

Choice Effects in Online Daily Fantasy Sports

A
Major Qualifying Project Report
Submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
In partial fulfillment of the requirements for the Degree of Bachelor of Science
by Jackson Perry

Date: April 25, 2019

Approved:
Professor Jeanine L. M. Skorinko, Project Advisor

Abstract

This research examined factors influencing decisions to take part in online daily fantasy sports games. In particular, we investigated whether the anchoring and adjustment heuristic (Tversky & Kahneman, 1974), the compromise effect (Carroll & Vallen, 2014), and the attraction effect (Carroll & Vallen, 2014) influenced decisions to participate in an online fantasy sports contest. In Experiment 1, 103 participants indicated how likely they were to participate in a \$5 contest after either seeing a \$2 or \$8 contest. Results showed no anchoring and adjustment effect as the valuation of the \$5 contest was not influenced by the first contest seen. In Experiment 2, 203 participants indicated which contest they were most likely to enter given a low set (\$3, \$5, \$8) or a high set (\$5, \$8, \$11). Contrary to past research, the middle, or compromise option was less likely to be chosen than one of the two extreme choices. Experiment 3 explored whether our 203 participants would be attracted to a lower priced contest if there was a decoy option available with the same cost, but lower prize amount. Results indicated a marginally significant attraction effect, such that participants were more likely to choose the target contest when the decoy was present. Over the three experiments, the attraction effect seems to have the strongest effect on online fantasy sports betting behavior; however, we note the significance of the compromise effect in the opposite direction, which may be indicative of an unusual phenomenon in the realm of online daily fantasy sports.

Word Count: 251

Key words: fantasy sports, decision making, gambling, anchoring and adjustment, compromise effect, attraction effect

Choice Effects in Online Daily Fantasy Sports

With the rise of smartphone use and internet gambling, online sports betting has become pervasive. Recent changes in state and federal law have paved the way for individual game betting (LaBrie et al., 2007). Countless websites and smartphone applications take advantage of this opportunity for profit. Many of these sites offer dozens of different contests at any given time. A typical contest would offer a number of top prizes to entrants, who each pay some entry fee to enter the contest. The choice of which contest a participant enters brings in concepts of decision theory, or the reason behind such a choice. However, what is not well understood is how entrants make decisions about which contests to participate in. This research aims to understand if participants use heuristics, or short cuts, in this decision-making context, such as anchoring onto a value and adjusting from that anchor point.

Many common sports betting websites exist online and in smartphone applications, but for this research we are mostly interested in daily fantasy sports sites due to their popularity and the lack of current research in that area. These sites offer contests in most major sports leagues like Major League Baseball, the National Basketball Association, the National Football League and Major League Hockey. They also offer contests in less mainstream American sports like European League basketball, golf, League of Legends and NASCAR.

Each contest typically has a buy in or entry fee ranging from a few dollars to thousands of dollars. Each user may only be allowed a certain number of entries, which typically consist of generating a roster of participating players to face other users' rosters. If the user's players do better than any other user's roster, they win a grand prize ranging from a few thousand dollars to multimillion-dollar prizes. Both the top prize and the entry fee are advertised for each contest amongst the dozens of live contests at any given time. These sites have web and mobile

platforms where a certain number of suggested games are presented sequentially, and the user can select which they would like to enter into.

In one of the longer longitudinal studies of Internet sports betting, LaBrie and colleagues (2007) followed almost over 40,000 Internet sports gambling website subscribers over a period of eight months. They tracked a number of betting behaviors of the participants during this time, including the number of bets that these people made, how much money each person bet and how much each person won. Two important classes of bets were observed: fixed-odds and live-action. Fixed-odds betting typically involves the outcome of a game, with some payout ratio set before the game. Live-action betting instead involves outcomes within the game, such as the next player to hit a homerun in a baseball game.

LaBrie and colleagues (2007) found many important results from this research. Of the participants, the average age was 31 years and 9 in 10 were male. Average numbers of fixed-odds bets over the period were 135 and live-action bets were 99. This study noted that fixed-odds bets lost more on average than live-action bets (LaBrie et al., 2007). This may suggest that live-action contests like those on fantasy sports sites may be perceived as safer by participants than fixed-odds bets.

Decision Making

In day to day life, we are faced with countless decisions and choices that guide our experience. What we put in our coffee, what route we take to work and what entertainment we consume are just a few of the examples of simple decisions in most people's lives. However, there simply is not enough time for each person to consider every possible outcome and analyze every facet to every choice. For this reason, humans have developed shortcuts, called heuristics, that allow us to jump to a decision based on only a few factors of whatever situation we are faced with. The many properties of a decision task help shape which heuristic a person uses, and also

allow for a great deal of flexibility in that decision process. As decisions become more and more complex, and many alternative options are provided, heuristic strategies are employed and only a subset of provided information is utilized (Payne, Bettman & Johnson, 1993, p. 2). Various aspects of the problem, for example the way the information is displayed on a menu, can affect the mental strain, or processability, of a certain task. While some researchers have taken a solely cognitive perspective on these choices and the processes that govern them, it is important to note that social influence can also play a role in what decisions people make (Payne et al., 1993, p. 3).

Decisions are inherently governed by some strategy. Payne defines this decision strategy as “a sequence of mental and effector ... operations used to transform an initial state of knowledge into a final goal state of knowledge where the decision maker views the particular decision problem as solved” (Payne et al, 1993, p. 9). In this definition, the “initial state” might be a question or task such as “choose which outfit to wear”. Payne goes on in this definition to describe a series of “elimination operators” that narrow the problem and remove some facets or potential options. Finally, a final goal state can be reached, but in many decision situations, this state is not easily defined at the start of the process (Payne et al, 1993, p. 10). When needing to provide a preference, there are three key components: there are alternatives to each choice, there are events tied to each outcome and there is a value associated with each outcome. These outcomes and alternatives are all present in daily fantasy sports, so we can explore the possibility of heuristics taking hold. The particular heuristic we explore is Tversky and Kahneman’s (1974) anchoring and adjustment heuristic. In particular, this research examines whether the anchoring and adjustment effect takes place with the entry fee of online sports betting games.

Anchoring and Adjustment Heuristics

When dealing with alternative choices, Tversky and Kahneman (1974) suggested one way in which individuals make decisions is through adjustment from an anchor. In short, this

heuristic takes some initial value and assigns it the role of an anchor. Then each subsequent value or alternative that the individual is presented with is compared to and judged based on that initial anchor value. The anchor value can be thought of as a target or a threshold. For example, if respondents in a survey indicated whether they thought the unemployment rate in the United States was lower or higher than ten percent, that value (ten percent) would become an anchor. Further questioning along the lines of “What do you think the current unemployment rate in the United States is?” will result in responses that are significantly closer to the anchor value (Tversky & Kahneman, 1974).

