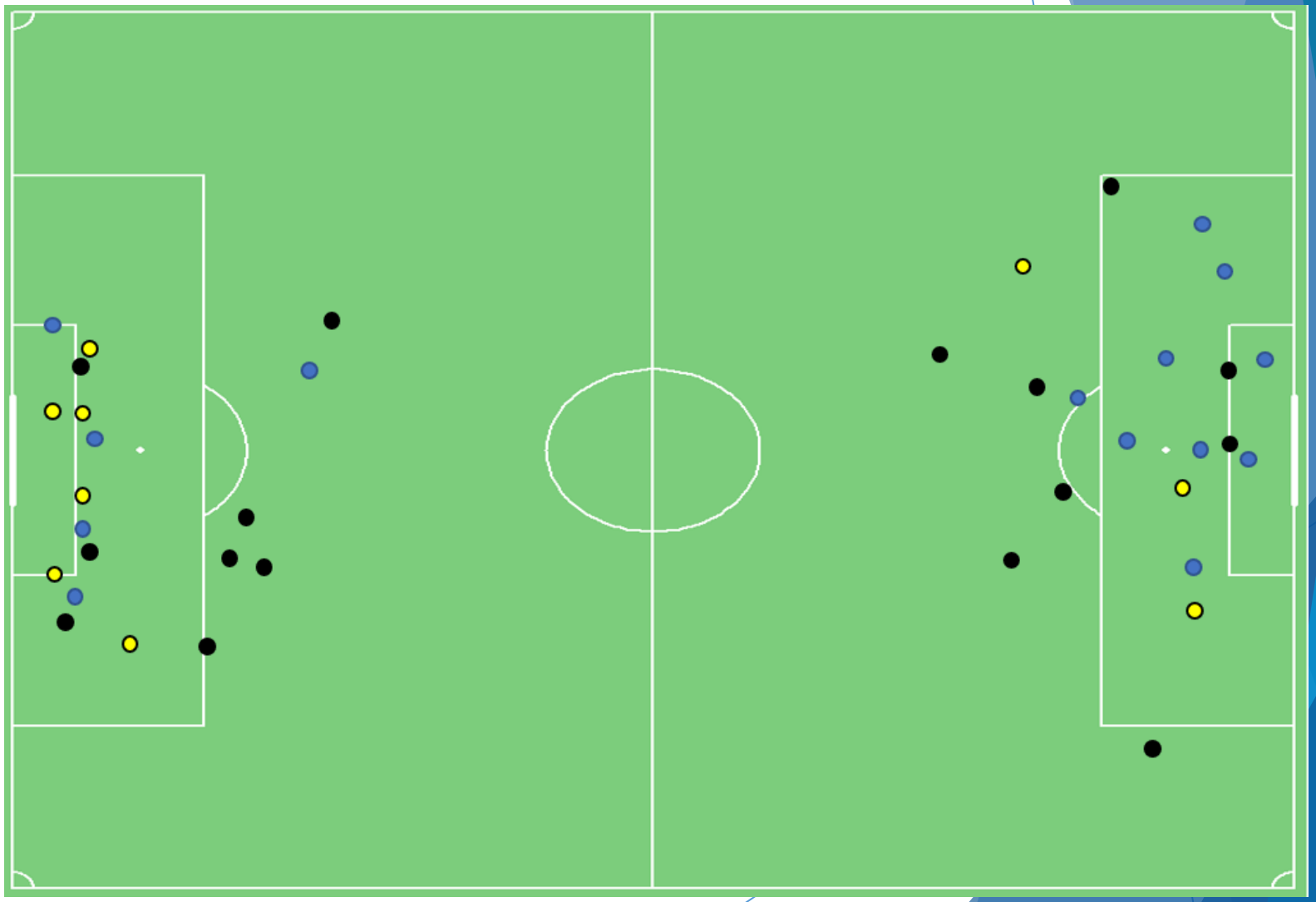
- Shot Plot from the BYU v SUU game

  (1st Half on the Right)

