Deciding the Fate of the World on a Daily Basis:

Comparing Rationality in Decision Making Between RPG Gamers and Non-Gamers

Yannick Nales

Media Technology M.Sc. Thesis

Leiden University

July 2021

Thesis advisors: Maarten H. Lamers, Peter van der Putten

Abstract

In Role Playing Games players are constantly presented with big moral dilemmas and difficult choices. Based on earlier research it could be possible that this improves certain decision-making skills in RPG players compared to non-gamers. This study looks into what differentiates RPG players from gamers who do not play RPGs and people who play no games at all. We also look at what makes people rational, and how certain aspects of RPGs might improve rationality for RPG players. To do this we gathered 62 valid surveys through online forums and social circles and provided them with a survey in which they were tasked with a rationality test. By analysing the survey results and comparing the rationality scores of RPG players and non-RPG players we found that there is no significant correlation between playing RPGs and a high rationality score. We did find that there is a significant correlation between a high rationality score and high self-evaluation of rationality. The results imply that playing RPGs does not noticeably improve rationality.

I. Introduction

I remember getting my very first gaming device for my seventh birthday. It was a second-hand purple Gameboy Color with four games. Three of these games came with the Gameboy, and with the extremely limited knowledge my parents had of popular games they ended up buying Pokémon as well, because they recognized the name from the tv show that was popular at the time. Looking back, if my parents had known what kind of game Pokémon is they would probably have picked a different game. Pokémon is a roleplaying game, meaning it is fairly text and statistic heavy[*]. Pokémon is also completely in English, and as a small 7-year-old Dutch speaking child who could barely even read Dutch this meant that I couldn't experience the game to its fullest. And even though I had absolutely no idea what things like 'moves' or 'potion' meant, I remember absolutely loving the game. The reason for this was that I recognized many elements from the tv show, but instead of watching someone else living in this amazing fantasy world, I was living in it myself. I decided where my little pixelated avatar

---

[*] Skills with numerical values play a large role in RPGs, with certain actions requiring a minimal value for a specific skill.

moved, what actions he performed and friendships he made. This was my first taste of role playing games, and I kept playing them ever since.

In terms of player freedom, Pokémon is not even that open of an RPG. As I grew older (and learned better English), I started playing more narrative-driven RPGs. In these games the choices you make as a character can greatly impact the flow of the story, which made every choice feel so much more impactful. After playing these games for years, I have become somewhat used to the mechanic, and I have learned what factors to weigh in my ultimate decisions. But does that mean my decisions are better? More rational? I did definitely become better at recognizing these points in games, but does this also go for real life? Have I, and for that matter all gamers that often play these types of games, become better at making rational decisions than someone who doesn't play these games or games in general? Does playing these games mean you become more rational?

It is slowly dawning on the general public that video games are, in fact, not just an immense waste of time and bad for someone's development (although the whole 'video games cause violence' debate is still going strong and video game addiction is now officially recognised by the WHO[1]). There are already some proven cases where playing video games is actually good for improving certain skills, which we will go over in this paper. If it turns out that playing role playing games is beneficial in any way, shape or form, this could be added to the list of benefits of playing video games.

By testing (RPG) gamers and non-gamers on their rationality we hope to get some insight into whether playing Role Playing Games has any effect on people's rationality. We do this by constructing a method to test rationality, and compare the scores of multiple groups of people. This showed some interesting results. In the remainder of this paper we look into related work, explain our method based on and inspired by related work, analyse test results and form a conclusion.

II. Related work

As mentioned in the introduction, the idea of games improving real-life skills has been fairly well explored. So is the genre of RPGs within video games. In this section we go over what RPGs are, what their players are like and look into rationality as a human quality. We will also find a lack of studies about rationality and gamers. From hereon when games are mentioned, it should be known that we mean video games, unless stated otherwise.

II-1. Gamers vs non-gamers

Playing games has been proven beneficial in several skills. One example of this is improved visual skills, with people who frequently play action games having a faster visual search rate and better tracking of multiple items[2]. Another example is how gamers are less prone to crashing their car while driving and calling[3], although the usefulness of this skill can be debatable. A study by Sammut & Andrejevic [4] shows that surgeons who are also gamers have a better baseline performance with laparoscopic surgery. Another example of what games can do is a study by Jorrit Siebelink[5] about the use of framing in games, where players who assume the role of a virtual worrier become more susceptible to framing.