This heuristic is used as a tactic in many circumstances, especially in sales. A used car salesperson may begin negotiations at a value much higher than the car is worth. The buyer will certainly counter at a lower value, but simply by stating that higher point, the buyer’s valuation will rise, and a higher final price can be agreed upon. It is interesting to note that anchor values can be completely unrelated to the actual aspects of the choice.

Anchors can also take hold when no number is even mentioned aloud or shown visually. In a more recent study by Bhatia & Gunia (2018), the concept of phantom anchors is explored. Phantom anchors are values that serve as mental reference points that other valuations are based on. For example, in a negotiation for the price of an item, the seller may want a high price – the phantom anchor – but offers a more reasonable price. In the seller’s mind, they anchor on the phantom value and the reasonable price they offer is an adjustment from that value. That reasonable price is still affected by the higher mental valuation, which makes that value an anchor (Bhatia & Gunia, 2018).

There is some evidence that anchoring effects may not take as strong of a hold in a naturalistic setting as they do in laboratory experiments. Johnson and Liu (2007) observed that in the Hong Kong horse racing system, anchoring effects were not as strong as previous results in

laboratory settings. In this case, individuals could anchor their probability judgments on accessible information like the jockey's or horse's previous race record; however, this anchoring and adjustment phenomenon did occur as strongly in this naturalistic observation. Therefore, it is unclear to what extent the anchoring and adjustment heuristic would take place in online daily fantasy sports sites. On one hand, individuals will see information to anchor onto, such as the top prize and entry fee. On the other hand, it is possible that these available anchors will have less of an influence on choice decisions in this daily fantasy sports context similarly to Johnson and Liu (2007). An experimental design could reveal if the anchoring and adjustment heuristic is taking place in online daily fantasy sports.

Price Effects

One reason the anchoring and adjustment effect may either be stronger or weaker in an online daily fantasy sports setting is because of the power of the price in these situations. Feess and colleagues (2016) explored the impact of betting size on betting behavior. For example, in betting situations such as online daily fantasy sports, each contest has a different entry fee and a different potential payout, and these fees can range from just a few dollars to thousands of dollars. Therefore, Feess and colleagues argue that participants assign a probability that they will lose the contest and a probability that they win, and this then influences when individuals place a bet or do not. Feess' research project explores the idea that the size of a bet will affect the assigned probability for loss, while introducing two key theories: Expected Utility Theory and Cumulative Prospect Theory.

When a bettor places a bet on the outcome of a certain event, he or she anticipates or expects something to come of it. In a financial sense, prize money is expected. However, expected utility theory suggests that the financial aspect is only a piece of a participant's valuation of winning. The outcome of the gamble may include personal glory, recognition,

positive feedback such as pride, or a whole host of other things. The usefulness, or rather the perceived usefulness, for the participant is particularly emphasized in this theory.

Cumulative Prospect Theory also comes from Tversky and Kahneman's work on the anchoring and adjustment heuristic. This theory has many aspects. Firstly, people tend to overweight extreme events and underweight average events, seeing jackpot victories as something more probable than is actually true. Additionally, bettors tend to compare potential outcomes to some reference point (similar to an anchor) and base their perceptions of other outcomes on that anchored outcome. A final important aspect of this theory is that the value function these researchers claim participants follow depends heavily on relative payoff. In other words, contests where more is at stake are typically valued more highly by participants in those contests.

Conclusion

The past research in this field suggests that a choice judgment likely occurs in online daily fantasy sports, but this area of decision making has not yet been explored. Thus, we do not currently know which choice effects, if any, take place in this example of a decision-making environment. From a cumulative prospect theory perspective, participants in these types of contests are able to anchor onto specific characteristics of an initial contest and adjust their valuation of future contests as they see them (Tversky & Kahneman, 1974). On the other hand, research from Johnson and Liu (2007) suggests that the anchoring and adjustment heuristic may not take place in a more naturalistic setting like a sports betting arena. In our research, we hope to empirically examine the factors that contribute to a participant's choice of one contest over another. In Experiment 1, we provide participants with two different possible contests to enter into. The first game either has a higher or lower entry fee than the second. If the anchoring and adjustment phenomenon is occurring, then we would predict that when participants see the

higher priced contest first, they will rate the second contest more highly. In Experiments 2 and 3, we explore contest choice with more than two available options.

Experiment 1

In Experiment 1, we aimed to discover how the values of the first fantasy sports contest a participant views affects their valuation of subsequent contests. In this experiment, we manipulated the entry fee of the first contest that participants saw, then measured their valuation rating of a second contest that always had the same price. In order to best replicate common online daily fantasy sports platforms, we built our own contest platform to display appropriate information about the contest, seen in Appendix A. Based on Tversky and Kahneman's (1974) anchoring and adjustment heuristics, we would anticipate that when the first game's price is higher, people will be more likely to buy into the second contest (whose price is lower) than when the first buy-in price is lower than that of the second contest.

Method

Participants

A total of 103 participants completed the online experiment, 100 through Amazon's Turk Prime service and an additional three were undergraduate students from a private university in the Northeast. Participants on Turk Prime were compensated \$1.00 for their responses, and the students were given academic credit. Sixty-four percent of participants were male. Ages of participants ranged from 18 to 68 years old with a mean of 34.4 years. The median annual income reported amongst participants was between \$40,000 and \$49,000. About two thirds of participants reported playing online daily fantasy sports less than once a month, but other demographic characteristics are consistent with those of past research (Millar & Baloglu, 2008). All participants provided informed consent. An additional 12 participants provided pretest data;

these participants were undergraduate students at a private northeast institution. Their data was not included in the later results section but did inform the design of the experiment.

Design & Materials

Participants in this study learned that they would be providing value judgments for contests on an ostensible online daily fantasy sports site called SportsBeasts. Experiment 1 is a 1 factor (Entry fee of the initial, “typical” contest), 2-level (\$2 versus \$8) between-participants design. The study took place online via Qualtrics software.

Entry Fee. Participants in this study saw two sequential contests whose only differentiating information was their entry fee. Entry fee was manipulated in this study, with half of participants seeing a \$2 contest first, and the other half seeing a \$8 contest first. The entry fee of the contest that all participants viewed second was \$5, the median contest entry fee of a common daily fantasy sports site. The name of the contest, “NFL Max \$\$\$ Showdown”, reflected a common naming style in one of the most popular sports in daily fantasy. The top prize of the contest was not displayed in this study, nor were the number of allowable entries. Thus, the only information on the contest provided was the entry fee.

Value of Contest. The value of both contests was measured based on the responses to three questions regarding beliefs about the contest viewed. The three randomly ordered questions were “How likely are you to participate in this contest?”, “How reasonable is the entry fee (\$5) of this contest?” and “How worthwhile is this contest?”. These questions were all measured on 7-point Likert-type scales. Responses to the three items were averaged into a single value for analysis.