= Miss

= Shot on Goal

= Goal



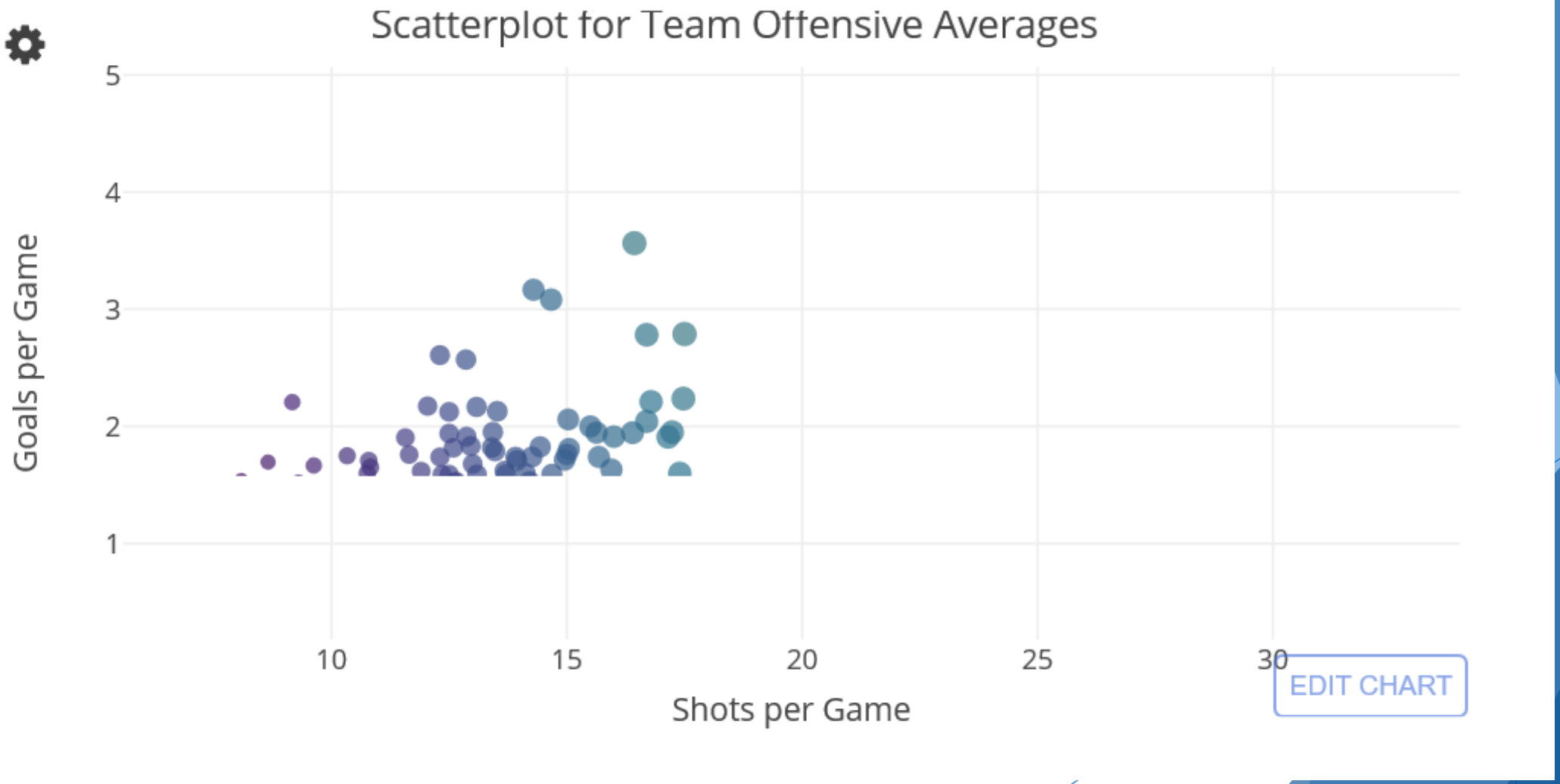
BYU Shot Efficiency Summary Statistics

- Number of Shots = 193
- Shots on Goal = 112
- Goals = 46

- **Overall Offensive Efficiency Statistics**
  - $Shot\ Efficiency = \frac{Shots\ on\ Goal}{Number\ of\ Shots}$
    - ***SE for BYU = 58.03%***

  - $Goal\ Efficiency = \frac{Goals}{Number\ of\ Shots}$
    - ***GE for BYU = 23.83%***

