PITCH LOCATION VARIABILITY OF FASTBALLS FOR FIVE BASEBALL TYPES ACROSS THREE SPEEDS AND TWO PITCHING MACHINE FEEDING INPUT METHODS

Angeleau A. Scott[1], Benjamin Caldwell[1], Yang Yang[1], Jared Fry[1], and Andrew C. Fry[1]

[1]Jayhawk Athletic Performance Laboratory – Wu Tsai Human Performance Alliance, University of Kansas, Lawrence, KS, USA

Introduction

Utilizing a pitching machine during batting practice can help to automate the reps and pitch types used to prepare for a game. Quality batting practice can come from the type of ball used, however, current literature lacks scientific data examining the effect of different baseball types on the plate location. Recent investigations have shown that batters change their mechanics when batting against a pitching machine versus a live pitcher[1]. Similar investigations have shown that multiple pitch types in a batting practice can lead to increased timing errors of batters[2]. The literature is leading to the ideas that pitching machines and multiple pitch types may alter a batters performance compared to a live at bat. Research suggests it could be a matter of reading the movement patterns of a pitcher, however, understanding the variability of balls utilized during a batting practice against a machine may help to understanding how the ball type may affect where it lands in the strike zone, thus effecting the consistency of a batter when batting against a machine.

Purpose

The aim of this study was to examine the effect of using different baseball types on pitch location at home plate with different fastball speeds and pitching machine feeding input methods.

Methods

Five types of baseballs {i.e., Old Game Balls (OGB) [5 yrs.], New Game Balls (NGB) [i.e., never used], Dimple Balls (DB), Old Pitching Machine Balls (OPMB) [5 yrs.; kevlar], New Pitching Machine Balls (NPMB) [i.e., never used; kevlar]} were fed through a 3-wheel pitching machine (I-Hack Attack, Sports Attack LLC., Nevada, USA) set at a slow speed of 60 mph (26.8 $m \cdot s^{-1}$), a moderate speed of 75 mph (33.5 $m \cdot s^{-1}$), and a fast speed of 90 mph (40.2 $m \cdot s^{-1}$) into a strike zone net placed directly over home plate. A total of 30 pitches were recorded at each speed for each ball type and each feeding input method. The distance between the net and the pitching machine was 50 ft, 6 in (15.4 m). A radar-based ball tracking system was used to determine ball location (TrackMan Portable B1, TrackMan, Vedbaek, Denmark). For the controlled feed input method, balls were fed with seams, specifically in a 4-seam fastball position immediately in front of the wheels. For the random feed input method, balls were rolled from the top without any specific ball orientation. Two 3-way ANOVAs were used to determine significant main effects and interactions between each of the three independent variables, speed, feeding input method, and ball type, on two continuous dependent variables (plate location height and plate location side). Bonferroni post-hoc analyses were used to identify differences between conditions.

