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Gender's Influence on Risk-Taking Behavior: Insights from Game-Based Decision Making

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Abstract: ***The research project investigates how gender influences risk aversion and gaming - related decision making. A sample of fifteen people, ages 24 to 47, from the Delhi - NCR area are used in the study. Five games, each with two rounds, were intended for the players to play. Male and female participants engaged in a bidding process wherein financial gains and losses were decided by strategic decisions. The study's findings indicate that men were more daring and regularly placed higher bids, whereas women were more conservative and adjusted their offers to minimize losses. In addition to winning more games, male players also lost more games on occasion. The study demonstrates the fascinating role that gender plays in risk - taking behaviors, which has implications for comprehending patterns of economic decision making.***

Keywords: Risk Aversion, Loss Aversion, Gender Differences, Decision - Making, Bidding

1. Introduction

If given a choice between gaining a certain 500 rupees or a coin flip with equal probability of winning 1000 or 0, what would you choose? Now imagine that if this choice was given to one of your male and female friends, what would they choose? Would their choices differ? Even if there is a difference, one thing that would be common is the fear of regret and loss. This fear often leads to making rational decisions while playing these games.

A rational decision made by a player is a fundamental element of any game which refers to a reflexive meaning i. e. whether the player is able to examine his opponents motives and his own reaction to it. It comes from a logical approach, maximizing the payoff of oneself and it also depends on whether they are risk takers or not (Santos et Barros, 2011). Risk taking is correlated with how deeply an individual takes on the loss i. e. loss having a deeper emotional impact than gain is known loss aversion.

Loss aversion is a specific form of risk aversion where individuals tend to strongly prefer avoiding losses rather than acquiring equivalent gains. This asymmetry in the way people perceive gains and losses can influence decision - making, leading to a reluctance to take risks that might result in losses. Loss aversion is also known as the Prospect theory which assumes that losses and gains are valued differently, and thus individuals make decisions based on perceived gains instead of perceived losses. It suggests that investors choose perceived gains because losses cause a greater emotional impact. (Tversky & Kahneman, 1992)

For instance, assume that the end result of a game is receiving $25. One option is being given $25 outright. The other option is being given $50 and then having to give back $25. The utility of the $25 is exactly the same in both options. However, individuals are most likely to choose to receive straight cash because a single gain is generally observed as more favorable than initially having more cash and then suffering a loss.

Another relative phenomenon in loss - aversion is the disposition effect. The disposition effect pertains to our inclination to sell assets that have experienced financial gains prematurely, while retaining assets that are incurring losses. This behavior is motivated by a desire to secure profits by selling successful investments early, while simultaneously avoiding the sale of losing investments in the hope that they will eventually become profitable. The research would suggest that this effect is observed more in men than in women because women are more loss averse and would not hold on assets causing loss longer than men.

It is observed that variations in risk aversion between genders are more probable in situations involving decisions under risk than in decisions under uncertainty. Decisions under risk refer to making decisions in contexts where the probabilities of each outcome are known, for example the toss of a fair coin. Decisions under uncertainty refer to decisions in which outcome probabilities are not exactly known, but are inferred by the decision maker based on subjective expectancies, which may be based on prior experience or any other relevant information source. Such uncertain decisions are more prevalent in our everyday decision - making processes.

Another common perception everyday decision making processes is that women are more risk averse than men. For instance, men engage more in risky driving behaviors (Rhodes & Pivik, 2011), are more represented in high - risk sports such as cliff diving and freediving (Frick, 2021), exhibiting more risk - taking than women in mutual fund investment decisions. The present research study will observe relative phenomenons like prospect theory, the disposition effect that observes different genders acting differently in certain situations.

2. Methodology

2.1 Research Design

The present study follows an experimental research design.5 games with 2 rounds each were played by 2 participants at once. The nature of the game was dynamic i. e the game was

played simultaneously and repeatedly. All the games were played in a symmetrical manner with the same rules. The experiment was followed by a qualitative survey in the form of a feedback form, collecting views and strategies the participants followed while playing the game. (The participants were aware about the purpose of the experiment while filling the form).