Comparing BYU to Professional Teams



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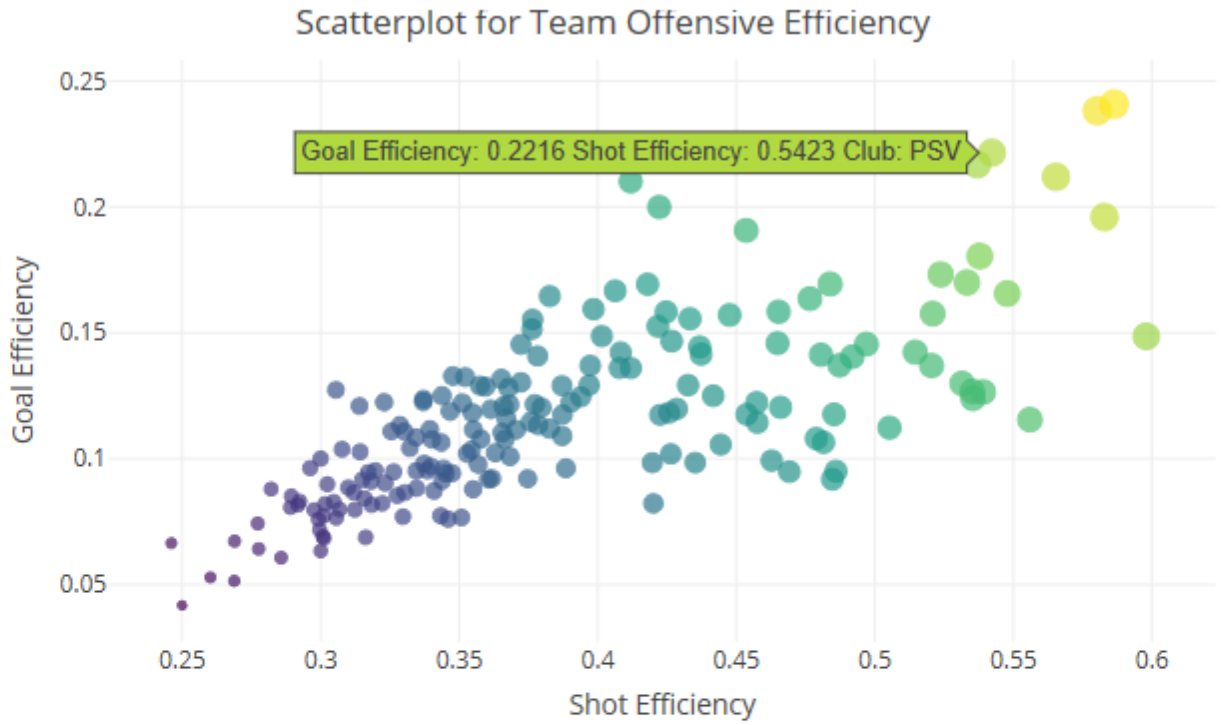

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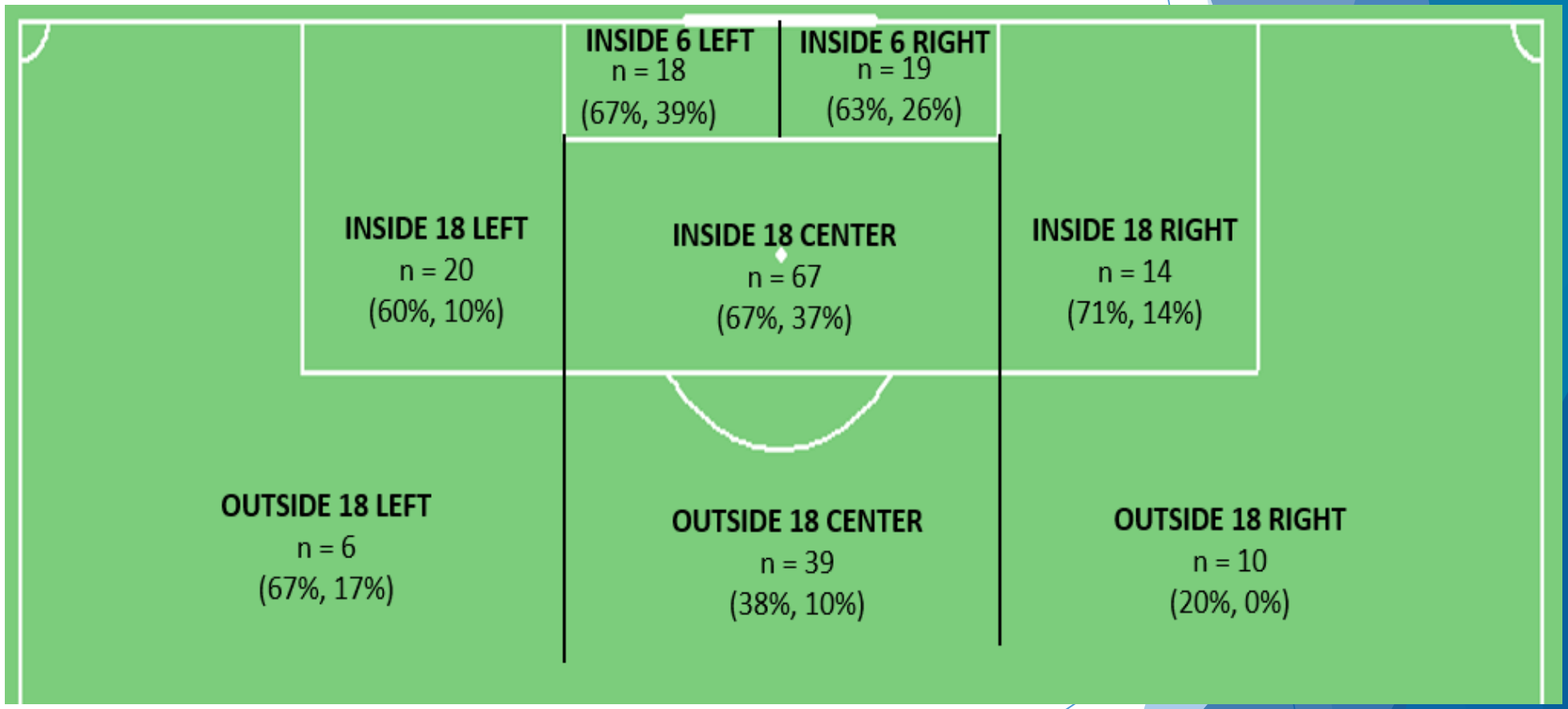
Maximization of Shot Efficiency