It is, however, not all too common for gamers to have any sort of advantage over non-gamers. Several studies show that although there is ample reason to believe that gamers could/should excel in certain real-life skills, it turns out they don't. Examples of this are a study by Gaspar et al.[6] that show that people who play action games are not better at dividing attention between crossing a road and working on a cognitively complex task. There are more of these examples, but these do not

necessarily contribute anything to the subject of RPGs and rationality which is why they will not be referenced any further.

II-2. RPGs

Role Playing Games, or RPGs for short, are a very popular type of game that has been around for decades. The RPG genre preceded video games, with popular tabletop RPG *Dungeons and Dragons* (Tactical Studies Rules Inc., 1974) coming out in 1974. In tabletop form, an RPG leans heavily on the players' imagination. As the name suggests, players assume the role of a fictional character or version of themselves, as they play through a story. Players must try to act in ways their character would. The tabletop version relies heavily on storytelling, with sometimes a map of the adventure and miniature figures representing the players. Video games allow for a much more detailed representation of all set pieces, and the format of a tabletop RPG, being relatively statistic-heavy, lends itself well for conversion to digital media. Depending on the kind of RPG the player assumes the role of a self-made character, or a predefined character that fits in an overarching story.

Within this section we mention examples for different classes of games. These are not meant to be exhaustive, but merely to give the reader an opportunity to explore an example game. For a more comprehensive list of RPG (sub)genres, please visit this page: "https://en.wikipedia.org/wiki/Role-playing_video_game#Subgenres".

RPGs exist in many different forms. The differences are mostly in gameplay. Due to limited hardware, early RPGs existed mostly as text-based games, where the player is presented with paragraphs of text explaining what is going on. With improvements in computer hardware this style of RPGs, and video games in general, has fallen out of favor. A popular successor to text-based RPGs, which is experiencing somewhat of a revival as of late, is a Computer Role Playing Game, or CRPG. These games play like a visual representation of a more traditional tabletop RPG, with often isometric maps where the player acts in turns. Well known examples of classic CRPGs are games like *Baldur's Gate* (Bioware, 1998) and *Fallout* (Interplay productions, 1997). An example screenshot is illustrated in Figure 1.
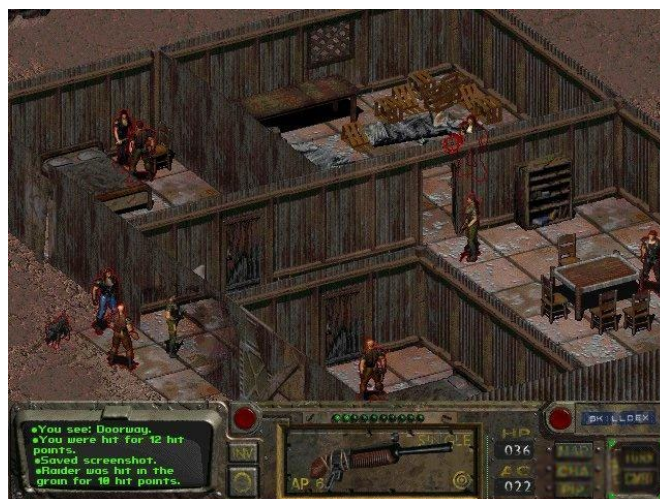

Figure 1: Fallout 1's isometric maps (Interplay productions, 1997). The game world works with an invisible hexagonal grid where each step covers one tile. Steps count as actions, of which the player can perform a limited number per turn. In the example above the number of action points is called AC.