2.2 The experiment

Two people will be provided with 20 dollars each and will be told to bid simultaneously with a maximum limit in each round (10 dollars). Both players will bid simultaneously, whoever bids the higher number wins the round along with gaining the money bid by the losing player while the losing player loses the money s/he bid and if they bid the same amount they both don't lose or gain anything. After 2 rounds of each game whoever ends up with the most money wins.

Qualitative Survey: The survey consists of 3 qualitative questions on what the players prioritized in the game, if they had a specific strategy in mind and collected their views on whether they thought or felt a gender bias in the experiment itself.

Assumptions of the experiment:

- Players are not prone to any other bias like altruism, the disposition effect, age, player's state of emotions
- A dyad of players: 1 male and 1 female
- Each player have 20 dollars
- Generalization is done with a small sample size.

2.3 Hypothesis

Ho: Males are more loss averse than females.
Ha: Females are more loss averse than males.

2.4 Sample

The sampling method used for the study was convenient sampling.15 people participated in the game out of which 8 were females and 7 were males. Participants reside in the urban region of Delhi National Capital Region belonging to the age group ranging from 24 - 47 years.

2.5 Ethical Considerations

Informed consent was taken from all the participants for data collection. Confidentiality and privacy of the respondents were maintained ensuring them that no data would be disclosed to a third party. No identifiers such as name or pictures were disclosed in the game or while conducting the study. Ethical guidelines of research were followed.

2.6 Data Collection Procedure

The experiment is done manually with the help of a calculator, division board to keep between the players to prevent them from seeing the opponent's strategy and money. The data was collected in a tabular form while a feedback form was given to the players to fill after the experiment.

Data analysis strategy

The data was analyzed through graphical representation of qualitative and quantitative data including bar graphs, pie charts and frequency distribution.

3. Results

Game 1: Round 1

Table 1: Five bids (in $) to determine the winner in Round 1 Game 1

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	5	8	9	8	9	Left with- 25
Player 2 (Female)	5	9	9	7	6	Left with - 15

Game 1: Round 2

Table 2: Five bids (in $) to determine the winner in Round 2 Game 1

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	7	7	8	8	9	Left with- 37
Player 2 (Female)	4	7	6	8	7	Left with - 3

In the first round, male players and female players started off by bidding the same amount after which they observed it got them no money and proceeded to bid higher. Gradually after the female player started losing money, she proceeded to bid lower to lose a smaller amount (realizing this by the end of the round). Learning from this, in the second round, the male player started with a moderately high bid and the female player with a low one to avoid any greater loss. She gradually raised her bid which the male player expected. He expected her to bid at around 6 (as told by him) but this backfired since she bid a little higher and they both got nothing by bidding the same amount. Regretting this the female player went back to lowering her bid to ease the loss and the male player went higher being less loss averse. The same continued further.

Game 2: Round 1

Table 3: Five bids (in $) to determine the winner in Round 1 Game 2

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	6	7	9	10	8	Left with- 14
Player 2 (Female)	8	8	9	10	7	Left with - 26

Game 2: Round 2

Table 4: Five bids (in $) to determine the winner in Round 2 Game 2

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	6	8	8	9	10	Left with- 10
Player 2 (Female)	7	8	9	9	4	Left with - 30

In the first round, the female player starts with a moderate bid and then gradually raises her bid and it declines when she realizes the player is doing the same. The same happened with the male player. Both the players applied the same strategy in round 2 as well. This time the female player bid moderately high and kept winning and bid low when she thought the male player would bid very high which was a smart move since he bid the highest (10).

Game 3: Round 1

Table 5: Five bids (in $) to determine the winner in Round 1 Game 3

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	7	9	9	9	9	Left with- 18
Player 2 (Female)	5	8	3	10	10	Left with - 22

Game 3: Round 2

Table 6: Five bids (in $) to determine the winner in Round 2 Game 3

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	9	9	10	8	10	Left with- 27
Player 2 (Female)	7	9	8	10	10	Left with - 13

In the first round, the male player kept bidding the same amount which was a unique strategy and evidently it did not work out for him! Mainly because the female player caught on to it and started bidding higher than that. In the second round, the female player continued to bid high thinking it was working well for her but the male player acting less loss averse started bidding even higher with little fear of losing more money and taking risk.