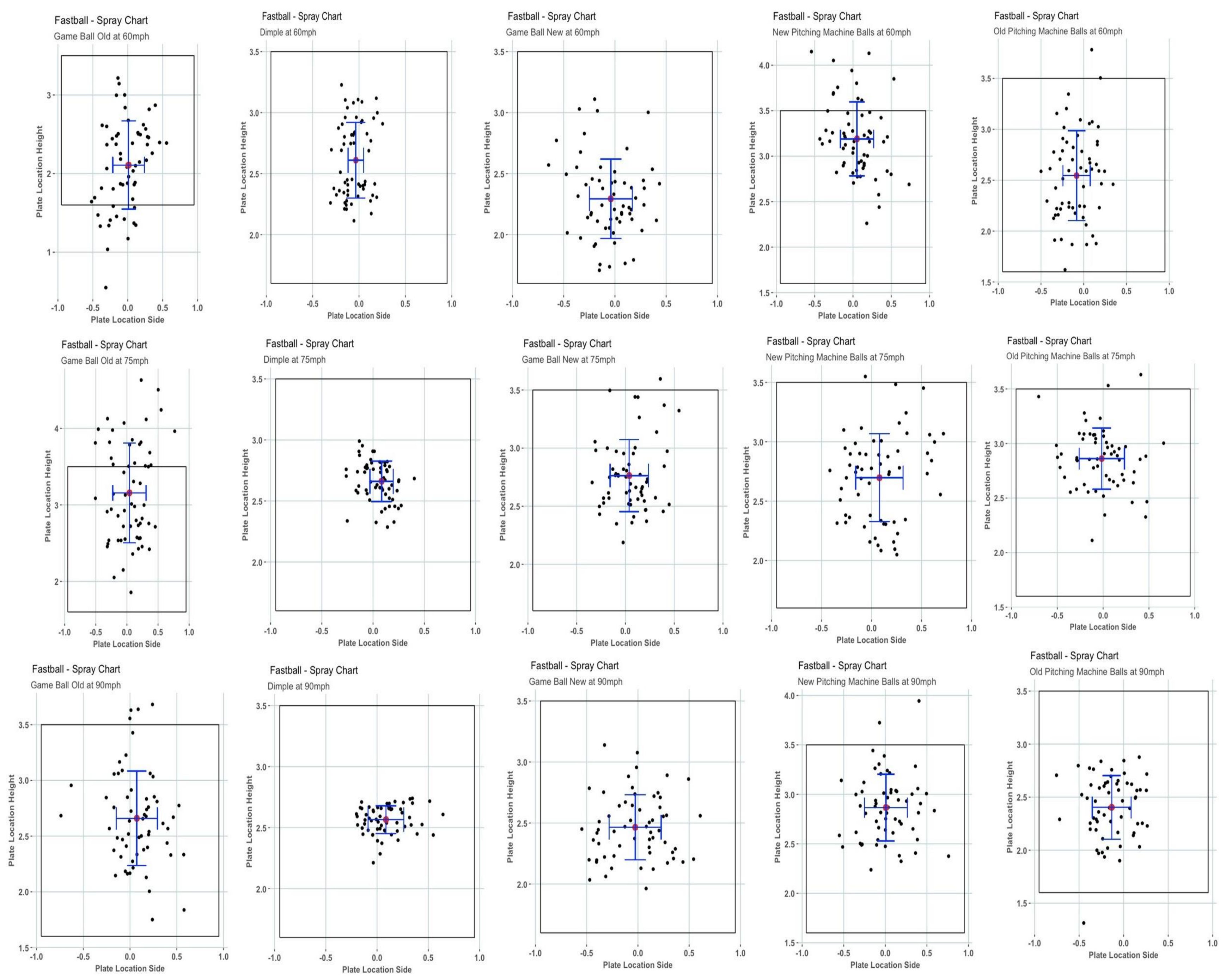

Figure 1. Spray Charts of the Plate Location Side and Plate Location Height of the Fastballs separated by Ball Type and Pitch Speed

Acknowledgements

This Project is funded by the Clara Wu and Joseph Tsai Foundation

Results

Significant interaction effects were observed for Ball Speed x Ball Type x Input Method for both plate location height (p=0.001) and plate location side (p=0.002). Post-hoc analyses showed significant differences between NGB and DB as well as NPMB and DB, irrespective of ball speed for plate location height. For the plate location side, significant differences existed between OPMB and DB, irrespective of ball speed. Standard deviations (SD) were used to measure variability to determine how dispersed each ball type was across home plate. Across all speeds, input methods, and ball types for the dependent variable plate location height, OGB had the largest SD, the only exception being OPMB, which was larger at the moderate speed with a random feeding input method. Significant results of the post-hoc analyses were reported for variables compared to DB, as the standard deviation for DB was the smallest across all speeds, input methods, and ball types for plate location height.

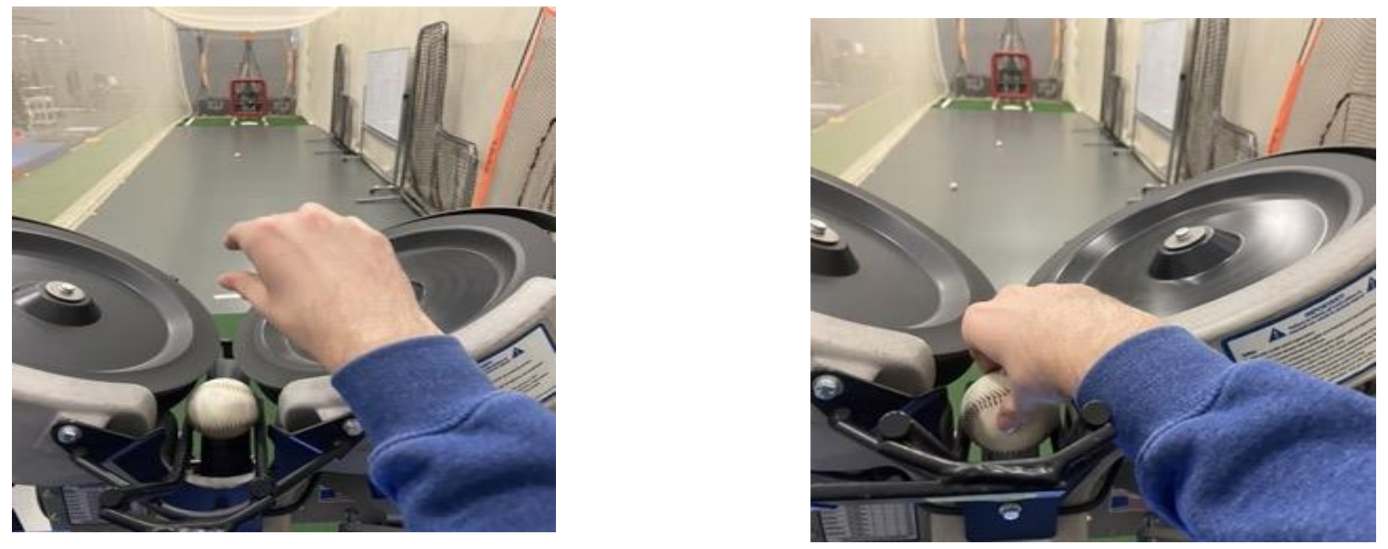

Figure 2. Ball Input Methods (Left is Random Input) (Right is Controlled Input)

Conclusions & Practical Applications

CONCLUSIONS: For plate location height, OGBs had greater variability, indicating greater spread across home plate for all conditions except one. DB had the smallest SD across all conditions, indicating less dispersion across home plate. **PRACTICAL APPLICATION:** These findings may allow coaches to understand which types of balls they would want to use in the pitching machines for batting practices. DBs and/or NPMBs could provide more accurate pitches than OGBs. If coaches are wanting pitches for more game like situations, using an OGB during batting practice will create more variability for the hitter. Likewise, if coaches want players to get more consistent ball contacts, using the DB and/or NPMBs may meet that need.

References

1. Kuo, S. Y., Cheng, K. B., & Lee, Y. C. (2021). Differences in baseball batting movement patterns between facing a pitcher and a pitching machine. Research Quarterly for Exercise and Sport, 92(3), 420-428.

2. Kidokoro, S., Matsuzaki, Y., & Akagi, R. (2020). Does the combination of different pitches and the absence of pitch type information influence timing control during batting in baseball?. Plos one, 15(3), e0230385.

Jayhawk Athletic Performance Laboratory

Wu Tsai Human Performance Alliance
University of Kansas