- n = Number of shots from each zone
- (SE%, GE%)
- **Max Number of Shots:** Inside 18 Center (*n = 67*)
- **Max SE%:** Inside 18 Right (*SE = 71%)*
- **Max GE%:** Inside 6 Left (*GE = 39%*)



Statistical Analysis on Shot Efficiency

- For each scoring zone in the Attacking 3rd, we conducted a one-sample z test with $\alpha = .05$:
  - $\boldsymbol{H_0}: GE = .2383$ ***Significant Zone(s):*** *Inside 18 Center (P-value = .0048)*

    $\boldsymbol{H_A}: GE > .2383$

    *.2383 = mean goal efficiency across all zones
  - $\boldsymbol{H_0}: GE = .2383$ ***Significant Zone(s):*** *Outside 18 Right (P-value = .0048)*

    $\boldsymbol{H_A}: GE < .2383$ *Outside 18 Center (P-value = .0233)*

*

  - $\boldsymbol{H_0}: SE = .5803$ ***Significant Zone(s):*** *Outside 18 Right (P-value = .0074)*

    $\boldsymbol{H_A}: SE < .5803$ *Outside 18 Center (P-value = .0066)*

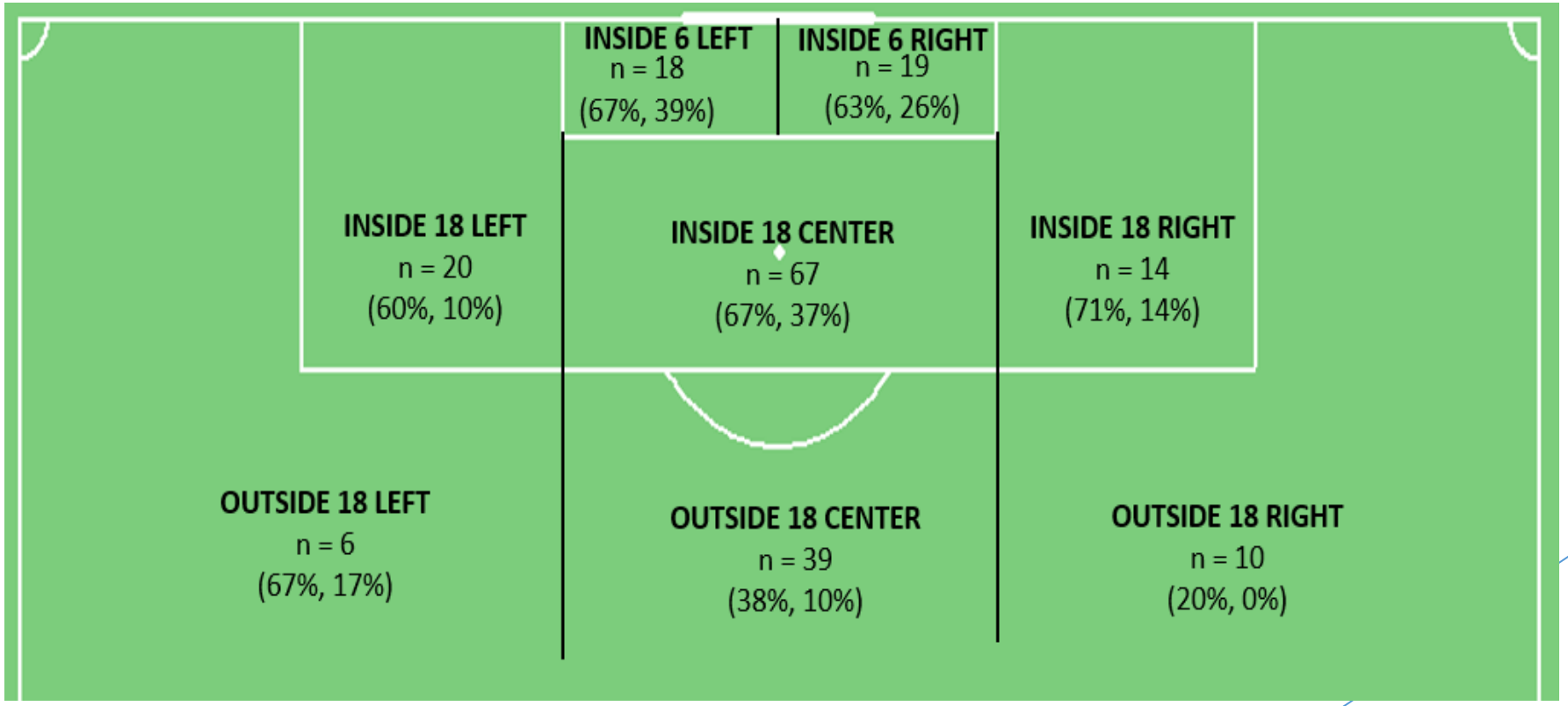
*Summary: The **Inside 18 Center Zone** was the best zone for scoring (Goal Efficiency) for BYU while the **Outside 18 Right and Center Zones** proved to be the lowest zones for both shot accuracy and goal scoring.*