Attitudes towards Online Fantasy Sports Questions. A number of additional questions gathered information about participants’ views of online daily fantasy sports in general. Key questions in this later section included “How much did the entry fee affect your judgment of this

contest?” and “How much did the sport of the contest affect your judgment of this contest?”. We had no predictions regarding these measures and included them for exploratory analysis.

Demographics. Finally, demographic questions were asked to determine what effects, if any, gender, race and other factors may have had on participants’ valuation of the contests. We collected data on participants’ gender, age, race, annual income, and sports betting behavior. The results of these demographic surveys are consistent with previous demographic research for gambling behavior (Labrie et al., 2007; Millar & Baloglu, 2008).

Procedure

This study was run through the web platform Qualtrics and was distributed through Amazon’s Turk Prime service. After giving informed consent, participants viewed an informational statement describing the online platform SportsBeasts, what a contest consists of, and what the first part of the experiment would entail.

Following this introduction, participants viewed a “typical contest”, which is actually where the manipulation takes place in the experiment. Half of participants were randomly assigned to see a \$2 contest and the other half to see an \$8 contest. Participants were asked to notice all the important factors of the contest they saw and respond to the three measurement questions (likelihood of participation, reasonability of entry fee and worthwhileness of contest), randomly ordered, as a way to control for general contest valuations.

After seeing and rating a “typical” contest, participants then saw a similar contest except it had a \$5 entry fee. Participants answered the same three value measurement questions, randomly ordered, and then also some randomly ordered questions about their attitudes towards online fantasy sports. Once this portion of the experiment was complete, participants completed a demographic survey. After completing the entire experiment, participants were thanked and debriefed. The full experiment can be found in Appendix D.

Results and Discussion

To examine whether there was an anchoring and adjustment effect, the three questions related to the value of the \$5 questions were averaged and served as our dependent variable. We conducted an independent means t-test to compare the value of the \$5 contest when the first contest was lower (\$2) versus higher (\$8). Contrary to the anchoring and adjustment hypothesis, participants rated the \$5 contest similarly when they saw the \$2 contest first ($M = 4.41$, $SD = 1.62$) compared to when they saw the \$8 contest first ($M = 4.12$, $SD = 1.56$), $t(101) = .949$, $p = .35$.

Exploratory Attitude Analyses

We carried out some basic analyses of the Attitudes Towards Fantasy Sports questions. Out of a possible rating of 5 for a very strong effect, the sport of the contest had an average rating of 2.85 with a standard deviation of 1.35. The entry fee of the contest had an average importance rating of 3.25 with a standard deviation of 1.20. Further research is necessary to explore the significance of this preliminary finding.

Conclusion

In Experiment 1, we did not find evidence of anchoring and adjustment, as those who saw a \$2 entry fee first rated the value of the \$5 entry fee contest the same as those who saw the \$8 entry fee game first. It is possible that those participating in online daily fantasy sports do not use the anchoring and adjustment heuristic as seen in past work (Johnson & Liu, 2007). It is possible that the anchors did not differ widely enough; however, the anchors were chosen based on actual entry fees charged in real online daily fantasy sports contests. In addition, in real online daily fantasy sports platforms, individuals are presented with more than two contests at a time and more information than just entry fee. Therefore, in Experiments 2 and 3, we examine choice effects when more than two choices are available, and more information is available.

Experiment 2

In Experiment 1, we did not find evidence for anchoring and adjustment. However, Experiment 1 was limited in that we restricted the set of options to two contests and only provided entry fee information. In online daily fantasy sports, individuals are able to see more than one contest and are provided with more information than just the entry fee. Therefore, the anchoring and adjustment heuristic may be less likely to work because there might be competing information among the multiple choices. For instance, each choice may have favorable as well as unfavorable attitudes. To give an example, consider a grocery store shopping situation where the shopper is presented with three possible options for an item. Option 1 is the highest in price but also the lowest in calories. Option 3 is the lowest in price, but also the highest in calories. Option 2 is a compromise of both – the middle in price and calories (see Figure 1 taken from Carroll and Vallen, 2014).

In this situation, we would predict that participants would choose the middle option (Option 2 in our scenario). And, indeed, Carroll and Vallen (2014) found this Compromise Effect, such that consumers were likely to choose the middle option when the other options were favorable in one attribute but less favorable in another. In fact, it was also found that depending on how a choice is framed, a previously unappealing option (Option K in Graph A) can become an appealing compromise if framed differently (Option K in Graph B). In other words, individuals try to avoid extremes, and consequently tend to compromise for the middle option (Neumann, Bockenholt & Sinha, 2016).

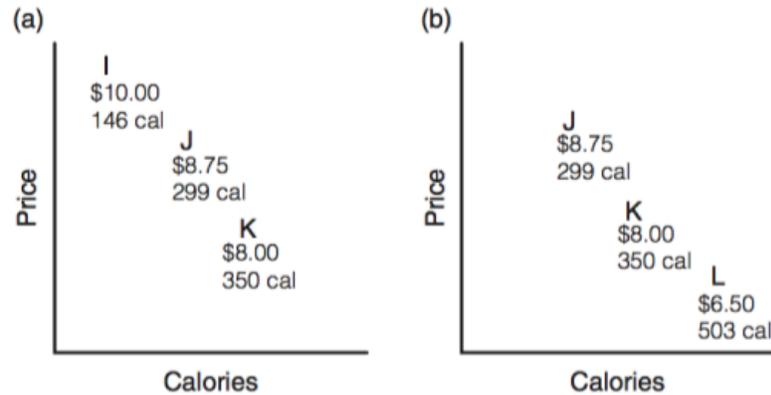


Figure 1. Carroll & Vallen's Compromise Effect where Graph A has compromise Option J but Graph B has compromise Option K.

In Experiment 2, we aimed to examine whether the compromise effect plays a role in how individuals choose which online daily fantasy sports contest to enter. Adapting from Carroll and Vallen (2014), participants saw three possible games simultaneously. We manipulated the entry fee along with the top prize. As in previous work on the compromise effect, Option 1 had the highest entry fee (unfavorable attribute) but had the highest top prize (favorable attribute). Option 3 had the lowest entry fee and lowest top prize, while Option 2 had the middle value for both entry fee and top prize. If the compromise effect plays a role in online daily fantasy sports contest choice, then we would predict that participants would be most likely to pick the middle option, regardless of the pricing.

