# Research on the Hobson's Choice Effect in Games

Jiasen Ding(✉)

Games Design, University of the Arts London, London, UK
1412712126@qq.com

**Abstract.** Nowadays, games usually provide a lot of options for players. Players can choose the way that they like to play games. However, some dominant strategies in games may break the game balance. The dominant strategy may become the only option for players even though there are other options. In addition, some choices in games may not be suitable for different levels of players. Finally, it decreases the gameplay and wastes other game assets. Keeping the game balance between different options can be a method to avoid the dominant strategy. This research analyzes the problem of game strategy balance through relevant theories, and tries to find some methods to solve this problem.

**Keywords:** Games · Games Balance · Hobson choice · interactive design · games design

## 1 Introduction

Hobson's choice means a situation in which it seems that the player can choose between different things or actions, but there is really only one thing that the player can take or do. Nowadays, games are becoming more and more free and personalized. For example, Hearthstone from Blizzard entertainment allows players to collect 30 cards from thousands of different cards on their desks. Many first-person shooter games provide many different weapons. However, some imbalance may cause Hobson's choice in the game. Players are forced to choose only one way to play the game. A study shows that players will exclude other strategies that are bad for themselves and only choose the strategy that is most good for themselves [1]. Many game assets become useless, and players will lose interest in the game. If players only focus on a few choices that can bring winnings, the game will become uninteresting [2]. There are some elements that can be modified to make the game more balanced. Also, artificial intelligence can help to test the game to ensure its balance.

Adjusting the variables of game assets can help the game become more balanced. Players' strategies will be determined by these basic game variables. A simple variable change can cause a lot of changes in strategies. Furthermore, every unit in games can have both advantages and disadvantages. Units can restrain each other, so players can have many different strategies. Some combinations consisting of different balanced units


M. F. b. S. M. Dom et al. (Eds.): CDSD 2022, ASSEHR 739, pp. 233–239, 2023.
https://doi.org/10.2991/978-2-38476-018-3_24

can also cause imbalance. In addition, a game can have different levels of players, so keeping the game at medium difficulty can make players more choices.

Therefore, this paper analyzes the game design through the method of qualitative analysis. Great game balance can keep different players from having a great playing experience and ensure that most of the game resources can generate its values. It can help designers avoid wasting costs on making useless game assets.

## 2 Adjustment of Variables and Dominant Strategies

### 2.1 Macro Perspective: Adjust Variables and Dominant Strategy in Symmetrical Games

A game will have a system that consists of many variables, such as the number of resources a player can have or the area of the game. From a macro perspective, a basic game setting like the maps or levels of a game can affect players' strategies in many aspects. In other words, players will have different reactions to different game initializations.

The symmetrical game means that every player will be provided with the same starting conditions and have the same ways to gain resources and information [2]. For example, flight chess requires every player to complete 4 routes. One route includes 56 steps. Players need to roll a dice to 5 or 6 to take off a plane and move their planes by rolling the numbers on the dice. Players usually take off a plane if they get 5 or 6 on the dice if they have other planes at the airport, and move different planes together. Rather than start another route after finishing the first route. Afterward, assuming the flight chess only requires two routes and each route includes 9 steps. The average number of each time roll dice is x, the probability of each number is 1/6, and the dice have 6 numbers (1, 2, 3, 4, 5, 6). So $x = 1/6\ (1 + 2 + 3 + 4 + 5 + 6) = 3.5$. 9 steps need a player to roll $9/3.5 \approx 2.6$ times. Also, it is much easier to send other planes back to their airport. So the strategy becomes complete one route as soon as possible and start another plane.

Furthermore, some initial game settings not only can change players' strategies but also can have a dominant strategy. Sometimes every player has the same options, but it can still be imbalanced. Players know that they will lose the game from the beginning [3]. To be specific, even all the items like weapons or abilities of players' agents within games are the same for every player. The basic game setting or mechanism causes the "lock on victory". For example, Crawford mentioned that there is a "lock on victory" in the game MazeWar. MazeWar is a competitive multiplayer game. Players can walk in a big maze and shoot others. The dominant strategy is that players can walk into a blind alley and aim at the only entrance, then shoot others. It is legitimate in the game system, but every player knows that it is an unfair mechanism [4]. The classic game Tic-Tac-Toe also has dominating strategies [5]. The first step is a huge advantage in Tic-Tac-Toe. Players who go first always win or draw.

