# An Empirical Study of Pace and Defensive Metrics in Cloth Dodgeball Across Set Outcomes and Gender

Exploring the Relationship Between Game Speed, Defensive Success, and Set Results

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# 1. Introduction

*Overview of Dodgeball and Research Purpose*

   Competitive dodgeball is a fast-paced game that employs a mix of team strategy and individual performance. There are six different playing formats recognized by the World Dodgeball Federation - Foam, Cloth, Rubber, Beach, Trampoline, and Digital.[1] Our team focused on the Cloth playing format across Men's, Women's, and Mixed matches. Within the Cloth playing format, matches are composed of two 20-minute halves which are further broken up by sets. Sets are three minutes long unless ending by elimination prior to time expiration. Gaining insight into what influences set results in competitive dodgeball can inform strategy and development for teams and individual players alike. Our team's analysis of competitive cloth dodgeball sets focuses on how pace, accuracy, and defensive metrics interact to influence set results - specifically whether a set concludes by elimination or time expiration - across match types. Through this study, we aim to provide actionable insights for teams and players seeking a competitive edge in the Cloth dodgeball format.

*Preview of the Data*

Table 1. Preview of data collected through observation of competitive cloth dodgeball.

| H_TEAM | A_TEAM | GENDER | SET_TIME | HOME_RESULT | FINISH | H_HITS | A_HITS | H_THROW | A_THROW | H_CATCH | A_CATCH | H_OUTS | A_OUTS | H_BLOCK | A_BLOCK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Netherlands | Switzerland | F | 2:26 | W | eliminated | 7 | 1 | 12 | 12 | 0 | 1 | 2 | 7 | 3 | 0 |
| Hungary | Mexico | F | 0:44 | W | eliminated | 6 | 2 | 7 | 3 | 0 | 0 | 2 | 6 | 0 | 0 |
| England | Wales | F | 3:00 | L | timed out | 3 | 4 | 17 | 14 | 1 | 1 | 5 | 4 | 2 | 1 |
| Hungary | Ukraine | F | 0:56 | W | eliminated | 5 | 1 | 10 | 5 | 1 | 0 | 1 | 6 | 2 | 1 |
| Austria | Mexico | F | 1:01 | W | eliminated | 7 | 2 | 14 | 10 | 0 | 1 | 3 | 7 | 2 | 0 |
| Chile | Czechia | Mix | 1:02 | L | eliminated | 0 | 4 | 6 | 9 | 1 | 2 | 6 | 1 | 0 | 0 |
| Czechia | Sweden | F | 3:00 | L | timed out | 2 | 4 | 17 | 16 | 0 | 1 | 5 | 2 | 0 | 4 |
| Scotland | Sweden | Mix | 1:05 | L | eliminated | 3 | 4 | 8 | 9 | 0 | 1 | 6 | 3 | 1 | 0 |
| Hungary | Ukraine | F | 3:00 | W | timed out | 5 | 3 | 20 | 18 | 0 | 1 | 4 | 5 | 2 | 2 |
| Austria | Croatia | Mix | 1:08 | W | eliminated | 3 | 1 | 7 | 11 | 0 | 0 | 1 | 6 | 1 | 1 |

*Data Collection*

   Data collection was performed between April 9 and April 11 of 2025 by each member of our group. Each group member was responsible for collecting 50 observations, where each observation corresponds to one set from a dodgeball match. To ensure a diverse and representative dataset, we intentionally gathered data across women's, men's, and mixed-gender match formats. This variety allows for more comprehensive analysis across different styles of play and team compositions.

   Our group watched matches posted to YouTube by the World Dodgeball Federation (WDBF). The WDBF is the international governing body for association dodgeball, headquartered in Edmonton, Canada. Their YouTube channel features international matches from over 60 member federations across the Americas, Europe, Africa, Asia, and Australia, and showcases competitions such as the Dodgeball World Championships.[2] We organized matches into playlists of 25 matches each, separated by gender format. These matches were randomly

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[1] WDBF Rules Committee

[2] "WorldDodgeballFederation."

selected from the total pool of "Cloth Women's", "Cloth Men's", and "Cloth Mixed" matches that had been posted to their channel. Two group members were assigned to each gender category (Women's, Men's, and Mixed), and divided data collection between the first and second halves of the matches. To ensure random selection of sets within each half, the total number of sets per half was counted, and an online random number generator was used to randomly select two sets from each half. As a result, the final dataset consists of two observed sets per half from 25 different women's matches, 25 different men's matches, and 25 different mixed-gender matches.