Another classic type of RPG is the Japanese Role Playing Game (JRPG). These types of RPGs became popular on classic game consoles like the Nintendo Entertainment System (NES) instead of personal computers. JRPGs, like the name suggests, originate from Japan and are just like CRPGs turn-

based. The biggest difference is that JRPGs alternate between a real-time overworld where the player interacts with non-player characters (NPCs) and a turn-based battle view. A more modern type of RPG is the Action Role Playing Game (ARPG). In ARPGs the main focus is on combat, with the story often being less prominent (e.g. *Dark Souls* (FROM Software, 2011)). RPGs work well in a linear setting, where the flow of the story and character development can be heavily controlled by the developer. While this is an effective and well received form of gameplay, with the advancement of technology a different type of gameplay emerged. The "open world" style of games has been around for quite some time, even in RPG games (like *The Elder Scrolls II: Daggerfall* (Bethesda Softworks, 1996)), but has seen many changes and improvements since it became mainstream with the immensely popular open world sandbox game *Grand Theft Auto III (*DMA Design, 2001). Open world games give the player much more freedom than linear games, at the cost of developer-directed pacing and progression. Where in linear games the player goes from point *A* to point *C* through point *B*, with certain scripted events somewhere around point *B* and an expected character level of *X*, in open world games the player can go from point *A* to point *F*, while skipping points *B* through *E* and arriving there with a heavily underleveled character. This poses major challenges in game design, but for RPG players this sort of game is ideal. In open world games the player can decide to not go save the world from dragons, but instead focus on a career in blacksmithing or potion brewing, finding a wife, building a house, go explore some caves and then maybe look into the dragon problem. It might not drive the plot forward at a consistent pace, and the story often suffers from this kind of freedom, but in terms of gameplay this works incredibly well. Because it is harder to create a strong narrative this way, the market for more linear games has not died out, for there is benefit to both styles. Another type of RPG that shares some similarities with ARPGs is a Massively Multiplayer Online Role Playing Game (MMORPG). Where (with the exception of tabletop RPGs) RPGs are usually played by a single player, MMORPGs are built on social interaction with many other players. Every player has their own character, and can try to complete their own goals or cooperate with others.

It is important to also make a distinction in the kind of role a player plays. There are two main directions an RPG can go with the player character. One is giving the player a blank character, with no name, bare backstory and often customizable gender and appearance. This approach makes it harder to give the player character much (if any) character development, from which the story can suffer, but at the benefit of giving the player a lot of freedom to shape their character exactly the way they want them. The other approach is giving the player control of an established character. This makes it much easier to give the presence of the character weight, relations and goals, but at the cost of player freedom. A good example of the latter is the "The Witcher" series of games (CD Projekt RED, 2007, 2011, 2015). These games are based on a series of fantasy novels, and form a sequel to them. This means that the main character in the games has an extensive history with clearly defined character. Players who read the books beforehand and are familiar the character will probably know when certain decision options are out of character. This could mean that the player will approach certain decision moments differently than when they would be playing with a completely self-created character.

II-3. RPG Players

RPG players, and in a broader sense gamers in general, are a demographic that evolved strongly over the last few decades. When video games first started to become a thing, games were too simplistic and limited to be seen as a big hobby, especially on home consoles of the time. A bit later more advanced games could be played on arcade cabinets, which were much more expensive and made use of more powerful hardware. For the longest time video games were seen as a children thing, with most games being colourful and child-friendly. Only a small handful of games (mostly on PC) were catered to a more mature audience. When in the 1990s more adult games were being released, the public view on video games as a form of entertainment gradually changed, with games getting far more mainstream and players of nearly all ages.

From an outsider's perspective the 'gamer' demographic might seem like a rather monolithic entity. This is far from the truth however, with many subgroups within the hobby. It is rare to find a gamer that only likes one specific style of games, but many gamers have genres they are more invested in. Some genres simply don't offer what a gamer wants.

Games can be divided in finite and infinite. Finite games are often short (ranging between minutes to an hour for a single match). Examples of this are sports games like football game *FIFA* (EA Sports, 2020) or a shooter like *Call of Duty* (Activision Blizzard, 2020). In finite games the player either wins or loses, but the outcome is usually only relevant for just that match. Infinite games do not have any kind of match, and only end when the player decides to stop or when the end of a story is reached. This makes infinite games feel like an entirely different activity, because the player is fully invested for the entirety of the playtime as compared to finite games where the player is taken out of the game and dumped in a menu at the end of a match. RPGs are infinite games. The lack of a clear end allows players to get more immersed in the game. This is a core element in RPGs and a major draw for fans of the genre. RPGs lack a competitive player vs player (PvP) element because there is no clear end, but since RPGs often have an overarching narrative they are also not as open-ended as simulation games where there is no definitive goal. An example of these simulation games is *Farming Simulator* (Giants Software, 2021). The lack of competitive elements also doesn't mean that RPGs aren't challenging, although modern story-focussed RPGs often include a difficulty setting that (mostly) omits any combat or challenges and lets the player purely experience the story. Something found in almost all gamers that enjoy RPGs is a certain sense of imagination, suspension of disbelief and at least a bit of escapism.