Method

Participants

A total of 203 participants were gathered from an online survey resource, Amazon's Turk Prime service. Participants were compensated \$1.00 for their responses. Sixty-six percent of respondents were male. Average age in this study was 32.67 with ages ranging from 19 to 72. About two thirds of participants reported playing online daily fantasy sports once a month or

less. Median annual income reported by participants was between \$30,000 and \$39,000. All participants provided informed consent. An additional 10 participants provided pretest data; these participants were undergraduate students at a private northeast institution. While their data was not included in the following analysis, it did provide insights into the experimental design.

Design & Materials

Participants in this study learned that they would be choosing contests to participate in through an ostensible online daily fantasy sports site called SportsBeasts. Experiment 2 is a 1 factor (Set of contests offered), 2 level (Lower Priced set and High Priced set) between-subjects design. Condition 1 of the low price set had a \$3 entry fee and \$5,000 top prize, a \$5 entry fee and \$9,500 top prize, and a \$8 entry fee and \$15,000 top prize contest for participants to choose between. Condition 2 of the high price set had a \$5 entry fee and \$9,500 top prize, a \$8 entry fee and \$15,000 top prize, and a \$11 entry fee and \$20,000 top prize contest for participants to choose between. Participants were randomly assigned to the two conditions. The study took place online via Qualtrics software.

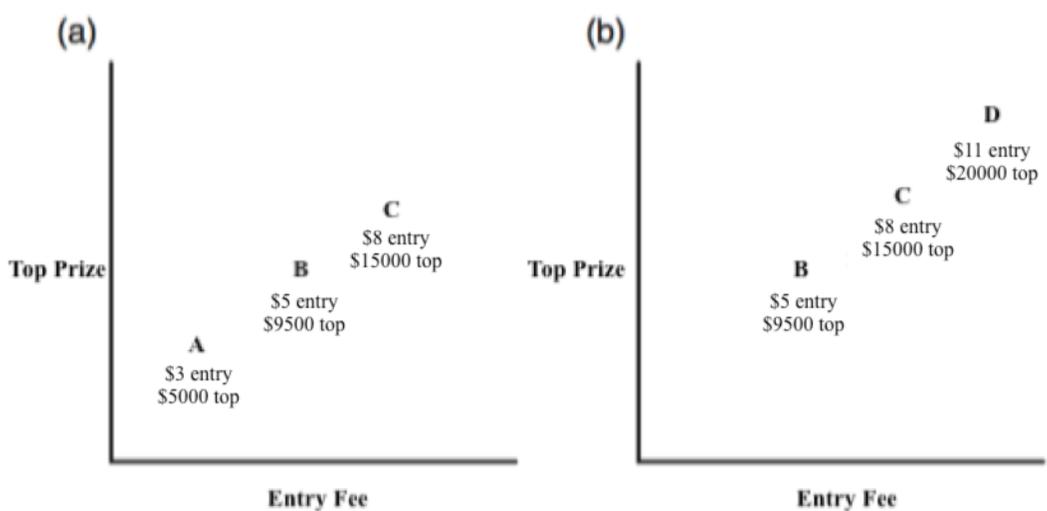


Figure 2. Experiment 2 Compromise Effect options in Condition (a) versus Condition (b).

Entry Fee. In Experiment 2 participants were presented with one set of three possible contests to enter. Half of the participants saw a set that had three lower entry fees: \$3, \$5, and \$8. The remaining half of the participants saw a set that had three slightly higher entry fees: \$5, \$8 and \$11. These fees were determined based on the most common entry fees of a common daily fantasy sports betting company. Unlike Experiment 1, the contest title (“NFL Max \$\$\$ Showdown”) was not shown. See Figure 2.

Top Prize. In addition to entry fee, participants also saw a Top Prize value. The top prize value was yoked to the entry fee, such that there would be one option where the Top Prize was the most, but the entry fee was also high, another option where the Top Prize was the lowest, but the entry fee was also low, and an option in the middle. Half the participants saw the \$3 contest with a top prize of \$5,000 and the \$5 contest with a top prize of \$9,500, and the \$8 contest with the \$15,000 top prize. The other half of the participants saw the \$5 contest with a top prize of \$9,500 and the \$8 contest with a top prize of \$15,000, and the \$11 contest with the \$20,000 top prize. See Figure 2. Because the scale of this experiment was much smaller than for a typical fantasy sports contest, we chose smaller values for top prizes that were roughly proportional to the entry fee.

Contest Chosen. The dependent variable in Experiment 2 is which contest in the set a participant chooses (e.g., the \$5 contest with \$9,500 top prize). The choice of contest in this between-participants design results in a proportion of participants choosing each contest, which can be compared using a t-test between the two conditions or a chi-square test for frequency of chosen contests.

Attitudes towards Online Fantasy Sports Questions: As in Experiment 1, we also asked participants to indicate the value of the game chosen as well as indicate their attitudes towards online fantasy sports. Again, these questions can be found in Appendix D.

Demographics. Finally, participants completed the same demographic questions from Experiment 1 to determine what effects, if any, gender, race and other factors may have had on participants' valuation of the contests. We collected data on participants' gender, age, race, annual income, and sports betting behavior.

Procedure

This study was run through Qualtrics and distributed through Amazon's Turk Prime service. After giving informed consent, all participants learned about the online platform SportsBeasts and what a typical contest entailed. The full introduction can be found in Appendix E. After this introduction, participants completed either Experiment 2 or Experiment 3 first.

In Experiment 2, participants saw three contests simultaneously, and they chose which of the three contests they would like to enter. Half the participants saw contests with lower entry fees and top prizes in a random order: the \$3 contest with a top prize of \$5,000 and the \$5 contest with a top prize of \$9,500, and the \$8 contest with the \$20,000 top prize. The remaining half of the participants saw contests with higher entry fee and top prizes in random order: the \$5 contest with a top prize of \$9,500, the \$8 contest with a top prize of \$15,000, and the \$11 contest with the \$20,000 top prize. Each contest was titled "NFL Max \$\$\$ Showdown". After selecting the contest they would like to play, each participant completed their impressions of the value of the contest they chose and their attitudes towards online daily fantasy sports. In addition, participants completed follow up questions on a 5-point Likert Type scale that centered around different factors that effected on participants' choices, including how much entry fee, top prize and sport of the contest affected their decision. We asked an open-ended question seeking any other factors that may have impacted their choice of contest. Finally, participants completed the demographic survey, which was identical to that in Experiment 1. Participants were then debriefed and thanked for their participation.

Results and Discussion

To analyze the compromise effect, we calculated the number of participants who chose each contest under each condition. Their choice in this case was the dependent variable. Using these frequencies, we were able to use a chi-square test, analyzed at the $\alpha=.05$ significance level. Note here that of the 203 participants in Experiments 2 and 3, half completed Experiment 2 first and the other half completed Experiment 3 first. We explored any differences from the ordering of these experiments and discovered no significant changes in the choice proportions.

