



# A Quantitative Analysis of Pokémon GO



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## Introduction

The purpose of the study was to reproduce a comparative quantitative analysis study of Pokémon Go using the Grand Unified Catch Theory to previous research and conduct original research concerning the new game release and spawn rate of shiny magikarp.



### What is *Pokémon Go*?

Pokémon Go is an augmented reality game, allowing players to locate and capture Pokémon based on real-world travel and interact with other game features.

### Why *Pokémon Go*?

Behind the simplistic overlay in gameplay features, mathematical algorithms are necessary for determining the probability of catch rate for individual Pokémon types and levels. The additional factors responsible for increasing catch likelihood are called multipliers.

## Terminology and Abbreviations

**BCR** = Base Catch Rate  
**CP** = Combat Power = (Attack \* Defense<sup>0.5</sup> \* Stamina<sup>0.5</sup> \* CP\_Multiplier<sup>2</sup>) / 10  
**CPM** =  $\sqrt{[(10*CP)/(A*D^{1/2}*S^{1/2})]}$

## Materials

Gameplay  
Phones  
Pokémon Go App

Data Collection  
Microsoft Excel  
Minitab 17



## Methods

The Pokémon included in this research study were captured over the span of 8 weeks, leading up to Niantic's game release of generation two Pokémon, in order to avoid any potential alterations to the original catch theory. 1,400 data sets were collected through our Google Poll, but only 1,378 sets were valid.

## Catch Mechanics

### Grand Unified Catch Theory

$$\text{Probability} = 1 - \left( 1 - \frac{\text{BCR}}{2 * \text{CPM}} \right)^{\text{Multipliers}}$$

### Multipliers

Ball Curve	Medal Curve	Throw Type	Ball Type	Razz Berry
1.7	1.0-1.3	1.0-2.0	1, 1.5, 2	1.5

## Results

Bonuses	$\chi^2$	P-value	Frequency
None	3.307	0.069	415

Table 1.1

Chi-Squared analysis with no multipliers.  $0.069 > 0.05$ . We fail to reject the null hypothesis that there is no benefit to using multipliers.