There are some methods mentioned by Tracy Fullerton. Changing some game mechanisms or Adjusting the game variables can help to solve this problem [2]. To be specific, designers can provide some advantages to help players who are in a weak position. So the gap between players in different positions can become smaller. For example, Monopoly requires players to move their agents by rolling dice. The randomness makes the first

player's advantage become smaller [2]. Also, Hearthstone from Blizzard entertainment [6] will provide a "the coin" to the player who goes second and the player can have one turn to have more costs than the first player.

On the other hand, changing the games' variables can make the gap of imbalance become smaller. For example, the game connects Four has a map of $6 * 7 = 42$ grids, which is bigger than the map of Tic-Tac-Toe: $3 * 3 = 9$ grids. More grids mean players can have more choices and chances to take strategies [2]. The game becomes longer than Tic-Tac-Toe. The advantage of the first step becomes less important.

### 2.2 Micro Perspective: Adjust Units' Variables and Dominant Strategy in Asymmetrical Games

From a micro perspective, different game units in Asymmetrical games can bring more strategies and improve the gameplay. Different units mean that games will provide different resources, abilities, and even goals and rules. That is asymmetrical games [2]. The balance in asymmetrical games is also really important. For example, in a first-person shooter game, players can choose 20 weapons. However, there is one extremely powerful weapon. The game has many choices, but there is only one choice for players to win the game. That is also a dominant strategy [7]. Units should both have their advantages and disadvantages, so each different in unit of Asymmetrical games can restrain each other. That is the core of gameplay [8].

#### 2.2.1 Rock-Paper-Scissors. Take Rock-Paper-Scissors as an Example

This game is well-balanced, each choices have their own advantages and disadvantages. The win rate for every choices are the same: 1/3 (as Table 1 shows).

However, if there is a hammer that can beat rock but be countered by scissors and paper. The game become imbalanced. The Win rate becomes imbalanced and the rock is too weak (Table 2, Fig. 1).

Another picture shows that rock and hammer be countered by two units, but scissors and paper only be countered by one unit. In order to keep the these 4 units become balanced, racket be added in to this game (Table 3, Fig. 2).

When every unit is countered by the other two units, these win rates show the same. Furthermore, the risk and reward is the same. So a relationship of units countering each other can help game balance.

**Table 1.** The win rate for every choice

| A | B | | |
|---|---|---|---|
| | Rock | Scissors | Paper |
| Rock | 0.0 | 1.-1 | −1.1 |
| Scissors | −1.1 | 0.0 | 1.-1 |
| Paper | 1.-1 | −1.1 | 0.0 |

**Table 2.** The win rate in Scenario 2

| A | B | | | |
|---|---|---|---|---|
| | Rock | Scissors | Paper | Hammer |
| Rock | 0.0 | 1.-1 | −1.1 | −2.2 |
| Scissors | −1.1 | 0.0 | 1.-1 | 2.-2 |
| Paper | 1.-1 | −1.1 | 0.0 | 2.-2 |
| Hammer | 2.-2 | −2.2 | −2.2 | 0.0 |
| Win rate | 1/4 | 1/2 | 1/2 | 1/4 |

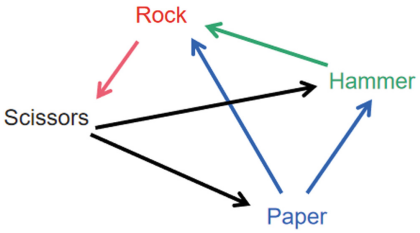


**Fig. 1.** Relationship between rock, paper, scissors and hammer

**Table 3.** The win rate in Scenario 3

| A | B | | | | |
|---|---|---|---|---|---|
| | Rock | Scissors | Paper | Hammer | racket |
| Rock | 0.0 | 1.-1 | −1.1 | −2.2 | 2.-2 |
| Scissors | −1.1 | 0.0 | 1.-1 | 2.-2 | −2.2 |
| Paper | 1.-1 | −1.1 | 0.0 | 2.-2 | −2.2 |
| Hammer | 2.-2 | −2.2 | −2.2 | 0.0 | 2.-2 |
| racket | −2.2 | 2.-2 | 2.-2 | −2.2 | 0.0 |
| Win rate | 2/5 | 2/5 | 2/5 | 2/5 | 2/5 |