II-4. Rationality

Rationality is sometimes used interchangeably with intelligence. Rational decisions are often seen as good, especially when the stakes are high. Thinking rationally often implies that someone can base their reasoning on logic and facts, and not get influenced by their own feelings and personal biases. People are often bad at making truly logical decisions, even when they think they are thinking rationally. This makes people predictably irrational[7]. What this means is that in scenarios that have a reasonably clear and objectively 'right' and 'wrong' answer, thanks to those biases, people can still make wrong choices at times. This has to do with the way people think. For example, when presented with a question of whether person *A* lives in town 1 or town 2, with 25% of the population living in town 1 and 75% of the population living in town 2, the logical answer is that it is more probable that person *A* lives in town 2. But if on top of this question a little description of person *A* is added, which adds no actual data but fits the stereotype that goes with town 1, people often completely ignore the overwhelming odds that person *A* lives in town 2 and choose town 1 instead, simply because this fits the stereotype narrative better but has no actual data supporting this. People often mistake their own intuition as logical thinking[8]. This also happens with sample sizes and correlation.

The examples given above are caused by certain heuristics. Tversky and Kahnemann[8] identified three heuristics that are prevalent in decision making. These are the availability heuristic, by which people make choices based on how easy it is to think of examples or elements prevalent in certain choices, the representativeness heuristic, by which people base their choices on how much an answer fits in what they know of a subject, and the anchor heuristic, by which people use earlier given information regarding a decision moment as an anchor point, regardless of whether this anchor point is actually useful. These heuristics are very useful in quick decision making, because they save a lot of time and effort and often give acceptable results. The trade-off with using heuristics is that you lose accuracy. Because people usually use heuristics without realizing, it could happen that you make objectively wrong choices because you're not using a rational approach. A heuristic approach means that information about a topic can be ignored to simplify and speed up a decision. This is not necessarily a bad thing

however. In plenty of situations, you simply don't have to carefully weigh all options and alternatives. When in a supermarket comparing two kinds of toothpaste, it doesn't really have the greatest impact on your life which one you choose. Using heuristics here saves time and effort, because using a rational way of thinking (taking in consideration the different kinds of caps on the tubes, the ingredients, etc) will take way longer and does not necessarily result in a better outcome.

Rationality is, much like intelligence, not a single quality. It is more of an umbrella term for a multitude of skills, which makes it difficult to measure universally. In the book 'The Rationality Quotient'[9] several psychology scientists attempt to design a general framework for testing rationality, called the Comprehensive Assessment of Rational Thinking (CART). The CART uses several different skills to score someone's rational thinking capability. While the CART is largely comprehensive, it does not give a definite rationality rating and should be seen as an IQ test, meaning it mostly gives an indication of rationality.

When looking at rationality and the way we make choices, it is not too far-fetched to think that constantly making these complex choices in RPGs does something with the way you use rational thinking. As mentioned before, rationality is comprised of multiple skills, and skills can often be enhanced through training. By making many difficult choices in games, it might be possible that RPG players are unbeknownst to them training these rational thinking skills. There is however no research done on this topic.