The complete dataset has 300 observations across 16 total variables. The variables are a mix of given information, observed, and engineered. Variables that are differentiated between home and away teams use the prefix "H" and "A", respectively. Home team, away team, and gender are variables indicated in the titles of the match videos. The observed variables are SET_TIME, HOME_RESULT, FINISH, hits, throws, catches, outs, and blocks. SET_TIME is observed by subtracting the remaining time at the end of the set from the designated set time at the beginning of the set. HOME_RESULT is observed by determining if the home team won, lost or tied the set. Sets are won when a team has eliminated all players of the opposing team, or a team has more live players than the opposing team after the designated set time runs out. FINISH is observed by determining how the set ended. Elimination is observed when all players from one team are eliminated prior to the designated set time running out. Timed out is observed when the designated set time runs out before all players from one team are eliminated. Hits are observed by counting the number of opponents hit by a team's throws. Throws are observed by counting the number of balls thrown by a team. Catches are observed by counting the number of opponent throws caught by a team. Outs are observed by counting the number of players on a team deemed out. Players may be called out due to being hit, their throw being caught, having an invalid throw attempt, or violations or penalties. Blocks are observed by counting the number of throws by the opposing team that were blocked by a team.

Together, this structured and randomized data collection process ensures that our dataset is balanced across match formats, unbiased in set selection, and includes the key performance metrics needed for analysis. With these 300 observations, we are equipped to investigate how pace, accuracy, and defensive factors interact to influence set outcomes in competitive cloth dodgeball.

## 2. Summary
*Tables*
Table 2. Summary of Categorical Variables

Summary of Categorical Variables

| Variable | Possible_Value | Frequency | Relative_Frequency |
|---|---|---|---|
| GENDER | F | 100 | 33.3 |
| GENDER | M | 100 | 33.3 |
| GENDER | Mix | 100 | 33.3 |
| HALF | 1 | 150 | 50.0 |
| HALF | 2 | 150 | 50.0 |
| HOME_RESULT | L | 143 | 47.7 |
| HOME_RESULT | T | 14 | 4.7 |
| HOME_RESULT | W | 143 | 47.7 |
| FINISH | eliminated | 185 | 61.7 |
| FINISH | timed out | 115 | 38.3 |

Table 2 summarizes the categorical variable in our dataset. Each variable's potential values are displayed along with their frequency and relative frequency.

Table 3. Summary of Numerical Variables

Summary of Numeric Variables

| Variable | Minimum | Maximum | Mean | Standard_Deviation |
|---|---|---|---|---|
| NUM_F | 0.00 | 6.00 | 3.00 | 2.45 |
| NUM_M | 0.00 | 6.00 | 3.00 | 2.45 |
| SET_NUM | 1.00 | 10.00 | 3.93 | 2.13 |
| SET_TIME | 44.00 | 180.00 | 146.14 | 36.14 |
| H_HITS | 0.00 | 7.00 | 3.34 | 1.84 |
| A_HITS | 0.00 | 7.00 | 3.33 | 1.73 |
| H_THROW | 5.00 | 21.00 | 12.82 | 3.47 |
| A_THROW | 3.00 | 22.00 | 12.80 | 3.63 |
| H_CATCH | 0.00 | 5.00 | 0.64 | 0.99 |
| A_CATCH | 0.00 | 5.00 | 0.77 | 1.11 |
| H_OUTS | 0.00 | 8.00 | 3.79 | 1.96 |
| A_OUTS | 0.00 | 7.00 | 3.95 | 1.99 |
| H_BLOCK | 0.00 | 8.00 | 1.53 | 1.45 |
| A_BLOCK | 0.00 | 7.00 | 1.44 | 1.38 |
| ACCURACY | 0.00 | 80.00 | 27.33 | 10.63 |
| H_BLOCK_PCT | 0.00 | 57.14 | 12.27 | 11.47 |
| A_BLOCK_PCT | 0.00 | 53.85 | 11.41 | 10.61 |
| H_CATCH_PCT | 0.00 | 50.00 | 5.62 | 9.16 |
| A_CATCH_PCT | 0.00 | 62.50 | 6.43 | 9.84 |
| PACE | 5.67 | 23.61 | 10.87 | 2.56 |

Table 3 is the table summarizing the numeric variables in our dataset. Notably, SET_TIME was converted to seconds in order to allow proper mathematical calculation. Additionally, the % symbol was removed from variables involving percentages in order to allow for calculation. Each numeric variable's minimum, maximum, mean, and standard deviation is displayed.