Statistical Conclusions on Shot Efficiency

- With these results, at the $\alpha = .05$ level, we can reject the null hypothesis for these scoring zones and conclude the following:
  - The Goal Efficiency for the **Inside 18 Center** *(.37, n = 67)* was significantly higher than the **Overall Goal Efficiency** of *(.2383, n = 193)*
  - The Goal Efficiency for the **Outside 18 Right** *(0, n = 10)* and the **Outside 18 Center** *(.1, n = 39)* was significantly lower than the **Overall Goal Efficiency** of *(.2383, n = 193)*
  - The Shot Efficiency for the **Outside 18 Right** *(.2, n = 10)* and the **Outside 18 Center** *(.38, n = 39)* was significantly lower than the **Overall Shot Efficiency** of *(.5803, n = 193)*

Statistical Summary on Shot/Goal Efficiency by Zone

- *Summary: The **Inside 18 Center Zone** was the best zone for scoring (Goal Efficiency) for BYU while the **Outside 18 Right and Center Zones** proved to be the lowest zones for both shot accuracy and goal scoring.*



Methods of Data Collection: Location of Play

BYU vs Utah (2nd Half)

= Goal Kick

= Throw-In

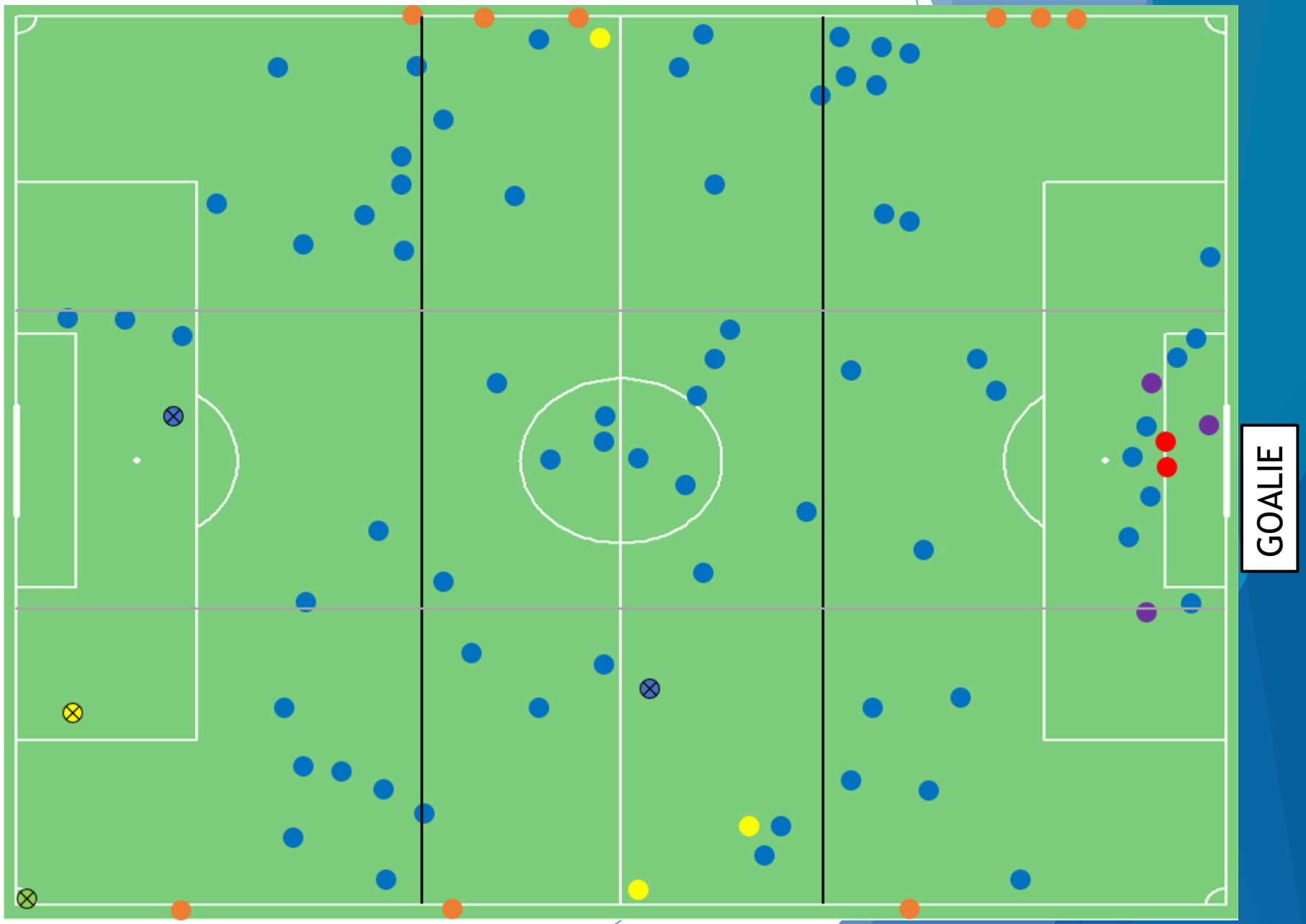
= BYU is Fouled

= Start at Half/Corner

= Steal

= From Keeper

= Start to a Goal



Location of Play Summary Statistics

- *Total Number of Starts of Possession = 996*
  - **Steals = 743 *(75%)***
  - Throw-Ins = 118 *(12%)*
  - BYU is Fouled = 63 *(6%)*
  - Goal Kicks = 32 *(3%)*
  - From Keeper = 30 *(3%)*
  - Start at Half/Corner = 10 *(1%)*

