

Final Technical Report

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1.3 Data and Methods

To determine if a player's ping pong shot accuracy is better when dipping the ball in water before their shot into a cup, I will complete trials that simulate a game of Cup Pong, with either a completely dry ball or a method of dunking the ball and shaking excess water off before each shot a participant takes. This experiment will investigate if the shot accuracy when using a ball that has been dunked in water is greater than the shot accuracy when using a dry ball in Cup Pong.

I carried out the experiment indoors, such as traditional Cup Pong. The experiment used a table with dimensions 96" L x 30" W x 29" H, eleven disposable 18-ounce Chinet brand red plastic cups, water, a microfiber towel, and 2 Franklin brand 40mm standard ping pong balls. The set up of the table and cups is as depicted in Diagram 1. The ten cups in the formation have an integer label from 1 to 10. All sampled attempts were from behind the singular cup at one end of the table, facing the triangle cup.

Each trial is a single attempt to make the ping pong ball into the cup. Two trials were performed consecutively, similar to traditional Cup Pong. After each set of two trials, the balls were removed, then dried off with a towel. The data was recorded on which shots were made, and if so, the number of the cup that the ball landed into was recorded. When balls were removed from the cups' insides, I left the formation undisturbed. Each shot attempt was made with an overhead toss and no bounce onto the table—a bounce-shot. Trials where the ball was made into a cup not using a bounce-shot was counted as successful. For the wet method, the ball was fully submerged in water and shaken lightly five times to remove excess water, which is similar to the standard technique for the “dunking method” in Cup Pong.

The total sample size of this experiment is the researcher's 100 attempts to make it into the cup. I am the researcher, Hannah Pawig, a sophomore Statistics Undergraduate student at the California Polytechnic State University in San Luis Obispo, CA. No other abilities or certifications were needed to carry out the trials, besides my own ability to participate in the activity without needing any accommodations or aid. I have some experience with Cup Pong, but do not consider myself a proficient player of the game. We must note that conclusions

from this study may not be generalized to a larger population of college students, because the researcher was the only recruited member of the study.

I used Microsoft Excel to record data in between each 2 trials (Excel Version 16.71). Prior to carrying out the experiment and collecting data, the order of playing method to be used for each trial was randomized in the Excel sheet that is detailed in the corresponding document within the “scripts” folder. This means that the method variable was randomized first, a variable that contains information specifying what playing style (“wet” or “dry”) was used for the trial. As trials were being carried out, the researcher recorded the data for the following variables: *success* and *which_cup*. The *success* variable was input as a binary variable: 1 was input for successful attempts and 0 for unsuccessful attempts. The *which_cup* variable was coded numerically from integers 0 to 10, each integer greater than 0 corresponding to a cup in the triangle formation. The integer 0 was recorded for *which_cup* when the shot was unsuccessful.

The analysis was carried out in statistical software R, using a one-sided 2 proportion z-test (R version 4.3.0). I created a *trials* variable into the analysis data set as an identifier for each trial, which gave each observation the corresponding trial number based on occurrence during the experiment. I also converted the *which_cup* and *method* variables from numeric to factor variables. I did this in order to relabel the “0” cup level in *which_cup* into a level named “None” and to use *method* as a grouping variable.

1.4 Results and Discussion

1.4.1 Results

Of the 100 total shot attempts, the ball successfully went into the cup 38% of the time (Figure 2). Overall in the experiment, I had a shot accuracy of 38%, disregarding shot method. However, when considering shot method, the proportion of times in which the shot was successful when using the dunk (wet ball) method was far from significant ($p = 1.00$, $n = 100$).

Out of 50 attempts, the dunk method resulted in 19 successful times where the ball landed in one of the ten cups. The same results occurred with the dry ball method, and is visually depicted in Figure 3. As stated before from the results of the two proportion t-test, there is a severe lack of statistical significance between each play method.