*Engineered Variables*

$ACCURACY = \frac{HITS}{THROW}$

$BLOCK\_PCT = \frac{H\_BLOCK}{A\_THROW} , \frac{A\_BLOCK}{H\_THROW}$

$CATCH\_PCT = \frac{H\_CATCH}{A\_THROW} , \frac{A\_CATCH}{H\_THROW}$

$PACE = \frac{THROWS}{SET\_TIME}$

After defining the key performance metrics, we now turn to visual summaries of how these variables interact with set results across Men's, Women's, and Mixed matches.
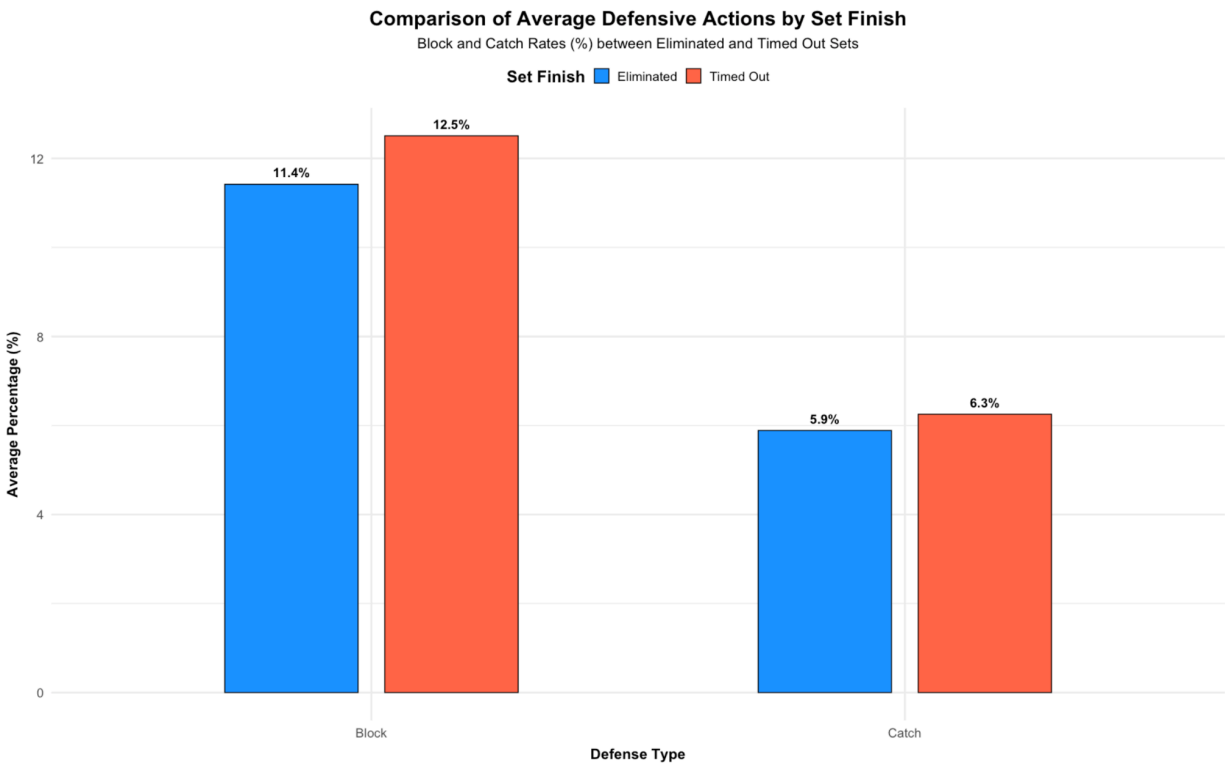
*Figures*