- Overall, a majority of BYU's possessions start as **STEALS**

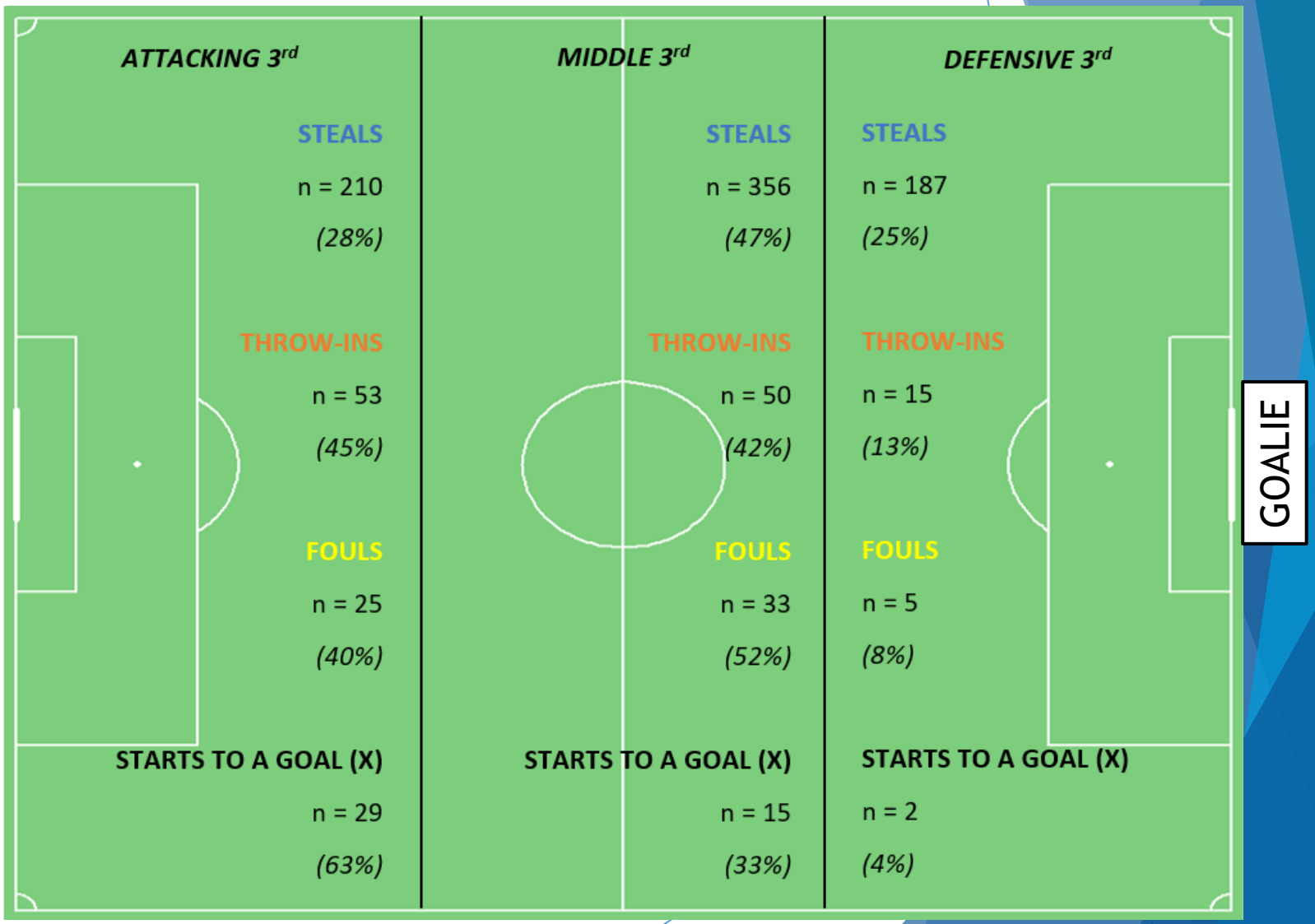
Most Effective Play Type

- BYU had 46 starts of possessions (out of 996) that lead to goals. Here is the breakdown of what *type of possession* led to those goals:
  - Steals = 28 goals *(60.87%)*
  - Fouls = 8 goals *(17.39%)*
  - Throw-Ins = 5 goals *(10.87%)*
  - Corners = 3 goals *(6.52%)*
  - Starts at Half = 1 goal *(2.17%)*
  - From Keeper = 1 goal *(2.17%)*
  - Goal Kicks = 0 goals *(0%)*

- With this breakdown, it is easy to see that BYU is most effective creating goals when they start their possession with a **STEAL**.

Location of Play Breakdown by Thirds

- BYU got a majority of their STEALS and FOULS in the **Middle 3rd**
- BYU got a majority of their THROW-INS from the **Attacking 3rd**
- While BYU may have gotten a majority of their possessions from the **Middle 3rd**, a majority of their possessions that led to goals came from the **Attacking 3rd**