Lower Priced Set

Of those in the lower priced set, 29 chose the \$3 contest, 24 chose the \$5 contest and 44 chose the \$8 contest. A chi-square analysis showed that for the lower priced set, the compromise effect did not occur, as participants were less likely to choose the middle (compromise) \$5 option (frequency = 24) than the highest priced \$8 option (frequency = 44), $\chi^2(2, N = 97) = 4.90, p = 0.086$. Thus, in this lower price range set, it appears participants preferred to pay more for the entry fee in hopes of getting a bigger pay out.

Higher Priced Set

Of those in the higher priced set 53 chose the \$5 contest, 25 chose the \$8 contest and 28 chose the \$11 contest. Again, a chi-square analysis showed that for the higher priced set, the compromise effect did not occur, as participants were less likely to choose the middle (compromise) \$8 option (frequency = 25) than the lowest priced \$5 option (frequency = 53), $\chi^2(2, N = 106) = 13.38, p = 0.002$. Thus, in this higher price range set, it appears participants preferred less for the entry fee.

Comparison Between Conditions

Looking at this analysis another way, respondents were significantly less likely to choose the first target contest, Contest B, when it was the compromise choice [25 vs. 50% for the

compromise vs. non-compromise condition, respectively; $\chi^2(1, N = 203) = 13.725, p = 0.000$]. Respondents were also significantly less likely to choose the second target contest, Contest C, when it was the compromise choice [24 vs. 45% for the compromise vs. non-compromise condition, respectively; $\chi^2(1, N = 203) = 10.705, p = 0.001$].

Conclusion

The results of this study suggest the opposite of what we hypothesized and what has been observed in the literature. In most studies, an option is more likely to be chosen when it is the compromise – the middle option in a set. We found that both the high and the low priced options in a set, regardless of condition, were more likely to be chosen than the compromise option. The population studied in our research could account for the differences in our results, as the Mechanical Turk population may be more apt to choose a good deal or a home run rather than the safer middle option. Future research could look into this possibility.

The results from this study suggest that individuals are not using the compromise effect when choosing which contests to select. Rather, it appears price is the main driving force with the top prize playing a role when the entry fees are lower. One possibility is that another choice effect is playing more of a role than the compromise effect. Because the entry fees are so narrowly distributed for this experiment, other factors are in play when users decide which fantasy sports contest to participate in.

Experiment 3

Thus far, it appears that individuals are less likely to use the anchoring and adjustment heuristic as well as the compromise effect when making decisions about which online daily fantasy sports contest to join. However, it does appear that at times entry fee and top prize are factors that are attracting individuals to a contest. Therefore, in Experiment 3, we investigated

the attraction effect, which is another possible effect that can occur when choosing from a set of multiple options.

If we think again about the shopping scenario, in a two-choice scenario, Option A might be lower in price (favorable) but higher in calories (unfavorable), whereas option B might be higher in price (unfavorable) but lower in calories (favorable). In this case, individuals will pick based on the attribute that is most important to them at that time (price or calories). If a third option exists that shares something in common with another option but is less favorable on the second attribute (e.g., shares price but is higher in calories), then this may make the other similar option more favorable. For instance, as seen in Figure 3, Option C shares the same price with Option B but is higher in calories. The inclusion of Option C now makes Option B more attractive because while they are the same price it has lower calories (Carroll & Vallen, 2014).

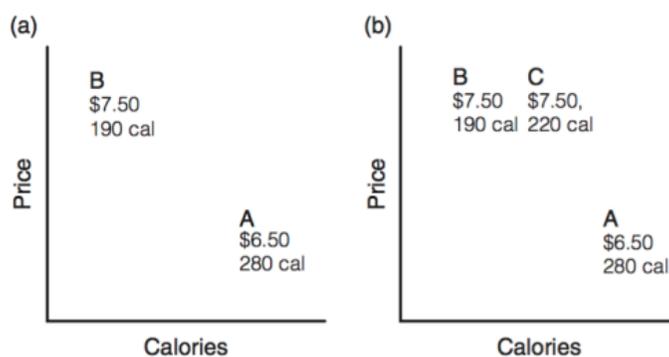


Figure 3. Carroll & Vallen's (2014) Attraction in Graph B where Option B becomes more attractive with the inclusion of decoy Option C.

In Experiment 3, we examine whether the attraction effect plays a role in how individuals choose which online daily fantasy sports contest to join. Adapting from Carroll and Vallen (2014), participants were randomly assigned to view one of two possible choice sets: a) set one had two contest choices, and b) set two had three game choices. We manipulated the entry fee along with the top prize, similarly to Experiment 2. As in previous work on the attraction effect, Option A cost the least to enter (favorable attribute) but had a low top prize (unfavorable

attribute). Option B had a high cost to enter (unfavorable attribute) but had a high top prize (favorable attribute). Option C had the same low entry fee as Option A; however, it had a lower top prize (see Figure 4). If the attraction effect plays a role in online daily fantasy sports game choices, then we would predict that participants would be most likely to pick Option A because the addition of Option C should make it more attractive.

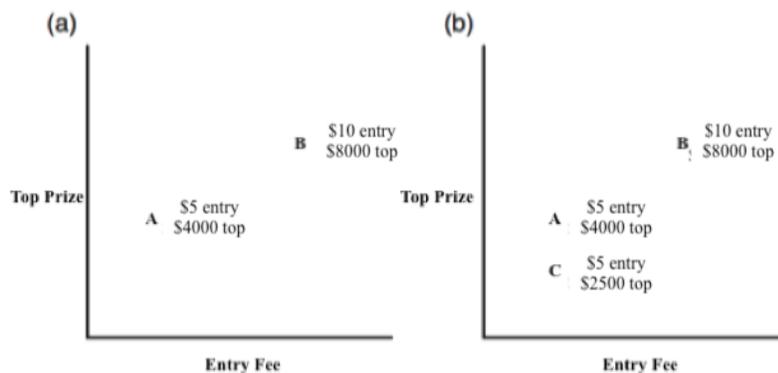


Figure 4. Experiment 3 testing for the attraction effect, with condition (a) versus condition (b)

Method

Participants

Experiment 3 consisted of the same population as those in Experiment 2. There were 203 participants in total.

Design & Materials

Participants in this experiment learned that they would be choosing contests to participate in for an ostensible online daily fantasy sports site called SportsBeasts. Experiment 3 is a 1 factor (Set of contests offered), 2 level (2-option [\$5 entry with \$4,000 top prize, and \$10 entry with \$8,000 top prize] and 3-option [\$5 entry with \$4,000 top prize, \$5 entry with \$2,500 top prize and \$10 entry with \$8,000 top prize]). Participants were randomly assigned to one of the two conditions. The study took place online via Qualtrics software.