*Figure 1. Comparison of Average Defensive Actions by Set Finish*

The comparative analysis of average block and catch percentages between eliminated and timed-out sets reveals that higher defensive activity is more associated with sets reaching time expiration. As shown in Figure 1, timed-out sets recorded an average block percentage of 12.5% and a catch percentage of 6.3%, slightly higher than the 11.4% and 5.9% observed in eliminated sets. This suggests that while improved defensive performance helps extend the duration of sets, its influence alone is modest. A difference of just over 1% in block rate and less than 1% in catch rate indicates that defense can delay elimination but is not sufficient by itself to secure victory. Teams seeking consistent success must combine defensive resilience with efficient offensive execution to transform extended gameplay into decisive wins.
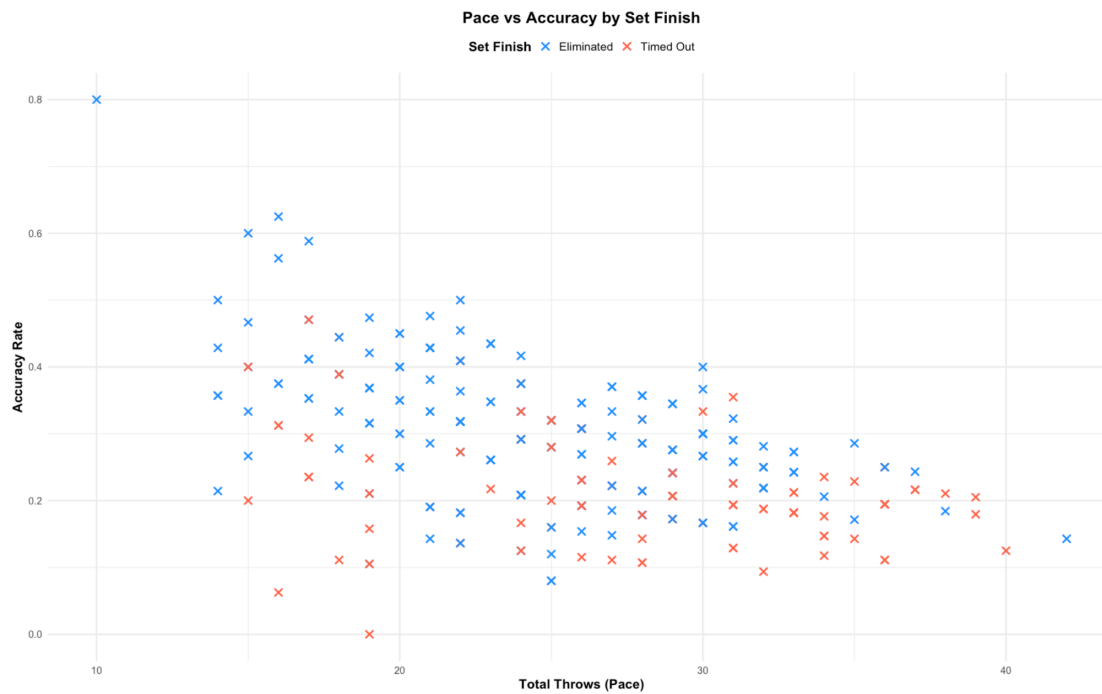


*Figure 2. Pace vs Accuracy by Finish Type*

This figure illustrates the relationship between pace (measured by total throws) and accuracy rate, revealing a negative correlation where increased throwing volume tends to coincide with reduced accuracy. Despite this trend, sets that ended in elimination generally maintained higher accuracy across varying levels of pace, whereas sets that timed out clustered at lower accuracy levels. This suggests that while pace contributes to the intensity and tempo of a match, accuracy plays a more decisive role in determining set outcomes. Teams capable of sustaining accuracy under high-tempo conditions are more likely to convert offensive pressure into eliminations rather than merely extending play to the time limit. These findings emphasize the importance of strategic training that balances throwing volume with precision, as offensive efficiency appears to be a key differentiator in high-level dodgeball performance.
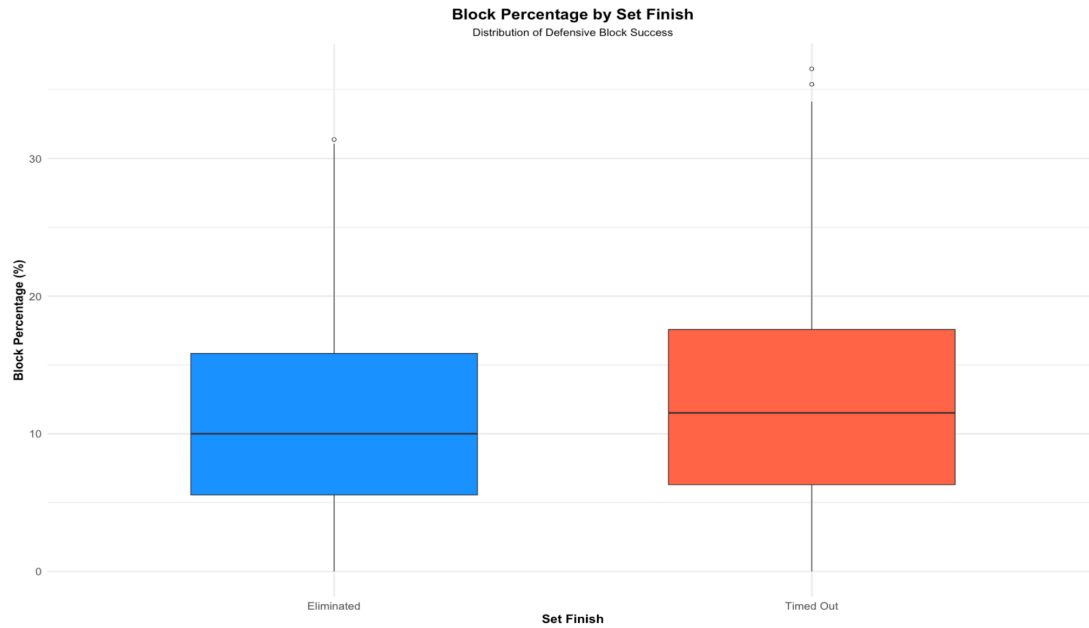
*Figure 3: Block Percentage by Set Finish*

