

# Phillies Baseball R&D Analysis Proposal

April 2021

## 1 Introduction

The following work attempts to provide clarity and an answer for the following question from the infield coach:

“One of our infielders, Player X, seems to be struggling in the field. He’s got a great arm, but he’s made a few errors this season and is failing to get to some balls. Could you look into this and identify any problem areas that we can target with drills?”

## 2 Potential Approaches

Initially, there seem to be several potential approaches to discover = why Player X is currently struggling, which include:

- Examining Player X’s starting location on the field relative to where balls land. If Player X is beginning play in a poor area to field balls, this could cause errors.
- Examining Player X’s speed combined with reaction time. If Player X is too slow either in moving or in reaction time, the inability to read the play quick enough could lead to missed balls/errors in fielding.
- Examining the Player X’s accuracy with throws. The coach mentions the arm being “great” but errors could include overthrows. If Player X is playing from the wrong spot, this could lead to him over/underthrowing to his teammates and creating errors.

## 3 Data

There are several pieces of data we can use to examine why Player X is struggling. Below is table of statistics and reasons why this statistic should be ex-

amined in regards to beginning to solve Player X's issues.

Statistic Name	Explanation of Stat
startX	The X-coordinate of where Player X begins the play on the field
startY	The Y-coordinate of where Player X begins the play on the field
targX	The X-coordinate of where the ball and player should meet (the event)
targY	The Y-coordinate of where the ball and player should meet (the event)
throwX	The X-coordinate of where the ball should be thrown to (the post-event play or PEP)
throwY	The Y-coordinate of where the ball should be thrown to (PEP)
eventType	The type of ball in the event (ground ball, line drive, fly ball, bunt, etc)
eventResult	The result of the individual event (1 for fielded successfully, 0 for error)
PEPResult	The result of the PEP (2 for no PEP, 1 for thrown successfully, 0 for error)
playerSpeed	The foot speed of Player X
playerReac	The reaction time of Player X
travTime	The time inbetween ball contact and event
exitVeloH	The horizontal component of the exit velocity for the ball

## 4 Known Issues

Due to the human component involved in the scorer's judgment of which player is at fault and thus credited for an error, there is potential for the eventResult to be skewed or flawed, but because every event would be thusly skewed, it is reasonable to assume that there is little to no bias in the results across every player and thus an examination of the eventResult's for Player X should be fine.

## 5 Methodology

Based on the above approaches and the similarities in some of their required data, the best analysis would seem to be a heat map of Player X and the events in which he is involved, with the first approach seeming to potentially provide the most concrete results but also would seem to have some of the easiest fixes (an adjust in starting position). The first step would be to examine Player X's current starting position relative to successful and error events and see if any

obvious trends become apparent (Example: events to the right of the starting position are much more successful than events to the left, indicating Player X might need to shift left to get to those balls quicker). From there, examinations could be made based on type of event and result.

Similarly, when it comes to examining Player X's throwing accuracy (the third approach), seeing how often the player makes errors in throwing from various regions of the field should give rise to whether his errors are fielding-related or throwing related, especially as it relates to his "great arm". Seeing trends arise, like throws from beyond halfway between third and second heading to first could indicate either vision problems or needing improvement in touch control. However, this approach could be examined by a heat map again, using targets and locations, all of which were explained in the Data section.

To begin with, the creation of the fielding event heat map should suffice, as it has arguably the easiest remedy for the infield coach to institute. From there, creating heat maps that correspond to altered starting locations can be created, and compared. A total of 3 trials should suffice to triangulate the best position for Player X to stand: initial position, first shift, second shift.