Entry Fee. Participants were randomly assigned to see either two contests or three contests. Each contest varied in their entry fee and top prize. In Experiment 3, in the two-contest set, participants saw one \$5 contest and one \$10 contest. In the three-contest set, participants saw two \$5 contests and one \$10 contest. The contest title (“NFL Max \$\$\$ Showdown”) did not differ in Experiment 3.

Top Prize. The second contest factor manipulated was the top prize. In the two-contest set, participants saw a \$5 contest with a \$4,000 top prize and a \$10 contest with a \$8,000 top prize. In the three-contest set, participants saw a \$5 contest with a \$2,500 top prize along the same two previous contests. As in Experiment 2, since the scale of this experiment was much smaller than for a typical fantasy sports contest, we chose smaller values for top prizes that were roughly proportional to the entry fee.

Contest Chosen. The dependent variable in Experiment 3 is which contest in the set a participant chooses. In addition to this measure, we also ask the same questions from Experiments 1 and 2 with reference to the major factors that affect their decision and their valuation of the contests more generally. The choice of contest in this between-participants design results in a proportion of participants choosing each contest, which can be compared using a t-test between the two conditions or a chi-squared test for frequency.

Attitudes towards Online Fantasy Sports Questions. Next, general betting behavior questions were asked to ascertain additional information about participants. Again, these questions can be found in Appendix D.

Demographics. As in Experiments 1 and 2, demographic questions determined what effects, if any, gender, race and other factors may have had on participants’ valuation of the contests. We collected data on participants’ gender, age, race, annual income, and sports betting behavior.

Procedure

This study was run through Qualtrics in a survey distributed through Amazon's Turk Prime service. After giving informed consent, all participants learned about the online platform SportsBeasts and what a typical contest entailed. The full introduction can be found in Appendix E. After this introduction, participants were led to either Experiment 2 or Experiment 3 first.

In Experiment 3, participants saw a set of either two or three contests simultaneously, and they chose which they were most likely to enter. Half the participants saw a \$5 and \$10 entry fee contest, with \$4,000 and \$8,000 top prizes respectively. The remaining half of participants saw those same contests with an additional contest that had a \$5 entry fee with \$2,500 top prize. Each contest was titled "NFL Max \$\$\$ Showdown". After selecting the contest that they would most like to enter, each participant completed a survey about their impressions of the value of the contest they chose and their attitudes towards online daily fantasy sports. The follow up questions were on a 5-point Likert-type scale and were centered around different factors that effected on participants' choices, including how much entry fee, top prize and sport of the contest affected their decision. We also asked an open-ended question seeking any other factors that may have impacted their choice of contest. Finally, participants completed the demographic survey, which was identical to that in Experiments 1 and 2. Participants were then debriefed and thanked for their participation.

Results and Discussion

To analyze the attraction effect, we calculated the proportion of participants who chose each contest. Their choice in this case was the dependent variable. Using the frequencies of each choice, we were able to use a chi-square test, analyzed at the $\alpha=.05$ significance level. Note here that of the 203 participants in Experiments 2 and 3, half completed Experiment 2 first and the

other half completed Experiment 3 first. We explored any differences from the ordering of these experiments and discovered no significant changes in the choice proportions.

Two-Contest Set

Of those in the two-contest set, 66 chose the \$5 contest, and 46 chose the \$10 contest. A chi-square analysis showed that for the two-contest set, the attraction effect occurred, as participants were more likely to choose the low (target) \$5 option (frequency = 56) than the higher priced \$10 option (frequency = 46), $\chi^2(1, N = 112) = 3.571, p = 0.059$. Thus, in this two-contest set, it appears participants preferred to pay less for the entry fee despite the lower payout, suggesting that they value entry fee more highly.

Three-Contest Set

Of those in the three-contest set 63 chose the \$5 target contest, 4 chose the \$5 decoy contest and 24 chose the \$10 contest. A chi-square analysis showed that for the three-contest set, the attraction effect did occur, as participants were less likely to choose the lower (target) \$5 option (frequency = 63) than the higher priced \$10 option (frequency = 24), $\chi^2(2, N = 112) = 59.363, p = 0.000$. Thus, in this three-contest set, it appears participants preferred to pay less for the entry fee, again suggesting that they value entry fee more highly than top prize.

Comparison Between Conditions

Respondents were more likely to choose the first target contest, Contest A, when the decoy choice (Contest C) was present [69 vs. 59% for the decoy vs. non-decoy condition, respectively; $\chi^2(1, N = 203) = 2.300, p = 0.129$]. This difference was not statistically significant. On the other hand, respondents were significantly more likely to choose Contest B when there was no decoy choice present [41 vs. 26% for the compromise vs. non-compromise condition, respectively; $\chi^2(1, N = 203) = 4.801, p = 0.028$].

Conclusion

Results from Experiment 3 replicate past research on the attraction effect (Carroll & Vallen, 2014). The results indicate that the presence of a decoy option makes a similar choice a more attractive choice. In other words, when choosing between a \$5 contest with a low top prize and a \$10 contest with a high top prize, participants are more attracted to the low entry fee of \$5 than the high top prize. Furthermore, when there is an additional \$5 contest in the set with an even lower top prize, the proportion of participants who chose the first \$5 contest increases.

General Discussion

In this set of experiments, we examined three well-studied factors that can influence decision making: anchoring and adjustment, compromise, and attraction. In Experiment 1, we did not see evidence for that anchoring and adjustment effect for entry fee. While this work does not replicate some of the past work on the anchoring and adjustment effect (Tversky & Kahneman, 1974), it is in line with research that found that this effect was not as strong in other naturalistic gambling situations (Johnson & Lui, 2007). In Experiment 2, participants were not likely to choose the compromise option. Rather, participants tended to choose the better deal (a lower priced contest) or the better opportunity (a higher-payout contest) than a middle-valued contest. Next, the attraction effect was nearly significant in Experiment 3. We found that participants were more likely to choose the lower priced contest in a set if there was a decoy present. This could suggest that the attraction effect is taking place. Perhaps if a larger number of contests were present in the set, this effect could be more significant. It is also possible that this effect could take place with differently valued contests, for example, contests with a \$20 entry fee. Varying the target contest could be explored by future research teams.

One limitation of this work is that it used generally low entry fees and may not represent decisions made when entry fees may be more extreme, as there is literature to suggest that people

do avoid extreme values (Neumann, Bockenholt & Sinha, 2016). Similarly, the top prize values tested were not representative of those typically found in online daily fantasy sports contests in that they did not vary as widely. We felt that a wider distribution would skew results towards extreme high values for top prize. Rather, we chose to keep top prize values proportional to entry fee amounts. Future research could further explore this possibility. In addition, the current experiments allowed participants to make decisions in a time frame that worked for them. However, there is research to suggest that individuals are more likely to rely on different heuristics when they are in a hurry or have depleted cognitive resources (Payne, Bettman & Johnson, 1993, p. 38). Again, future research could examine these additional factors in decisions made for online daily fantasy sports.