This boxplot compares the distribution of block percentages across sets that ended by elimination versus time expiration. Overall, sets that timed out tend to show slightly higher block percentages than sets that ended by elimination, suggesting that successful blocking may contribute to extending set duration. However, there is considerable overlap between the distributions, indicating that blocking alone is not the sole determinant of set outcome.
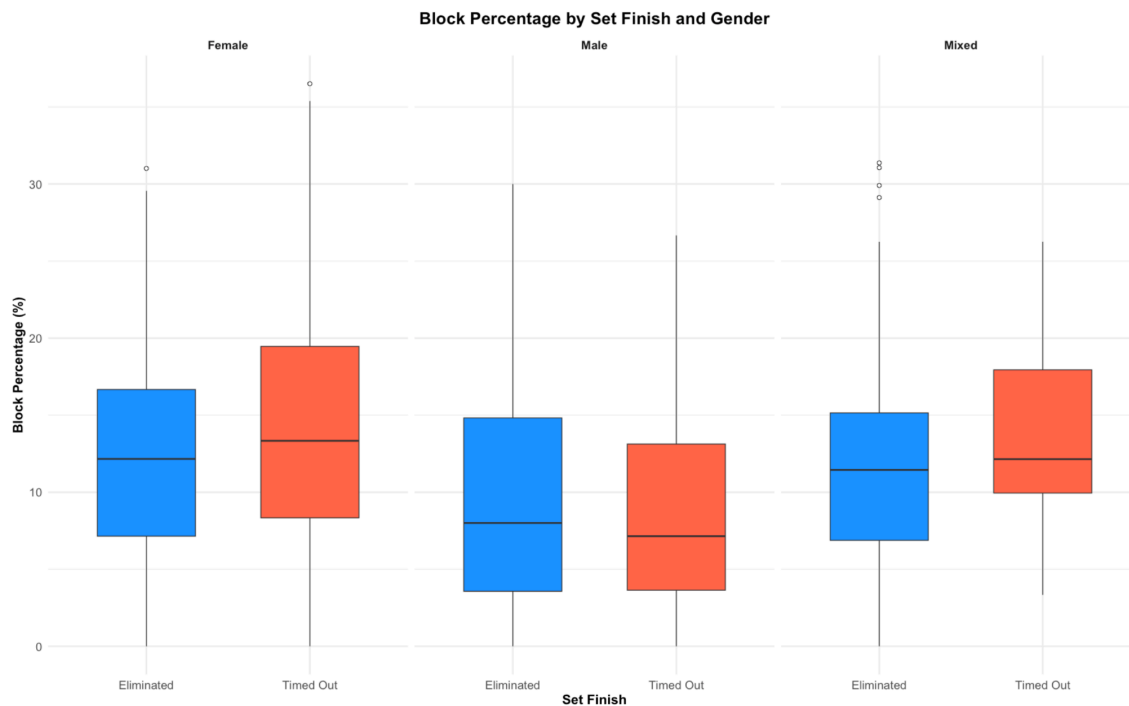


*Figure 4: Block Percentage by Set Finish and Gender*

This faceted boxplot breaks down block percentage distributions by set finish (eliminated or timed out) across gender groups (Women's, Men's, Mixed). Across all genders, timed-out sets generally have a higher median block percentage compared to eliminated sets. Notably, Women's and Mixed matches display slightly higher overall block percentages than Men's matches, reinforcing the idea that matches involving female players may emphasize defensive blocking strategies more heavily.

