Spicing up Spikeball: Quantifying Entertainment of the Sport of Roundnet and Beyond…

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Abstract

In 2007, the sports equipment company Spikeball invented Roundnet. Initially, Spikeball had a slow start, but in recent years, it has risen in popularity. As the sport continues to grow, Roundnet is considering rule changes to increase the sport's viewability.

To support this endeavor, the research team created a survey consisting of multiple Roundnet gameplay videos and questions on the gameplay's excitement and understandability to isolate and determine which factors of the game correlate to viewability and audience engagement. The primary metric we measured is a respondent's likert scale ranking (1-10) on the excitement and understandability of a point. With these scores as a response variable, we hope to use multiple regression to create a viewability metric that can serve as a quantifiable entertainment score.

Beyond this, we also provide a quantitative, objective opinion on some of the questions and theories currently circulating the Roundnet community regarding how to grow the game. To tackle this, we used T-tests to see which metrics are correlated with our response score. With these metrics determined and these questions answered, the research team can test future rule changes to see which adjustments increase the entertainment value of the sport. These rule changes will ultimately help Roundnet establish itself as a distinguished sport and will lead to its breakthrough into the professional world.

Background

In 2007, the Spikeball Roundnet Association was founded and played a major role in popularizing this sport. Historically, Spikeball has been a recreational sport, but with a recent rise in publicity and popularity, the Spikeball Roundnet Association has set its sights on breaking into the professional sports realm. Roundnet is currently working towards this goal, specifically aiming to enter the NCAA and the Olympics and become a recognized professional sport. They have even struck some deals with major television networks like ESPN to bring greater attention and interest to the sport.

To assist Roundnet with this initiative, we have decided to run a survey to pinpoint which aspects of Spikeball are exciting to both fans and non-fans. With survey data, we can measure which aspects of the game are interesting and create a viewability metric. This viewability metric will allow us to test future rule changes to see which ways the game can be shaped to be more interesting to viewers.

In creating the survey, we first researched what makes sports exciting to fans. We then collected videos and created an initial survey. We ran two pre-tests of the survey and adjusted it according to feedback. We added a video randomization aspect to the survey to circumvent survey fatigue and released a final version of the survey after approval from our faculty mentor, Professor Robert Gould, Vice Chair of the UCLA Department of Statistics.

To test some of the hypotheses listed below, we enlisted multiple statistical techniques including t-tests and multiple regression to see if various opinions circling the Roundnet community were supported by the survey responses. In testing these hypotheses, we hope to introduce new objective techniques to resolving debates in the Roundnet (and sports in general for that matter) community. As our viewability metric continues to be refined, we hope our findings will make an impact on how prospective rule changes are weighed in the sport and provide guidelines for measuring entertainment values of sporting events as a whole.

Hypothesis

We hypothesize that the excitement score will have strong correlation with production value elements such as camera angles and commentary. Moreover, we hypothesize that the excitement scores will typically be higher the longer points are, which will be shown by rallies having higher scores than shorter, lower-possession-change plays.

Method

In order to test our hypothesis, we designed and sent out a survey to pinpoint which aspects of Spikeball are exciting to both fans and non-fans

We started by researching what aspects of sports make it interesting. Looking at both scientific literature and sports articles, we discovered that there are four main aspects of a game that determine the fans' response: Context, Relatability, Pace, and Unpredictability. Thus in designing the survey, we sought to gear questions to address these aspects of the game.

We first collected short spikeball clips from Instagram and YouTube and categorized them into 4 main groups - Ace, Body Block, Rally, and Control. These are the four main outcomes in spikeball. We wanted respondents to see one video from each category, so that their responses would be balanced by a control video. We used Latin Squares to randomize the order of the video shown to minimize order fatigue.

Our survey first collects basic demographic information and the respondent's experience with spikeball. It then presents a short 10-second spikeball clip and asks for the respondent to rate the clip on excitement and understandability on a likert scale from 1 to 10. Excitement score is the key metric we used to determine how exciting the surveyees found a certain clip. The survey then asked the respondent why the point was interesting or boring. It prompts the respondent to click on the descriptions, called "hot words", that fit the point. These hot words included "high pace and energy of the point", "athleticism of the players", and others. These hot words would allow us to get a glimpse of why exactly a respondent rated a point. The survey repeats this section four times, so the respondent rates four videos in total.