II-5. Time pressure

People generally don't like to make split-second decisions. That is why important decisions often allow for some time to think before agreeing. In studies by Mark Hwang[10] and Edland & Svenson [11] it is shown that people under time pressure generally perform worse in making decisions than people who have more time to think about it. A study by Ordóñez and Benson[12] shows that people often fall into repetitive behaviour in decision-making if time pressure is added, while they would come up with new strategies or reasoning without time constraints. This is relevant to our research because in some RPGs, when the player has to make a decision, a little timer shows up giving the player a limited amount of time to decide what they choose (figure 2). An example of this is in *The Witcher III: Wild Hunt* (CD Projekt RED, 2015), where the story can change depending on what the player answers at certain points in the game, or doesn't answer at all. It should be noted that not even all choices in this game are timed, and many RPGs do not have any timed choices at all. Despite this, the addition of a timer with certain decision moments adds a certain sense of urgency, and can also fit the narrative better. Imagine an in-game scenario when the world is literally exploding and the player character has to decide to sacrifice himself to save humanity or let the world burn. If the player has an endless amount of time to decide, it would work a bit strange in the narrative.
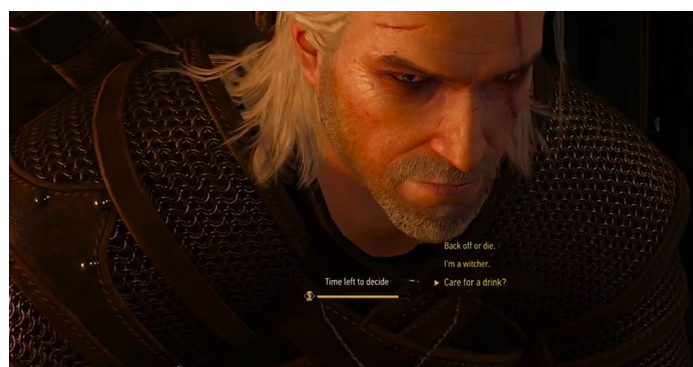

Figure 2: Screenshot from The Witcher 3: Wild Hunt (CD Projekt RED, 2015), showing a decision moment with non-diegetic timer element

III. Research question

In this Section we formulate the research question. Based on related work we hypothesize that RPG players, and that gamers in general, are more rational, meaning better certain skills and less susceptible for certain biases. Therefore the research question will be formulated as:
Are RPG players more rational decision makers than non-gamers?

IV. Method

To find an answer to the question mentioned in section III we needed to find a way to test rationality on a sufficiently large group of people. Since this research was done during a global pandemic where physical interaction was discouraged, a digital data gathering method was preferred. This situation made us decide on conducting a survey to acquire the data necessary to answer our research question.

IV-1. Studied Population

In this research we will be studying different groups of gamers like RPG players, shooter players and sports-game players, but also non-gamers. We do take nationality, age and gender into account. In order to find participants for the survey we made use of a combination of internet forums, personal relations and an internal university network. Among the forums is Reddit, a large collective of message board-style subforums and the world's 19th most visited website[13]. The survey is posted on multiple sub-reddits (sub-forums), namely r/RPG_gamers, r/SampleSize, r/SurveyExchange and r/Gaming. These *sub-reddits* were chosen to find both specifically RPG gamers, more general gamers and non-gamers. The survey was also posted on the popular gaming forum GameFAQs (https://gamefaqs.gamespot.com).

With gaming being such a mainstream activity nowadays it is somewhat difficult to find people who *never* game. Determining what qualifies someone as a gamer would be necessary, so the method for that is described in section IV-2.

IV-2. Questionnaire

As mentioned before, the data is collected through an online survey that can be accessed with a URL. The survey was made using Qualtrics, a highly customizable online survey tool. The survey consists of 32 questions, of which 5 ask for demographic data (age, nationality, etc.), 8 ask about the participant's video gaming experience, and 19 collectively test the rationality of the participant. Before the participant can start the survey they will first be presented with a message explaining what happens with the data and that they can opt out at any point. To continue the survey the participant must press the button acknowledging that they read the message and agree with it. The first 5 questions about demographics are all displayed on the same page, followed by a page showing the 8 questions about gaming experience. Most of the rationality questions have their own page, with the exception of a few questions that relate to each other. The rationality-testing questions are all timed and presented in random order, with the exception of the final question, which is not timed and always appears as the final question. This is because the final question asks the participant how they would rate their own rationality on a scale from 1 to 7. This question makes clear that the questionnaire is about rationality, which may influence the way participants answer questions. Since the final question is not part of the rationality test, it does not have to be timed. The amount of time a participant has to answer differs per question. If the participant did not answer a question when the timer runs out, the question will be presented once more later in the survey in case the participant did not understand the question or panicked because of the countdown timer. If the question is left blank a second time, it will not be repeated again. The rationality questions are timed in order to better simulate a situation in RPGs, and also to stop participants from taking too much time to think about certain questions that play heavily upon certain heuristics, which would influence the test. The whole survey takes roughly 12 minutes to complete.