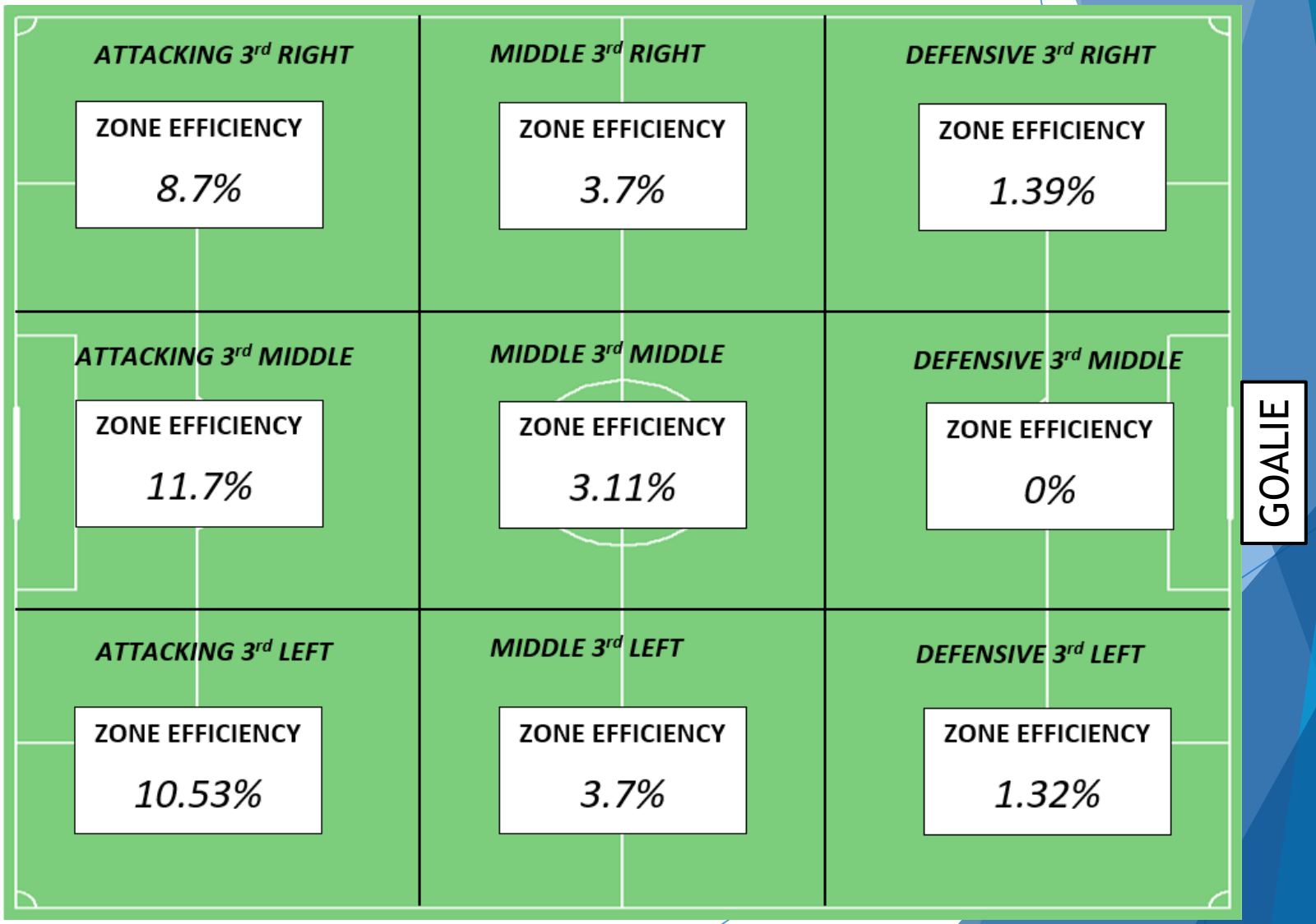


Pitch Zone Efficiency

- The zone where BYU started the highest proportion of their possessions was the **Middle 3rd Middle**, where BYU started ***19.38%*** of their possessions.
- The zone where BYU started the lowest proportion of their possessions was the **Defensive 3rd Right**, where BYU started only ***7.23%*** of their possessions.

Pitch Zone Efficiency

- $ZE = \frac{Starts\ to\ Goals}{Starts\ of\ Plays}$
- BYU created **46** goals from a total of **996** starts of plays. This is equivalent to an Overall Zone Efficiency rating of ***4.62%***
- BYU's most effective zone, in terms of creating goals was the **Attacking 3rd Middle**, where BYU had a Zone Efficiency rating of ***11.7%***



Statistical Analysis on Zone Efficiency

- For each zone on the pitch, we conducted a two-sample z-test for proportions with $\alpha = .05$ comparing one third of the pitch's Zone Efficiency with another third's Zone Efficiency:
  - $\boldsymbol{H_0}: P_A = P_M$ $\quad$ $\boldsymbol{Test\ Statistic} = 3.74$
    $\boldsymbol{H_A}: P_A > P_M$ $\quad$ $\boldsymbol{P\text{-}value} = .0001$
  - $\boldsymbol{H_0}: P_A = P_D$ $\quad$ $\boldsymbol{Test\ Statistic} = 4.97$
    $\boldsymbol{H_A}: P_A > P_D$ $\quad$ $\boldsymbol{P\text{-}value} < .0001$
  - $\boldsymbol{H_0}: P_M = P_D$ $\quad$ $\boldsymbol{Test\ Statistic} = 2.33$