After running two pretests of the survey and revising it based on feedback, we sent out our finalized version in early March and closed it in mid-April. We targeted Roundnet's primary audience - college students and young adults. We sent it to friends, family members, UCLA sports-oriented clubs as well as posted it to Facebook and Reddit Spikeball communities. After closing the survey, we cleaned the data and began the analysis. We ran exploratory analysis

and significance tests to pull interesting insights. We also utilized multiple linear regression to create our first version of our viewability metric.

Multiple linear regression is a statistical technique that takes in a certain amount of independent variables as predictors and uses those values of each variable to predict an outcome for the dependent variable. A model selection routine was used to create a final multiple regression model including the “regsubsets” package in R. The package conducts an exhaustive search of all possible independent variables we picked from the dataset that might be used to predict excitement score, the dependent variable. An exhaustive search looks at all combinations of predictor variables and selects the optimal variables (in terms of highest R-squared) for each number of x predictors from 1 to k, where k is the maximum number of predictor variables that could be included in the model. For example, if given 7 possible predictor variables, the exhaustive search would tell us the optimal 1-, 2-, 3-, etc., predictor models. Then, we utilized Akaike Information Criterion and Bayesian Information Criterion, which are model selection criteria that weigh model performance (R-squared) against size of the model. In the example above, each of the 7 models chosen by the exhaustive search would be given an AIC/BIC value, where lower values are better. Using subjectivity, we can determine when a steep dropoff in AIC/BIC is evident and at what point the returns become diminishing (in terms of lowering AIC/BIC values) as more variables are added to the model.

Results and Discussion

Exploratory Analysis

We collected 249 responses, with the largest age group being 18-25. The majority of our respondents were experienced players (Figure 1).

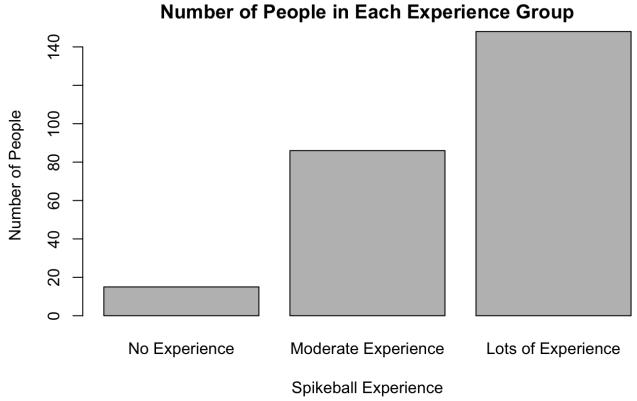

Figure 1: A barplot showing the distribution of survey responses by their experience with Spikeball.

The key metric we looked at were excitement scores. For each video, survey takers were prompted to rate the video on a scale from 1 to 10, with 1 being “boring” and 10 being “exciting”. The control videos - points that only have one possession change, and do not feature any rare or interesting plays - serve as our baseline. Interestingly, the ace videos seemed to consistently

score as less exciting compared to the other video groups. In the spikeball world, aces are seen as difficult and exciting plays. However, our audience seems not to favor them.

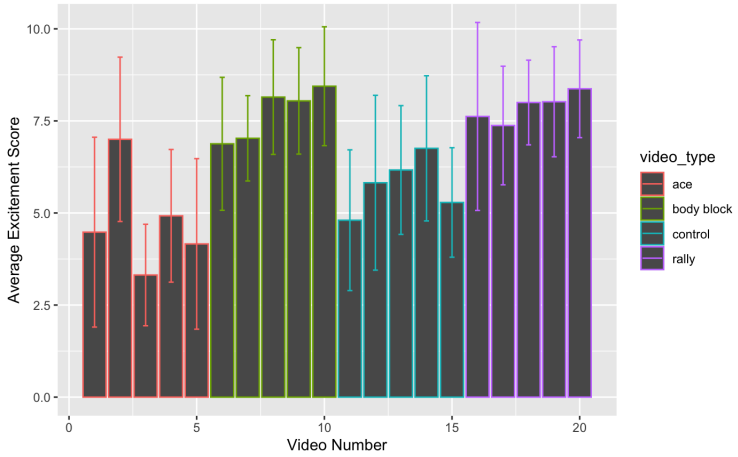

Figure 2: A bar plot showing the distribution of Excitement Scores by Video Type..