IV-3. Rationality questions

To test rationality, we designed a test based on the CART[9] mentioned in section II-4. The CART was designed more like a proof of concept rather than a scientifically proven method to test rationality. It is also far too long to put in an online survey (full version up to 3 hours, short version up to 2[14]), so we decided to create our own rationality measurement tool based on the CART, but slimmed down considerably to better fit our data gathering method and with some tests from different sources, like Wason's rationality test [15] (Wason's test is more like a single question rather than a full test). In the end, we ended up with questions testing the skills and topics described in Table 1. These skills are based on the skills from The Rationality Quotient[9]. Our slimmed-down test is a lot quicker, but that is at the cost of accuracy. The CART asks multiple questions per skill, while our test at the most only asks three questions per skill, making it less comprehensive and dependable. But again, in order to fit the survey format this was deemed necessary.

Skill	Description
Probabilistic and Statistical Reasoning	The ability to handle uncertainty by looking at the probability and make sense of statistical information
Anchoring	A cognitive bias where someone's decisions are influenced by a point of reference
Risk Knowledge	The ability to assess risks
Quantitative Reasoning	The ability to mentally manipulate numbers and quantitative information
Framing	A cognitive bias where someone's decisions are influenced by positive or negative connotations
Financial Literacy and Economic Knowledge	One's knowledge of financial and economic concepts
Temporal Discounting	A tendency where people devalue rewards when it takes longer to receive them compared to receiving them sooner but at a lower value
Conjunction Fallacy	A fallacy where it is assumed that certain specific conditions are more likely than a single general one
Deductive Reasoning	A form of thinking involving one or more statements and reaching a logical conclusion
Belief Bias in Syllogistic Reasoning	A tendency to judge arguments based on how plausible their conclusion is rather than how well they support their conclusion
Limits of Correlational Relationships	Finding logic in correlational relationships and knowing when something is not related

Table 1: Skills and topics making up rationality

The questions are can all be linked to the skills and topics mentioned in Table 1, which can also be seen in the appendix. An example of a question, in this case part of the Quantitative Reasoning skill, is *"In a field, there is a patch of grass. The grass patch doubles in size every day. If it takes 7 days for the grass to cover the whole field, how many days does it take to cover half of the field?"*. This question will reward 1 point if the participant answered 6 (the correct answer), and no points for any other answer. A participant can get a total of 15 points for the rationality test, and only if every question is answered correctly. The previously mentioned question is based on a question from the CART, but with a different narrative to not make it an exact copy (the original question used a pond with lilies as narrative).

IV-4. Variables

Using the method described above, we aim to capture the variables found in Table 2:

Role	Type	Name	Description
Independent	Numeric	Age	The participant's age
Independent	Categorical	Gender	The gender the participant chooses to identify as, with options for non-binary and not disclosing their gender
Independent	Categorical	Source	The way the participant found the survey (forum, email, forwarded by friends or family)
Independent	Categorical	Genres	Describes the genre(s) of games the participant plays
Independent	Ordinal	Experienced gamer	A gaming experience rating the participant gives themselves with 1 being the lowest and 7 the highest
Dependant	Interval	Rationality score	The combined total of points from correctly answered rationality questions (scoring system can be found in appendix)
Independent	Ordinal	Rationality self-report	A rationality rating the participant gives themselves with 1 being the lowest and 7 the highest

Table 2: Variables to be found in the survey results

IV-5. Analyses

In order to come to any conclusions, we want to analyse the gathered data and get results on three different statistical tests, these being: is there a correlation between how a participant rates themselves on rationality and their tested score, does the primary gaming platform have any influence on rationality score and, the main question, do RPG players score better or worse on rationality than non-gamers. The results will be acquired through the statistics program JASP and described in section V.

V. Results

In this section we describe the data we gathered through the online survey mentioned in the last section. We look at multiple different tests and how various subgroups relate to each other.