Another potential limitation of this work was the population. By using Mechanical Turk and college students, we could not access the population that regularly participates in online daily fantasy sports. If we partnered with a company that offers these contests, we could incorporate our studies directly into their platform and directly study the population we are trying to make conclusions about. Different directions that such research could take include varying the sport of the target contest, varying entry fee and top prize more widely and offering participants more information about each contest. This additional information could include the number of entrants allowed in a contest, total prizes and the amount of time before the contest begins. By offering this new information, the expected utility theory suggests that participants will assign different probability to the outcome that they win. In conclusion, further research is necessary to truly flesh out any potential choice effects that take place in online daily fantasy sports.

General Conclusion

The rise of online daily fantasy sports brings with it a curiosity of the drives that motivate users to participate in one contest over another. In this research, we have found some heuristics

and choice effects that take hold in unusual ways. With the conditions under which we tested for the anchoring and adjustment heuristic in Experiment 1, we found no evidence of the effect. To recap, whether participants saw a \$2 contest first or an \$8 contest first, they rated a second \$5 contest approximately the same. When we expanded the set of potential contests to three and offered information about the contests' top prizes, we noticed a significant effect. Experiment 2 showed that some effect is counteracting the previously studied compromise effect, with contests that had extreme values of both entry fee and top prize being chosen more frequently than middle value choices. When we isolated these extreme contests in Experiment 3, we learned that entry fee was more important to participants than top prize. Additionally, when a similar but less attractive option was available, the frequency of participants who chose the target contest increased, indicative of the attraction effect. In conclusion, there certainly seems to be some choice effects taking place when participants choose which daily fantasy sports contests to join. Further research could explore these effects with different contest parameters and new populations.

Reflection

This project was by far the longest, most comprehensive start-to-finish work I have completed in my academic career. There were layers of complexity to this project, between the work on the math side, the connection with the sponsor, and the research steps completed on the psychology side. I learned so much about the research and experimentation process that I didn't understand fully from classwork. The development of experimental design was so much more complex than I had anticipated, with numerous iterations before we could even get anything running. I became a great deal more patient through the development of our project. My ability to multitask and manage my time increase significantly over the course of the year. By the end of the project, I was juggling multiple presentations and reports effortlessly.

There was also a lot I wish I had been able to do but was not. I had hoped to involve our sponsor on the psychology side more heavily. If we had access to the user base at the company, we could have done A/B testing and gotten much more interesting, pertinent results. This research at times felt disjoint from what was actually happening in the real world. However, the skills I gained following a research project through from its inception in August to its completion in April will stay with me for many years. As I pursue a career in analytics, the ability to both collect and analyze data – something pivotal to this project – will serve me well.

References

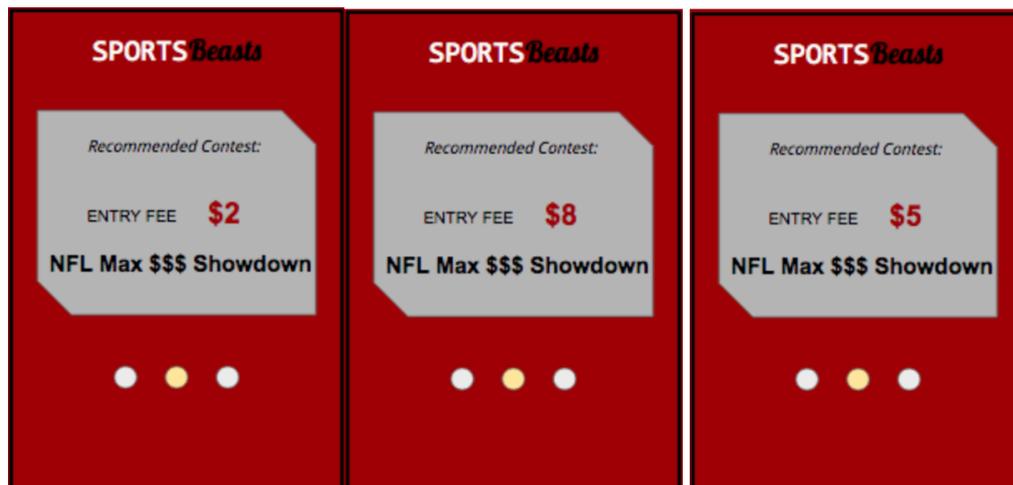
- Bhatia, N., & Gunia, B. (2018). "I was going to offer \$10,000 but...": The effects of phantom anchors in negotiation. *Organizational Behavior and Human Decision Processes*. Retrieved from <https://doi.org/10.1016/j.obhdp.2018.06.003>.
- Carroll, R., & Vallen, B. (2014). Compromise and attraction effects in food choice. *International Journal of Consumer Studies*. Retrieved from <https://doi.org/10.1111/ijcs.12135>.
- Feess, E., Muller, H., & Schumacher, C. (2016). Estimating risk preferences of bettors with different bet sizes. *European Journal of Operational Research*. Retrieved from <https://doi.org/10.1016/j.ejor.2015.09.053>.
- Gupta, P. (2017). Decision trees in machine learning. *Medium*. Retrieved from <https://towardsdatascience.com/decision-trees-in-machine-learning-641b9c4e8052>
- Johnson, J., & Liu, S. (2007). Searching for anchoring effects in a naturalistic environment: evidence from the Hong Kong horserace betting market. *The Journal of Gambling Business and Economics*.
- LaBrie, R., LaPlante, D., Nelson, S., Schumann, A., & Shaffer, H. (2007). Assessing the playing field: a prospective longitudinal study of Internet sports gambling behavior. *Journal of Gambling Studies*, 23, 347-362. Retrieved from <https://doi.org/10.1007/s10899-007-9067-3>.
- Millar, M., & Baloglu, S. (2008). The relationship of demographics to gaming preferences and behavior. *Hospitality Management*. Retrieved from <https://repository.usfca.edu/cgi/viewcontent.cgi?article=1008&context=hosp>
- Neumann, N., Bockenholt, U., & Sinha, A. (2016). A meta-analysis of extremeness aversion. *Journal of Consumer Psychology*, 26 (2), 193-212. Retrieved from <https://doi.org/10.1016/j.jcps.2015.05.005>

Payne, Bettman & Johnson (1993). *The Adaptive Decision Maker*. Cambridge University Press:
New York, NY.