This prompted us to look more into which metrics correlate highly with the excitement score. We categorized the main video metrics in 3 groups - point length, unique plays, and production value.

For point length, we had the number of touches, number of possession changes, and point duration (in seconds). Using the Pearson correlation coefficients, we looked for statistical significance.

Touches: R = 0.51, p = 2.2e^-16
Possession changes: R = 0.51, p = 2.2e^-16
Point duration (in seconds): R = 0.52, p = 2.2e^-16

With a type 1 error significance threshold of 5%, we found that these three variables had significant strong correlation with the excitement scores.

Figure 3: Scatterplot showing relationships between Number of Touches (left), Possession Changes (center), and Duration of Points (right), versus Excitement Score.

For unique plays, we looked at the number of body blocks and the number of dives. These plays are difficult and are exciting to watch. Using the Pearson correlation coefficients, we looked for statistical significance.

Body blocks: R = 0.43, p = 2.2e^-16
Dives: R = 0.43, p = 2.2e^-16

With a type 1 error significance threshold of 5%, we found that these three variables had significant moderate correlation with the excitement scores.

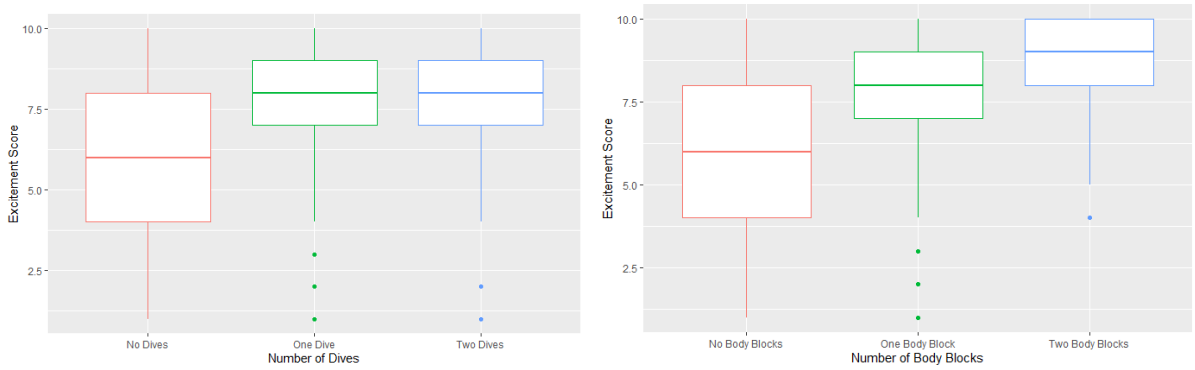

Figure 1: Boxplots showing the distribution of Number of Dives (left) and Number of Body Blocks (right) versus Excitement Score.

For production values, we looked at dummy variables indicating whether there was commentary, a scoreboard, and audible cheering from fans. Using the Pearson correlation coefficients, we looked for statistical significance.

Commentary: R = -0.0075, p = 0.81
Scoreboard: R = -0.0086, p = 0.0069
Fans cheering: R = 0.14, p = 5.9e^-0.6

With a type 1 error significance threshold of 5%, we found that these three variables had little to no correlation.