### Theoretical Catch Probability vs Experimental (w/o Outliers n>30)

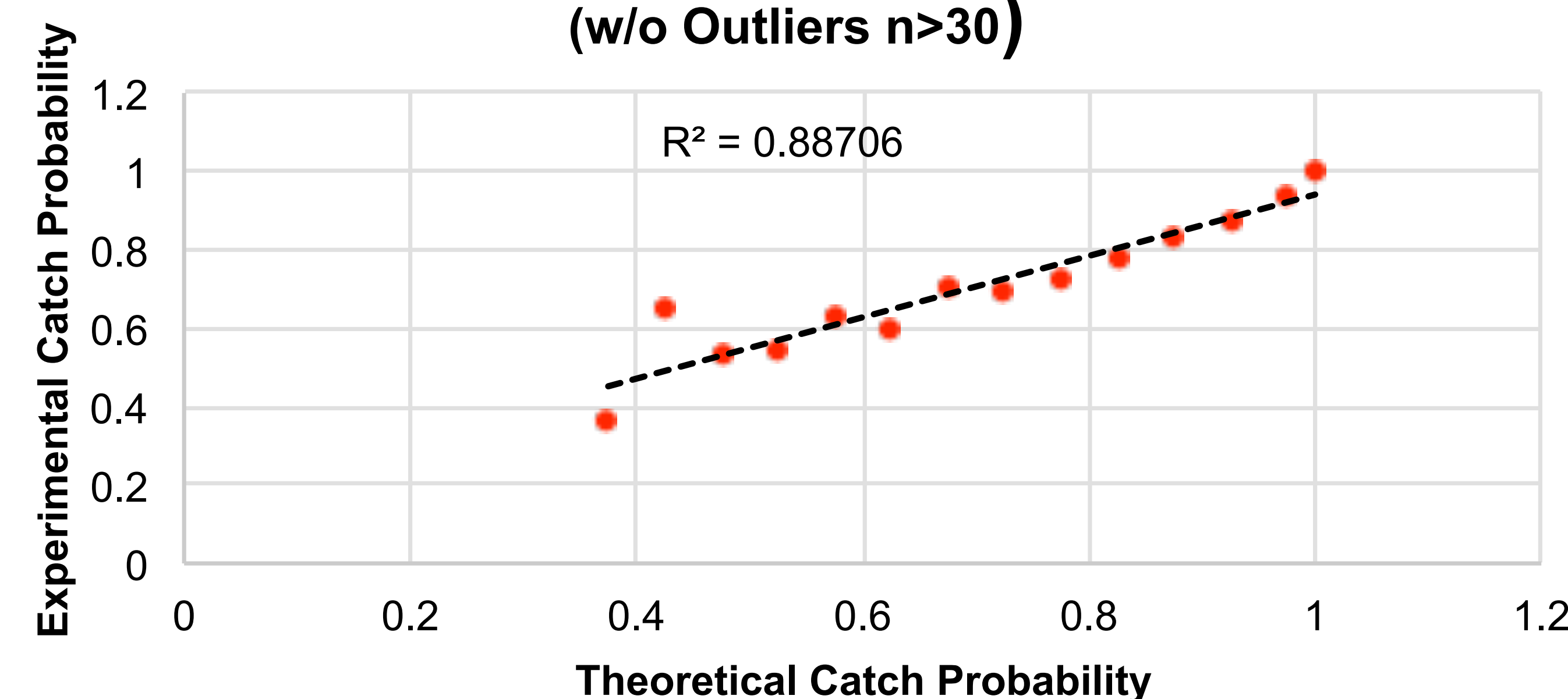


Figure 1.1

Correlation between experimental data and a previous study.