However, games now have units with many different properties. Designers can translate many different properties into a standard value and use this standard value to balance the game units. A study balances different game units with many properties by cost performance. In other words, balance is that this unit worth it's price, which means that the rate between the damage that these units can cause and their price should be a stable range. Furthermore, in a RTS (Real Time Strategy Game) game, the core is units' health exchange. So units' health can be a standard value. Attack can be other unit's health losing. Defence can be extra health. So these values can all be valued as health [9].

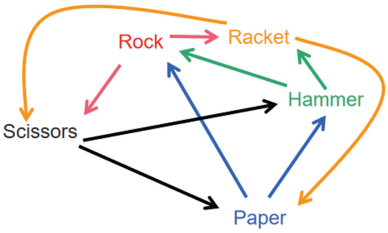


**Fig. 2.** Relationship between rock, paper, scissors, hammer and racket

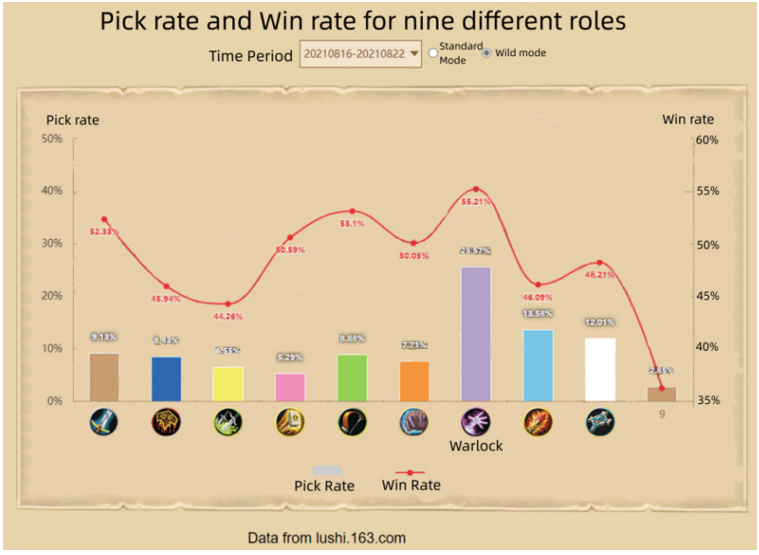


**Fig. 3.** Pick rate and win rate for nine different roles in Hearthstone

Furthermore, the combination of units can also make the game out of control, even if every unit is balanced. In other words, players may find some unexpected combo that has a really powerful effect. For example, data from Chinese official Hearthstone shows that Warlock had an extremely high win rate and usage rate in August, 2021 due to the powerful warlock desk [10]. In order to balance this complex system, some groups show that artificial intelligence can help to balance the game (Fig. 3).

## 3 Artificial Intelligence in Adjust Game Balance

Artificial intelligence can help designers balance the game both from the micro perspective and the macro perspective. To be specific, the testing game is a really important step to balance the game. However, it is hard to find real players to test games, again and again, during the testing period. On the other hand, artificial intelligence can test games hundreds, thousands of times, and even more. A study shows that artificial intelligence can help designers to balance hearthstone to some degree. They make the game

well-balanced and almost every desk has a 0.50 win rate. However, artificial intelligence changes too many variables in the game and it is hard for players and designers to play. So they use a multi-objective algorithm called NSGA2 to solve this question. The NSGA2 can not only balance the game but also minimize the change of variables [11].

On the other hand, another study shows how to balance multi-player shooter games through deep learning. They generate different levels through deep learning and artificial intelligence will play different weapons at different levels. Finally, their trained model can balance different variables in different weapons and different layouts of levels.