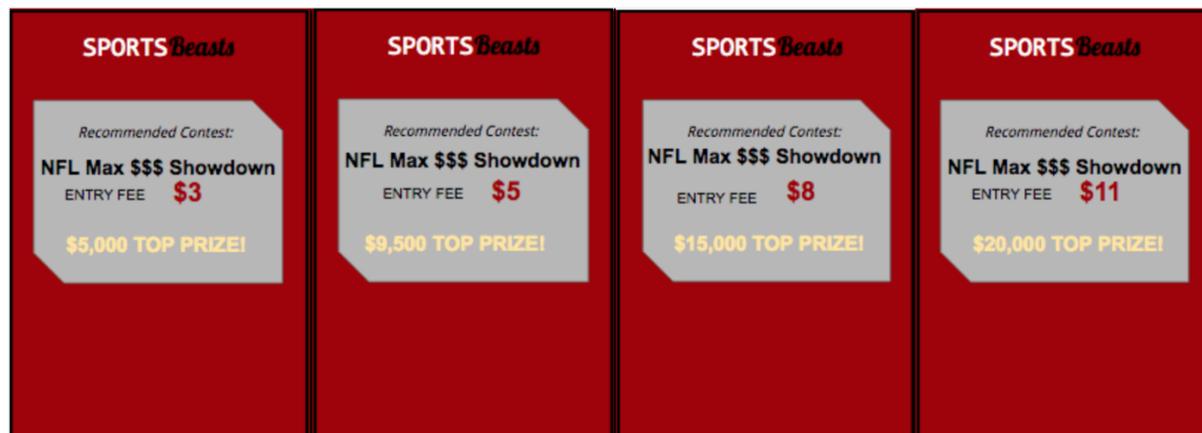
Simonson, I. (1989). Choice based on reasons: The case of attraction and compromise effects.
Journal of Consumer Research, 16(2), 158.

Tversky, A. & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases.
Science, 185(4157), 1124-1131.

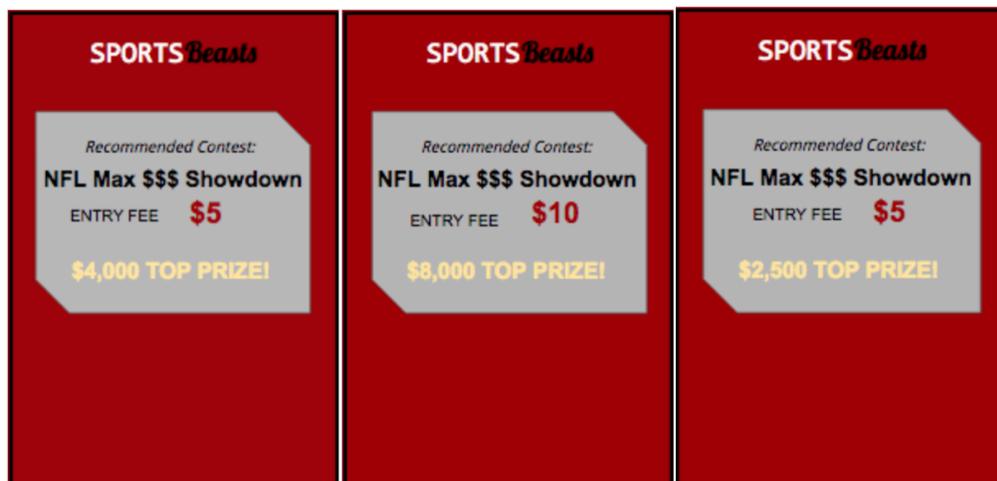
Appendix A
Mock Platform Examples Experiment 1



Appendix B
Mock Platform Examples Experiment 2



Appendix C
Mock Platform Examples Experiment 3



Appendix D
Study Surveys

Value of Contest Questions

- How likely are you to participate in this contest? (1: extremely unlikely – 7: extremely likely)
- How reasonable is the entry fee (\$5) of this contest? (1: extremely unreasonable – 7: extremely reasonable)
- How worthwhile is this contest? (1: not at all – 7: very much)

Attitudes towards Online Fantasy Sports Questions

- How likely do you think you are to win this contest? (1: extremely unlikely – 7: extremely likely)
- How does this contest compare to others on SportsBeasts? (1: much worse – 7: much better)
- What is the most you would be willing to pay, in dollars, to enter contests like this one? {\$1-3, \$4-6, \$7-9, \$10-12}
- How much did the entry fee affect your judgment of this contest? (1: not at all – 5: very much)
- How much did the sport of this contest affect your judgment of this contest? (1: not at all – 5: very much)
- How much do you think the top prize should be for a game like this?
- Did any other factors affect your judgment of this contest?

Demographic Survey

- What is your gender identity? {Male, Female, Other, Prefer Not to Say}
- What is your age in years?
- Are you: {African American/Black, Asian/Pacific Islander/SouthAsian, Caucasian/White, LatinX, Middle Eastern, Native American/Alaskan Native, Multi-racial, Other, Prefer Not to Say}

- Are you currently an undergraduate student? {Yes, No}
 - What year in your undergraduate studies are you? {First Year, Sophomore, Junior, Senior, Fifth Year}
- How frequently do you watch sporting events? {More than 4-6 times a month, 4-6 times a month, 1-3 times a month, less than once a month, never}
- How frequently do you visit casinos, racing tracks, or other betting venues? {More than 4-6 times a month, 4-6 times a month, 1-3 times a month, less than once a month, never}
- How frequently do you place bets on the outcome of a sporting event? {More than 4-6 times a month, 4-6 times a month, 1-3 times a month, less than once a month, never}
- How frequently do you play online daily fantasy sports? {More than 4-6 times a month, 4-6 times a month, 1-3 times a month, less than once a month, never}
- What is your approximate individual annual income? {Less than \$10,000, \$10,000-\$10,999, ...\$90,000-\$99,000, \$100,000-\$149,000, More than \$150,000}

Appendix E Introductions

Experiment 1: First, you will view the platform of a daily fantasy sports company, SportsBeasts. In daily fantasy sports, users are presented with thousands of contests, in each of which you have the opportunity to pay money (the entry fee) and have the potential to win thousands of dollars in return. Some contests might be NBA related, others NFL, or in dozens of other sports. Daily fantasy sports differ from typical fantasy sports because for each night in the NBA or each week in the NFL for example, you can select a new team of players to compete against other users on SportsBeasts for the top prize. You will view a typical contest in the SportsBeasts application to get an idea of how the platform works.

Experiment 2 & 3: First, you will view the platform of a daily fantasy sports company, SportsBeasts. In daily fantasy sports, users are presented with thousands of contests, in each of which you have the opportunity to pay money (the entry fee) and have the potential to win thousands of dollars in return. Some contests might be NBA related, others NFL, or in dozens of other sports. Daily fantasy sports differ from typical fantasy sports because for each night in the NBA or each week in the NFL for example, you can select a new team of players to compete against other users on SportsBeasts for the top prize. You will also view a set of contests in the SportsBeasts application. Please pay attention to the information about the contests, and then make a choice as to which contest you would be most likely to participate in.