    $\boldsymbol{H_A}: P_M > P_D$ $\quad$ $\boldsymbol{P\text{-}value} = .0198$
- There was a statistically significant difference in BYU's ability to turn a play start into a goal based on which zone the play started in. BYU had the greatest likelihood of scoring if the play started in the Attacking 3rd of the pitch (p-value<.0001, Zone Efficiency = 10.31%).

Tactical Conclusions

- In the Attacking 3rd, BYU is most effective at getting Goals from the Inside 18 Center Zone
  - *(Goal Efficiency = 37%)*
- BYU's most effective start of possession, in term of creating goals, is a steal
  - *(60.87% of goals came from steals)*
- BYU's most effective area of the pitch for creating goals was the Attacking 3rd
  - *(Zone Efficiency = 10.32%)*

Tactical Conclusions

- Implications for future play:
  - BYU should send the ball forward from the defense and have their forwards go for steals from the opposing teams defense rather than trying to work the ball up from their own Defensive 3rd.
  - BYU should focus on having their forwards play tight defense to win the ball back deep in the opposing side of the field, creating a short field in the Attacking 3rd to allow more starts of possession there.
  - When BYU is in the Attacking 3rd, they should work the ball into the center of the 18 yard box to shoot rather than attempting shots from outside the 18.

QUESTIONS?