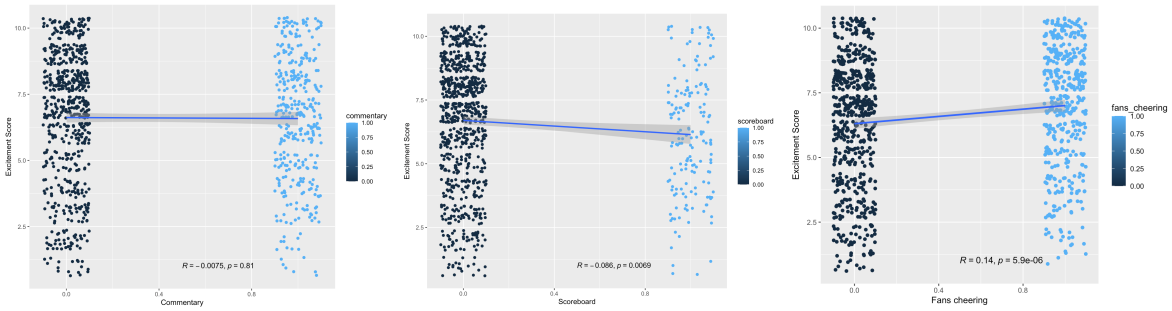

Figure 1: Scatterplots showing the relationship of Commentary (left), Scoreboard (center), and Fans Cheering (right), against Excitement Scores. Note: each predictor variable is a dummy variable, so for a given graph, the left is the absence of the variable and the right distribution is with the variable present.

In summary, the length of a point has high correlation, unique plays have moderate correlation, and production value has little correlation with the excitement scores. This initial analysis indicates that in order to expand the sport, Roundnet should prioritize optimizing rules to lengthen points. Longer points will generate excitement to viewers and will help bring it to a professional level.

Viewability Metric

Viewability Metric 1.0 **(Multiple Linear Regression Model)**				
Type of Variable	**Variable**	**Relationship**	**Estimate**	**P-Value**
Numeric	**No. of Possession Changes**	+	0.42	<2e-16
	No. of Body Blocks	+	0.37	6.69e^-16
	No. of Dives	-	-0.42	.005
	Control Difference	+	0.67	<2e^16
Dummy	**Commentary**	+	.67	2.1e^-07
	Slow Motion Replay	+	1.24	5.7e-12
	Control	-	-0.43	.007

Table 1: Viewability Metric version 1.0 is shown in the multiple regression table above.

In interpreting the results of the viewability metric's first iteration, we will separate the discussion of variables into two categories, numerical and dummy variables. Numeric variables take on numerical values representing numbers that were captured in the survey or descriptive statistics that were captured about the videos themselves. Number of possession changes, body blocks, and dives, were statistics that we cataloged ourselves about the clips in the pool of videos. Control difference is a statistic that measures an individual's score of the control video they watched subtracted from the excitement score of each of the other three non-control videos (i.e. each person will have at least one zero and three values for "non-control - control" excitement scores. The estimates tell us how much we can typically expect excitement score to change given a one-unit increase in the predictor variable at hand, holding all other variables constant.

Dummy variables take on a one or zero and represent if the category in the table is present in the video clip being analyzed. For example, if a row of the dataset has a 1 in the "Commentary" column, it means that the video had commentary. The estimates for the dummy variables tell us the average difference between excitement scores when the stated predictor variable is present in the clips versus when it is not.

I. Numeric

A. Number of Possession Changes

An estimate of .42 can be interpreted as meaning that for every extra possession change for a video clip, we would expect that excitement score would be about .42 points higher on average holding all other variables constant. This aligns with the hypotheses set forth at the beginning of this paper and reiterates what the Roundnet community has argued: longer points are typically associated with more exciting points.

B. Number of Body Blocks

The estimate for Number of Body Blocks being .37 has a similar meaning and can be interpreted as meaning that for every extra body block in a video, we would expect the excitement score to be .37 higher holding all other variables constant. This aligns with our hypotheses and can be explained by the fact that body-blocking is a phenomenon that typically takes a lot of skill and knowledge of defense (an aspect of the sport that is very difficult given the 360-degree nature of the game) to execute.

C. Number of Dives

Number of dives is an interesting finding given its negative estimate of -.42, which would indicate that for every extra dive in a clip we would expect excitement score to be about .42 points lower on average, holding all other variables constant. This pushes against intuition, because dives are usually indicative of athleticism and we believe that it would typically be rewarded with higher excitement scores.

Alone, this is actually the case, with the Pearson correlation coefficient (R) between Excitement Score and Number of Dives being moderate at R = .43. Thus, this disparity is likely due to the effect of athleticism being captured by other variables in the model like number of possession changes and body blocks. It could be that after controlling for the change in excitement score with these two variables, the rest of the variation to be explained by Number of Dives is negative. Overall, we believe that moving forward these findings should be taken in context of the statistical techniques used. While the Viewability Metric 1.0 at first glance doesn't support the number of dives being important to increasing excitement, we would point to the individual, positively moderate relationship between it and excitement score.