## 3. Insights

*Insight 1:*

Figure 1 presents a comparative analysis of average block and catch percentages between sets that ended in elimination and those that timed out. The results show that timed-out sets recorded a slightly higher average block percentage (12.5%) and catch percentage (6.3%) compared to eliminated sets (11.4% and 5.9%, respectively). Although these differences are modest, they consistently demonstrate that stronger defensive performance, through successful blocks and catches, correlates with prolonging a set's duration. This trend suggests that teams capable of disrupting offensive plays more frequently are able to survive longer, forcing the game to reach the full time limit without a decisive elimination.

However, the statistical differences observed—just over 1% in block rate and less than 1% in catch rate—imply that while defense can delay elimination, it does not independently drive set victories. Teams that focus primarily on defense may succeed in resisting elimination but may lack the offensive strength needed to capitalize on extended gameplay. As seen in Figure 1, many sets that timed out exhibited higher defensive statistics without achieving offensive dominance. This emphasizes that in competitive dodgeball, resilience alone is insufficient; teams must balance defensive fundamentals with proactive, accurate offensive strategies to secure consistent wins. Improving block and catch efficiency remains valuable, but optimizing transition moments from defense to offense—such as counterattacks following successful blocks—could provide an even greater competitive advantage. Thus, strategic emphasis should be placed not only on sustaining defense but also on leveraging defensive stops into scoring opportunities to maximize set success.

*Insight 2:*

Figure 3 reveals that block percentage was notably higher in sets that timed out compared to those that ended in elimination, particularly in female and mixed-gender groups. This trend suggests that gender composition may influence defensive dynamics, with teams involving female players exhibiting more consistent use of blocking as a means of prolonging play and avoiding elimination. The elevated block percentages observed in these groups during timed-out sets imply a more conservative, defense-oriented style of play that prioritizes survival over aggressive elimination strategies. While male-only groups showed a smaller difference in block rates between outcomes, the divergence in female and mixed divisions indicates that defensive emphasis may be more pronounced or effective in these formats. This insight not only supports the role of gender-specific tendencies in shaping match outcomes but also offers tactical implications: teams competing in female or mixed brackets may benefit from refining coordinated block formations and defensive positioning as a competitive advantage in high-level dodgeball.

What is particularly interesting is that in Figure 4 we see that the median block percentage for mixed groups is very similar to that of the female groups. One might expect that it would lie somewhere in the middle of male and female groups, but it does not. This can perhaps

be due to the attacking males getting eliminated early, and the females compensating with more focused defense, or it could be a concession to play more defensive for a strategic advantage, allowing all teammates to be on the same end. With this data, male groups should pay closer attention to their aggression in attack leaving them vulnerable to being an open target with a low block chance. Female groups on the other hand might use this data to allow themselves to ease up on defense somewhat, as they already are significantly stronger in this aspect.

*Critique of the Study*

While our study provides meaningful insights into the interaction between pace, accuracy, and defensive metrics in cloth dodgeball, there are several areas where improvements could strengthen the analysis.

First, our dataset primarily focused on observable in-game actions such as hits, throws, catches, and blocks. However, we did not record more detailed context about gameplay, such as player positioning, ball control time, or turnovers. These additional variables could act as important confounders influencing both offensive and defensive success. Including them would allow for a deeper understanding of the tactical decisions that lead to either elimination or timeout outcomes.

Second, our definition of pace as total throws divided by set time captures overall activity, but does not differentiate between strategic throwing versus forced low-percentage throws under pressure. A more refined measure, such as the proportion of high-quality throws or coordinated team attacks, might better represent meaningful differences in offensive efficiency.

Third, although we ensured a balance across men's, women's, and mixed matches, we did not control for variations in team skill levels or tournament stages (e.g., group rounds vs finals). Stronger teams may naturally have different patterns in pace, accuracy, and defense compared to weaker teams. Incorporating information about team rankings or tournament progression could help adjust for these factors.

Finally, because data were collected manually through video observation, minor inconsistencies in counting actions (such as fast exchanges of throws and catches) could introduce small errors. Future studies might benefit from the use of official match statistics or automated tracking tools to enhance precision.

Overall, while our methodology produced a solid foundation for analyzing key performance drivers in competitive dodgeball, acknowledging these limitations provides important guidance for future research aiming to build even stronger models of success in the sport.

# References

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