### Curveball Bonus

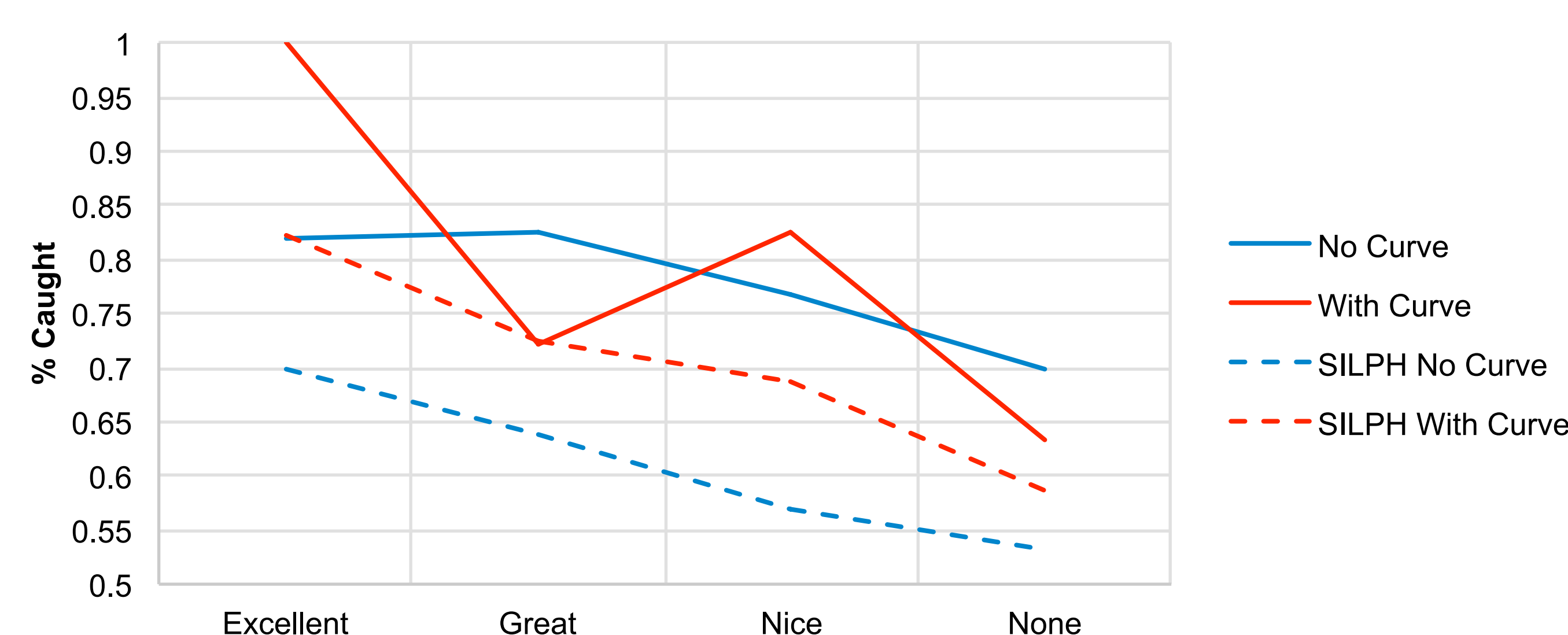


Figure 2.1

Comparing experimental and theoretical curve ball bonus on percent capture.

### Flee Rate: Theoretical vs. Experimental

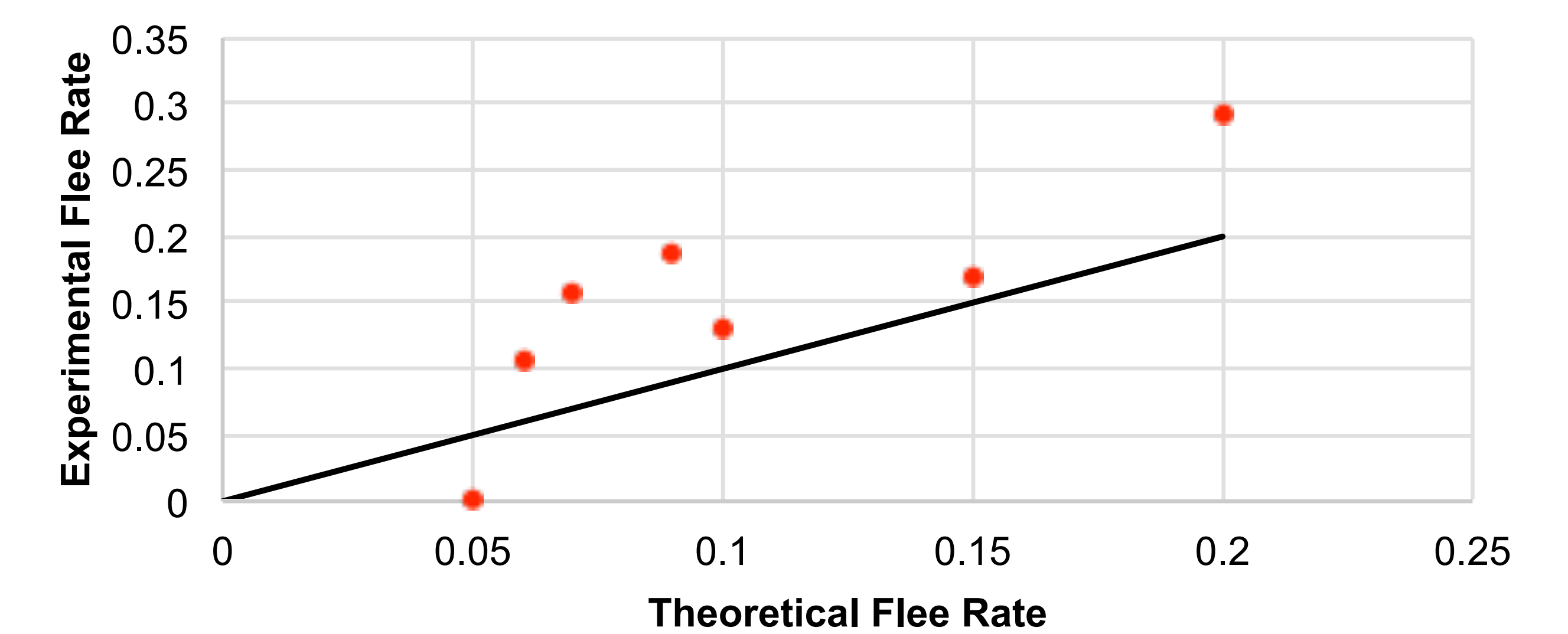


Figure 3.1

Comparing experimental and theoretical flee rate.