D. Control Difference

Control Difference has a positive estimate of .67, meaning that for every one point higher that a survey respondent rated the non-control video compared to the control video (e.g. if instead of rating the ace video 6 instead of 5, when they rated the control video a 4), we would expect the excitement score of that video to be .67 points higher on average, holding all other variables constant. This makes sense because it is a variable that should be strongly correlated with higher scores because within the calculation of the variable the non-control clip's excitement score is being compared to the control clip's excitement score. It also suggests that a

larger difference between non-control and control videos can be predictive of higher excitement scores, perhaps suggesting (in tandem with the estimate for “Control” which will be discussed later) that non-control videos are more exciting than control videos.

II. Dummy variables

A. Commentary

An estimate of .67 indicates that videos with commentary were .67 points more exciting on average than videos without commentary holding all other variables constant. This makes sense as we hypothesized that commentary added to the production value of the clip and makes Roundnet seem more legitimate as a sporting activity when present. Moving forward, it would be interesting to introduce other clips into the pool with different styles and qualities of commentary. Nonetheless, these findings suggest that when viewers watch clips with commentary points tend to be more exciting than silent clips.

B. Slow-Motion Replay

An estimate of 1.24 means that when clips had a slow-mo replay accompanying the play, excitement scores were 1.24 points higher on average than clips without slow-mo replay holding all other variables constant. This could be because we did not add any slow-mo replay ourselves, which could be indicative of the fact that the content creators of the clips with slow-mo cared more about the production value of the clip in general, which is why they instituted added production-value aspects such as slow-mo. It’s possible that this greater care for the quality of the clips is what makes the point more exciting. Nonetheless, these findings suggest that higher production value is important to increasing the entertainment value for Roundnet.

C. Control

An estimate of -0.43 is expected and means that control videos were about .43 points lower on average than non-control videos holding all other variables in the model constant. This aligns with our hypotheses and those of the Roundnet community’s suggesting that videos with a single possession change (i.e. the serve) followed by an immediate putaway on the next possession are less exciting than videos where the play lasts longer due to rallies. Because of the prevalence of control plays in the sport of Roundnet as a whole, the lack of exciting points could be drawing down the appeal of the sport to other prospective fans. These findings support that idea. Moving forward, it would be helpful to analyze people’s reactions to full games, where control points make up a much larger percentage of the plays than only 25% or one-of-four videos that survey respondents saw in this study.

Conclusion

Through our survey and analysis of the data, we were able to answer what factors make a specific spikeball point interesting. According to our survey, the length of the point is the strongest factor in generating excitement, unique plays have a moderate correlation with excitement, and production value has very little effect on the excitement of a point. Based on these results, we would suggest Roundnet to implement rule changes that focus on rule changes that lengthen points. This will best capture interest in the sport, and this interest is the catalyst that will propel Spikeball into the mainstream spotlight.

Additionally, we were able to create our first iteration of a viewability metric. Multiple linear regression was chosen because of its simplicity, and even a simple model captures the data well. As we continue to optimize the model, we will have a viewability metric that will score a certain point on excitement. A viewability metric is important as it will quantify rule changes and allow Roundnet to forecast the effects of rule changes on this sport.

Obstacles

The survey was sent mostly to people in the LA area, so the sample does not represent the entire sports fan population. As a result, we cannot make wide scale generalizations with our findings. Nonetheless, our main finding of longer points correlating to more excitement matches the common thought among experienced spikeball players.

In order to keep the survey at a reasonable length, we could only show 4 isolated spikeball points. Thus we are not addressing the question of what keeps a viewer engaged in watching it, but rather what types of points draw bystanders to become interested in this new sport. We answered the question “What makes a point interesting?” rather than “What makes a whole match interesting?”. Nonetheless, our findings regarding what makes individual points interesting is valuable in that lengthening points will help Roundnet to attract new viewers. Gathering interest in new viewers is the first step in increasing popularity of a sport.

Next Steps

Our next steps are to collect more data from a wider population to validate our findings. We also intend to try different models to quantify an excitement score. We will continue conducting data analysis on the unexplored features, such as hot words and further hidden variables. We will test our own rule changes to see how they affect viewability. We will continue using our data to answer questions that arise from the Spikeball community.

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