Game 4: Round 1

Table 7: Five bids (in $) to determine the winner in Round 1 Game 4

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	9	9	10	8	10	Left with- 27
Player 2 (Female)	7	9	8	10	10	Left with - 13

Game 4: Round 2

Table 8: Five bids (in $) to determine the winner in Round 2 Game 4

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	10	9	10	9	8	Left with- 13
Player 2 (Female)	8	10	10	2	10	Left with - 27

In the first round, the players thought bidding high led to winning which is why growth in the bid is observed in both players but since the male player bid higher and took more risk they won in that round. The second round turned out to be interesting! Initially the same pattern is observed as in the first round: Both players kept bidding higher while the male player bidding higher of the two but gradually the female player realises what is happening and suddenly lowers her bid from 10 to 2! This shows that instead of aiming to win the round by bidding higher (which was not working) she decided to lower the amount that the opponent would gain, decreasing the amount she would lose so in a way easing the loss incurred by a large margin. After that she realized the opponent would not make the bid lower in the fear of her making her bid higher so she bid the highest (10) again since if the player bids 10 then both would get nothing which eases her loss and if the player bid something lower then she would gain that money. The latter happened because the male player got confident. This led to her gaining money and changing the pattern of this round drastically!

Game 5: Round 1

Table 9: Five bids (in $) to determine the winner in Round 1 Game 5

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	10	9	10	9	10	Left with- 3
Player 2 (Female)	8	9	10	10	10	Left with - 37

Game 5: Round 2

Table 10: Five bids (in $) to determine the winner in Round 2 Game 5

Amount bid	(Lt - 10)	(Lt - 10)	(LT 10)	(LT 10)	(Lt 10)	Total ($)
Player 1 (Male)	10	10	5	7	7	Left with -24
Player 2 (Female)	9	10	2	8	7	Left with- 16

The above tables represent the results obtained after playing game 5. In the first round, it is observed that the male player starts off bidding the highest amount (10) and then lowers it to 9. Usually after losing the female players tend to lower their bid but in this case she may have thought that the male player will lower his bid thinking that she would do the same. When that did not happen and the female player raised her bid, it helped her avoid any further loss. Applying the same strategy and not lowering the bid even once made her win the round with a margin of 34 dollars ! In the second round, having the same mindset she starts with a high bid and increases it in the next one but this time the male player caught on to it and doesn't lower his bid like he did in the first round. In the next one both of them thought the other one wouldn't lower their bid based on the last round so both resorted to avoiding as much loss as they could. The male player brought it down to 5 while the female one brought it way down to 2. This shows that the female player was more loss averse. This strategy helped the male player win this round by a margin of 8 dollars! However, the female player still came out with a larger amount in this game.

Table 11: Total number of rounds won by each gender [N=15]

Gender	Rounds Won
Male	6
Female	4

The above table depicts the total number of rounds won by each gender throughout the experiment. It indicates that male players won 2 rounds more than the female players. This shows that being less loss averse and bidding high helped the male players to win 6 rounds. They managed to win 60% of the time. However, the female players were not so behind either. They focused on avoiding loss and managed to win 40% of the time.

Table 12: Average bid by each gender [N=15]

Gender	Average Bid ($)
Female	7.46
Male	8.58

The above table depicts the average bid by each gender. The average bid by male players was 1.12 dollars more than female players. This shows that the male players tend to bid on the higher side of the spectrum that means their bid usually ranged from 7 - 10. The female players usually restrained from bidding the highest amount which lowered their average bid to 7.46.