## 4 Hobson's Choice in Difficulty Curve

A game will have different levels of players. Middle-game difficulty or optional difficulty can fit various players [2]. To be specific, a game asset can not only be performed well by the hard-core player but also can be tried by new players. So the game assets will not be wasted. Overwatch [12] shows a good example. A data website shows that many offense heroes will be picked by different levels of players and the win rates are all around 50%. Especially the hero Genji which has the highest pick rate in the middle-level players and a slightly lower pick rate in the lowest and highest levels of players [13].

Besides, a study shows that players cannot go to many high-level maps in some open-world games. To be specific, an open-world game allows players to explore anywhere they want. However, some enemies in high-level maps are too powerful to win. Finally, players give up to explore these areas. One solution is shown in the Legend of Zelda: Breath of the wild. Enemies are grown by players' growth, no matter where they are [14]. The difficulties of the game can be changed by the game itself and make the difficulties fit players' skills.

## 5 Conclusion

Game balance can be changed by micro perspective and macro perspective. From a macro perspective, designers can change the basic game settings or add some special mechanisms to make the game more balance. From a micro perspective, designers can adjust different variables of different units, and keep the relationship of units countering each other to achieve game balance. Furthermore, artificial intelligence can help designers to find the point that causes imbalance and balance in a complex system.

This essay is mainly for small groups and indie game developers. Besides, some models of artificial intelligence from other groups cannot show too much in this essay. The essay is great to balance games that have small systems but not enough for complex systems.

With the games becoming more and more complex and rich, the systems of games will be more and more complex and sensitive (a little imbalance can make the game out of control). Using artificial intelligence to balance games will be more and more important than before. However, it is hard for small groups and indie game developers to develop artificial intelligence now. So the basic methods to balance games are also significant for designers.

## References


1. Holt, C.A., & Roth, A.E. (2004). The Nash equilibrium: A perspective. *Proceedings of the National Academy of Sciences of the United States of America*, 101, 3999 - 4002.
2. Fullerton, T., 2016. *Game Design Workshop: A Playcentric Approach to Creating Innovative Games, 3e,* 1st ed, BeiJing: publishing house of electronics industry, pp.323–346.
3. Chen, H., 2020. Research and Implementation of Game Planning Theory and Method. Satellite TV & IP Multimedia, (02),205–206, https://www.cnki.com.cn/Article/CJFDTOTAL-WSDS202002105.htm
4. Crawford, C. (2004). *Games design theory*. China science and technology press; Beijing hop electronic press.
5. Aycock, R. (2002). *How to win at tic-tac-toe.*
6. Blizzard Entertainment. (2013). *HearthStone: Heroes of Warcraft* [Video game]. Blizzard Entertainment.
7. Doan, D. (2016). G*ameDev Thoughts: The Power of Meaningful Choices In Game Design.* Medium. Retrieved July 24, 2022, from https://medium.com/@doandaniel/gamedev-thoughts-the-power-of-meaningful-choices-in-game-design-50dbdeb0348a
8. Cai, Q., & Liu, Y. (2021). Deconstruct the immersive experience of multiplayer online competitive games from a design strategy perspective. *Art and Design Research.*
9. Quan, Y. (2022). *RTS game balance and intelligent NPC optimization design and implementation,* Master's dissertation, Southeast University, https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD202201&filename=1021857960.nh.
10. (2021). *Hearthstone legend 273rd week wild mode ranking big data from 16, August,2021 to 22,August,2021.* Box of Hearthstone. Retrieved July 24, 2022, from https://lushi.163.com/bigdata/ladder/20210816-20210822/
11. De Mesentier Silva, F., Canaan, R., Lee, S., Fontaine, M. C., Togelius, J., & Hoover, A. K. (2019, August). Evolving the hearthstone meta. *In 2019 IEEE Conference on Games* (CoG) (pp. 1–8). IEEE.
12. Blizzard Entertainment. (2016). *Overwatch* [Video game]. Blizzard Entertainment. (2022). Hero Statistics. Overbuff. Retrieved July 29, 2022, from https://www.overbuff.com/heroes
13. Vidqvist, J. (2019). Open-World Game Design: case Study: The Legend of Zelda: Breath of the Wild.