1.4.2 Discussion

The results observed from the experiment suggest that the dunk playing method has no improving effect on my performance while attempting to throw ping pong balls into a cup in Cup Pong. The results show no significance of the dunk method; these results are other than what I expected, as though I believed that my performance in the experiment would at the

Table 1:
Frequencies and Percentages of Successful Shots by Cup Pong Method

Method	Total Attempts	Count of Success	Percentage Made (%)
Dry	50	19	38%
Wet	50	19	38%

○ = a cup
(filled halfway with water)

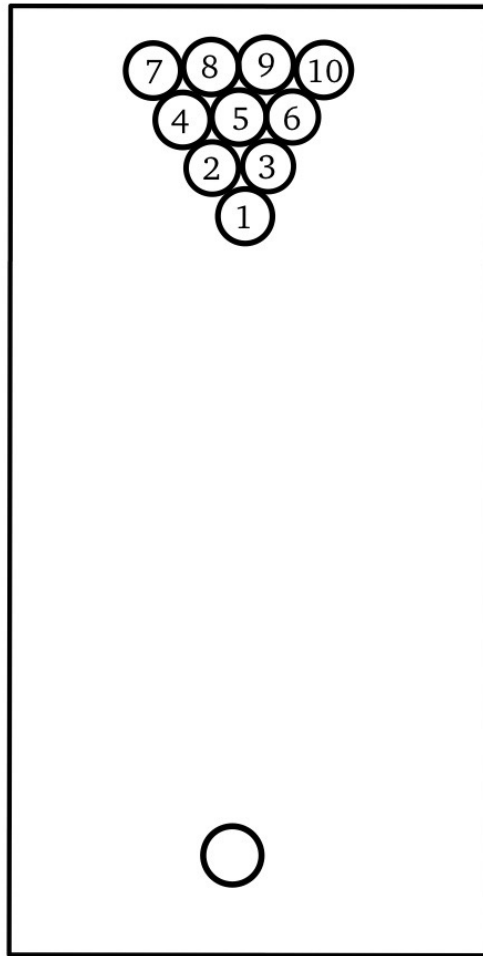
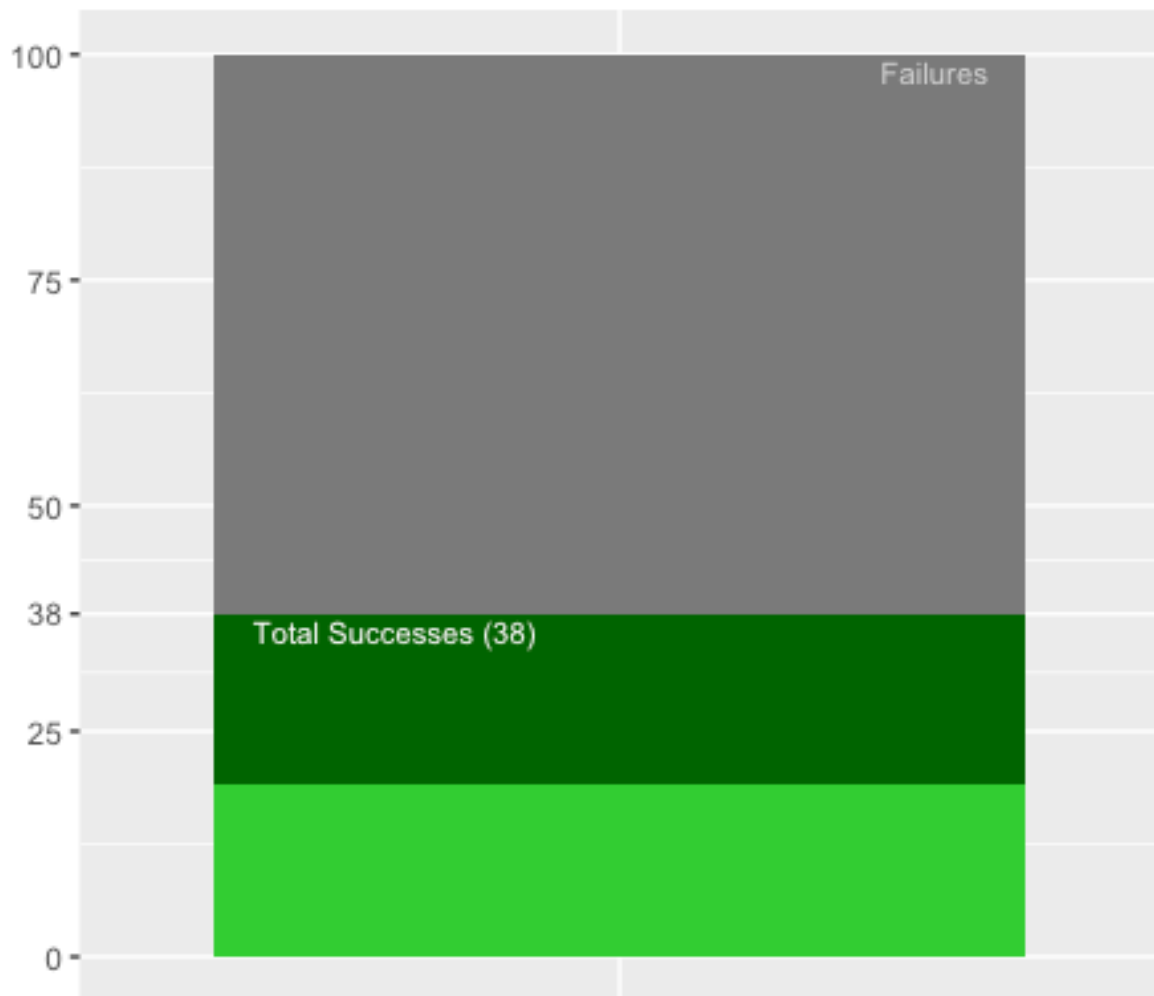