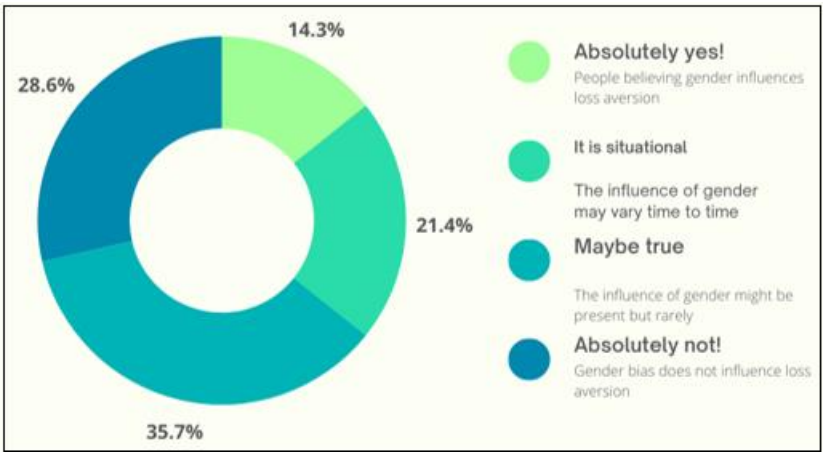

Figure 1: Perception of the players towards risk aversion in different genders [N=15]

The figure above depicts the views of the participants on whether gender influences risk aversion. A low majority of 35.7% of the people were certain that it did have an effect on loss aversion, however, an even lower percentage of people denied it.

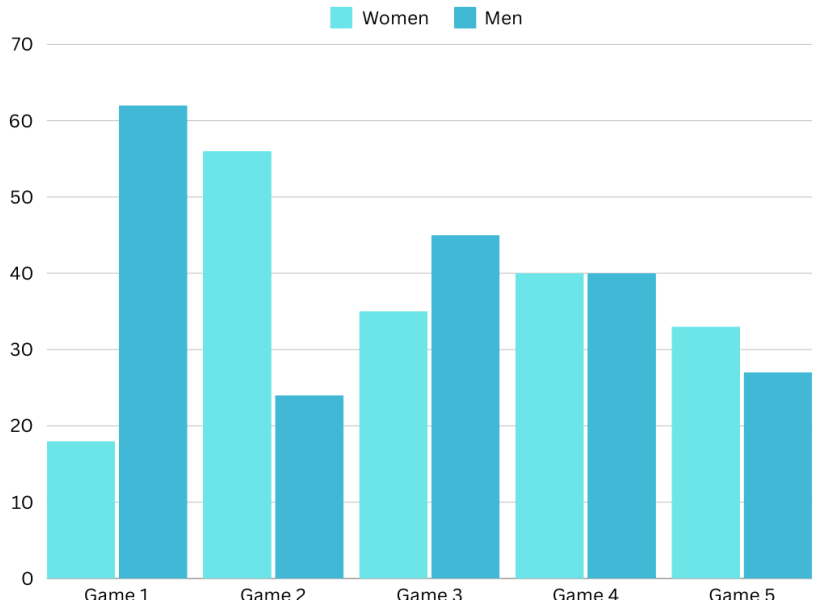

Figure 2: Total amount of money left with Male and female players by the end of the game. The total amount of money was combined from round 1 and round 2.

The above figure shows a broader view of the results obtained in each game. The bars for each player in each game depicts the amount they are left with out of (20+20) dollars with which they started. The female players were left with a lesser amount in the first and third game while the male players were left with a lesser amount in the second and fifth game and both of them were left with the same amount in the fourth game.

4. Discussion

Male players tend to bid higher than female players. Male players, being less risk - averse, bid higher than female players to ensure they have the highest bid. Although they tend to bid the maximum amount despite knowing that if both of them did the same, they would gain nothing, it is evidence of their will to always bid higher and take risks with a chance of losing. With respect to Tables 7 and 8, male players start their bids from a high amount and hardly lower their bids even when there is a probability of the opponent bidding the same amount. They use it as a defense mechanism. If a player is relatively more risk - averse than the other players, it is a sufficient condition for the total expected bid to decrease as their risk aversion increases (Meyer). This is also supported by the fact that after experiencing a loss, women generally decrease their effort, irrespective of the monetary worth of the prize they missed out on. In contrast, men reduce their effort solely when they fail to secure substantial prizes (Gill and Prowse, 2017). In an experimental setting, Buser and Yuan (2016) demonstrate that women are significantly more prone than men to cease competing after experiencing a loss. This gender disparity results in notable differences in competitive game outcomes (Tartakovsky, 2017).