### Frequency of Wild Pokémon

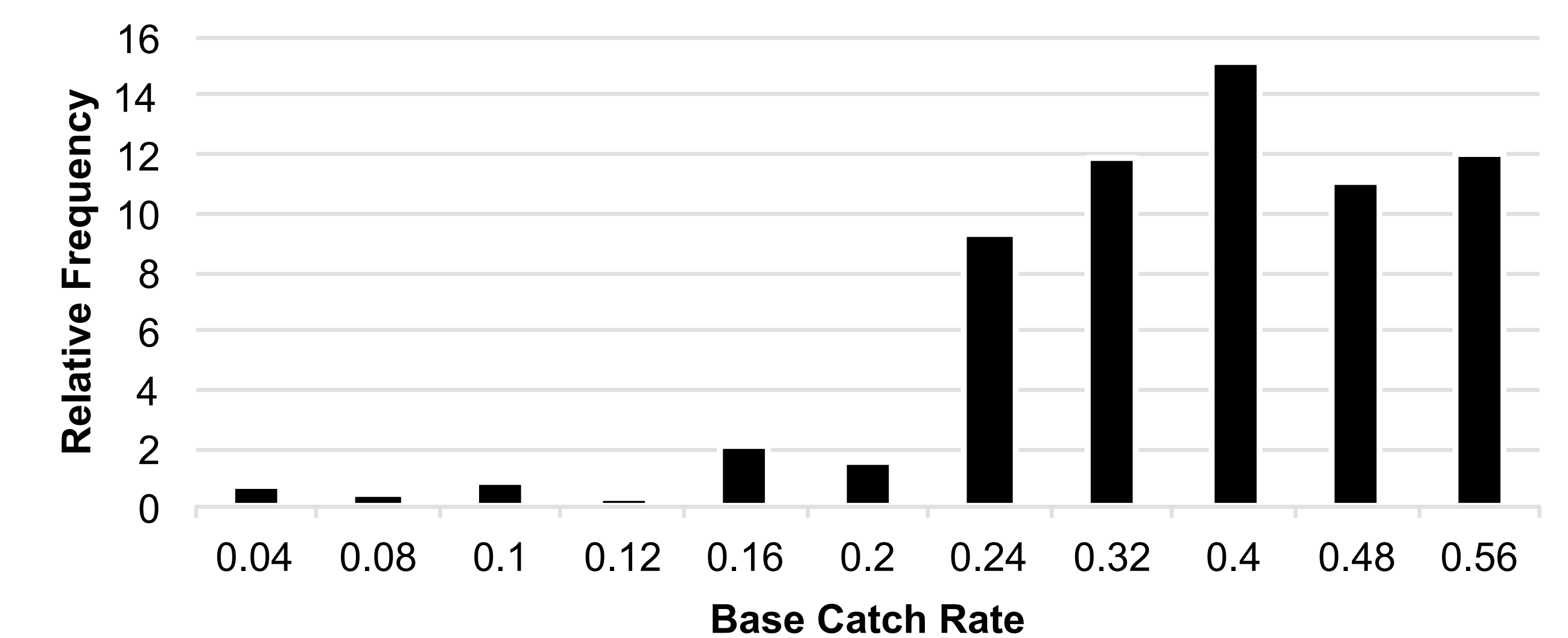


Figure 4.1

Frequency (ratio) of finding wild Pokémon based on BCR.

## Shiny Magikarp

Magikarp	Shiny	Ditto	Chance of Shiny
5,304	15	2	0.28%

Table 2.1

Probability of finding shiny magikarp, based on poll.

## Conclusion

### Limitations

When exporting data between different statistical software, individual corrections were necessary before the information could be interpreted.

1. Data filtering categories could not differentiate responses such as "No" and "no"
2. Multiple sources of catch entries, which led to unusable data

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Pokémon Go

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Android and Apple

Google Forms

Microsoft Excel

Minitab 17

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IvStats

IV GO

Silph Road

1. Bukowskaii. (2016, October 18). The Curveball Bonus in Pokemon GO. Retrieved Jan. & feb., 2017, from <https://thesilphroad.com/science/curveball-throw-bonus-in-pokemon-go>  
 2. Game Press. (2017, January 30). Catch Mechanics. Retrieved Jan. & feb., 2017, from <https://pokemongo.gamepress.gg/catch-mechanics>