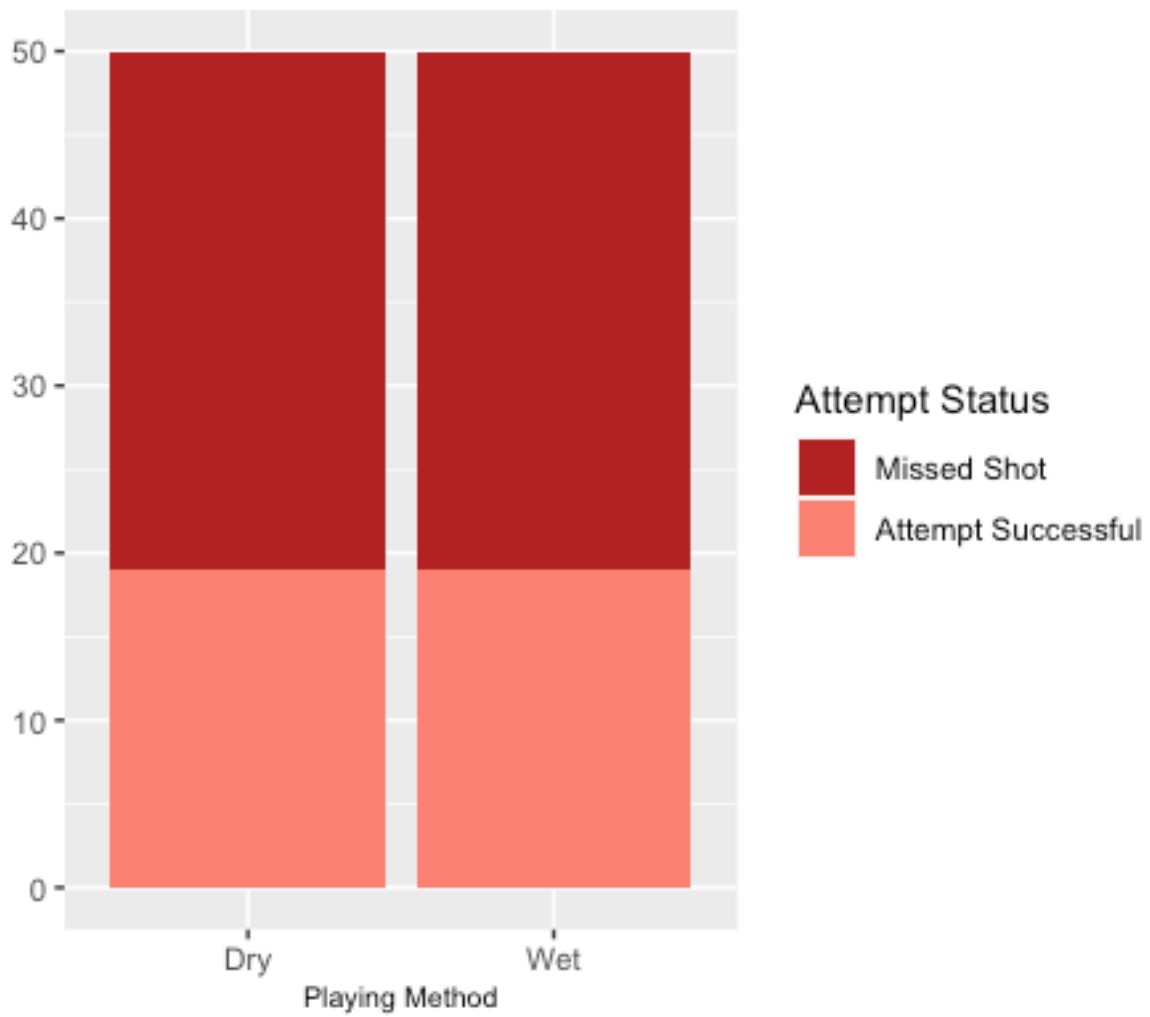
Figure 1: Cup Formation

Overall Successes of the 100 Shot Attempts

Successes with the **Dunk Method** and **Dry Ball Method**



Breakdown of Shot Attempts
For Each Playing Method



least differ between play styles. This is because I have been exposed to the pre-existing notion that dunking the ball in water improves performance.

Therefore, when I participate in Cup Pong using the dunk ball method, my shot accuracy is not enhanced more-so than when I use the default dry ball method. This was a randomized experiment, and so we may consider these results to lead us to a cause-and-effect, or lack thereof, relationship between play method and my shot accuracy. Additionally, the experiment was a *simulated* game of Cup Pong that has similar structure but most importantly not identical. Thus, my accuracy may be affected in a real game of Cup Pong, which involves removing cups as the game continues with each successful shot.

It is crucial we also evaluate these results keeping in mind that I, the researcher, was the only participant in the Cup Pong simulation. We are unable to consider these results in the scope of any other college students, but we may hope so in the future. This experiment alone at the least starts the conversation in the importance of the decision of play method in a game such as this, or other games which involve landing ping pong balls into cups of water. Moreover, my role in this experiment as both the data collector and participant limits the potential of this particular study insofar as we cannot see a wider range of variation in subjects with varying degrees of Cup Pong experience or ability that could depict a better, more informative result regarding the effect of the wet ball “dunk” method. I have hopes that a future experiment and analysis could collect data on a large number of various students to see if college students play better using the “dunk” method, and even make the experiment structured more closely to the traditional one of Cup Pong. Future experiments may even test whether liquids other than water have some effect in shot accuracy in this game, by running the experimental Cup Pong trials with the cups filled with other liquids such as soda or beer. In this way, there is hopes of significant findings that consider more than one factor and can more confidently be applicable to true Cup Pong games.