All the players show risk aversion to different degrees. Any strategy applied by a rational player will be based on a common goal: to achieve the best payoff possible. Wanting to win is inversely related to wanting to avoid loss. Bernoulli points out a bet that most individuals would be willing to participate in for a nominal fee, despite its infinite expected value. He proposes that diminishing marginal utility explains why this occurs. This shows their fear of losing, i. e., risk aversion (Meyer, 2014).

Female players adopted a ‘loss prevention’ strategy, while male players looked for a winning - oriented strategy. Now that we have established all the players aim to achieve the maximum payoff, there are different ways in which they do so. With respect to Table 8, after both players bid the same amount, the female goes on to reduce their bid to a very low 2 dollars, adopting a loss prevention strategy rather than trying to win by bidding higher. On the contrary, the male player goes on to bid a high amount, adopting a winning - oriented strategy, not caring about the risk of loss. Buser, Niederle, and Oosterbeek (2014) show that men are substantially more competitive than women with similar past grades and test scores (Tartakovsky, 2017). On average, women tend to exhibit a greater inclination towards prevention, prioritizing the maintenance of a secure status quo. Conversely, men typically lean towards promotion, showing a higher propensity to pursue advancement beyond their current situation (Gutermuth and Hamstra, 2005).

The first round of any game affected a player's response in the second round. This is the human tendency to try and correct a mistake from past experience. This can be understood by analyzing Tables 9 and 10. Table 9 consists of instances where both players bid the same amount and kept losing money or gaining nothing. Table 10 shows how the bidding behavior changes significantly after the first round. In the second round, after bidding the same amount, both players reduced their bid by a large margin to correct mistakes made in Round 1. It is evident that the previous affected their future behavior.

It is common for the players to believe that bidding higher and higher will make them win. It is usually noticed that in the first round of any game (when they are new to the setting), players start by bidding higher and higher in the belief that bidding higher will get them to win. This was inspired by the understanding of ascending bid auctions in which the seller

increases the price gradually, bidders withdraw until only one remains, who then secures the item at the final price. Similarly, in this game, a player believes bidding higher would make them win (Easley and Kleinberg, 2010).

5. Conclusion

The study aims to test the hypothesis: whether loss aversion is influenced by gender. Along with that it provides readers an outlook on one of the many phenomena taking place in behavioral economics that are often blindsided in our daily lives.

The findings from table 12 suggests that the average bidding amount of a male participant was slightly higher than female participants. This observation provides evidence to the hypothesis indicating that males are less risk averse i. e they continued to bid higher with little fear of losing and females are more risk or loss averse i. e they usually lowered their bid once they started losing money. Results of rounds won by male and female players mentioned in table 11 builds on the hypothesis and also implies that being more risk averse may lead to winning in this particular game. This thought of ‘bidding high leads to winning’ was observed evidently in male participants most of the time. However, in some cases, this also had a downside; the male participants got over confident and dependent solely on bidding higher to win which led to a greater loss if in any case they didn't. The female participants who were more risk averse carried the thought of ‘avoiding loss’ in which they were successful. They didn't end up losing a great deal of money but did not gain too much either.

The study concludes that there is a significant impact of gender differences on risk aversion and decision - making strategies. In general, men are risk - takers, whereas women are more cautious and put loss prevention first. These findings can guide tactics in domains like finance, marketing.

6. Limitations

This study also has some limitations. The study done through convenient sampling doesn't have a fairly large sample space. The observations were collected through a direct investigation method therefore it was time consuming and was also prone to human errors.

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