V-1. Participant characteristics

A total of 118 people took our survey. Out of these 118 participants, 55 did not reach the final question of the survey, disqualifying their results. One participant did reach the final question but did not answer anything. Subtracting these 56 invalid participants from the total left us with 62 valid responses. Participants were found through different channels. Table 3 shows how valid responses are distributed across the different sources the survey was shared through.

Source	*n*
Forum	43
Email	9
Friends or family	8
Not answered	2
Total	62

Table 3: Distribution of valid participants over sources

Several characteristics of the 62 participants whose data is used for analysis is shown in Table 4.

Gender	*n*	Age	
Male	41	Min	14
Female	20	Max	42
Unknown	1	Mean	25

Table 4: General participant characteristics

To the question of whether or not the participant plays games, nearly all participants replied with 'yes', with only 3 participants replying with 'no'. Other gaming-behaviour related data can be seen in Table 5. To get an impression of the general gaming experience of the participants, we asked the participants to rate themselves on their gaming experience, with 1 being 'not at all experienced' and 7 being 'very much experienced'. Figure 3 shows how these scores are distributed across all 62 participants. Over 60% of all participants gives themselves a 5 or higher, which means that a majority of all participants could be considered as 'gamers'.

Plays games	n
Yes	59
No	3
Last played games	n
Today	30
Last week	23
Last year	4
Never/Can't remember	2

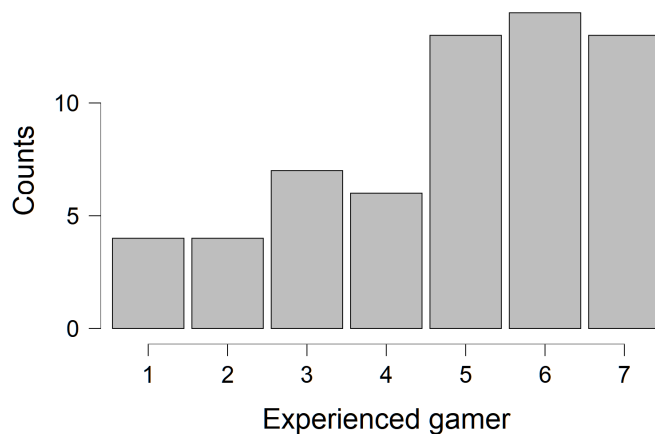Table 5: Overview of participant gaming behaviour

Figure 3: Distribution of self-rated gaming experience

The most popular genre games played by participants was RPGs, with the least popular genre that was listed being puzzle games.

V-2. The rationality test

The rationality test consisted of 16 questions. Every correct answer yields 1 point, with a max total of 15 points. Questions 6 and 7 are linked and collectively count as 1. Because the questions had a countdown timer, it was to be expected that some questions would be skipped by some participants. The most unanswered question was question 11, which was a temporal discounting test. Further analysis of the data does not clarify why this question in particular was left unanswered so often. From the 62 participants, 18 did not finish this question. The perfect score of 15 points was not obtained with a high score of 14 points and a lowest score of 3 points. The distribution of scores is shown in Figure 4. A Shapiro-Wilk test shows that this is normally distributed (p=0.129).
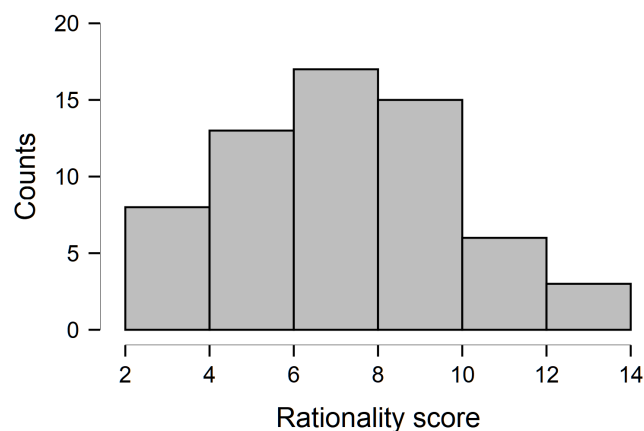

Figure 4: Rationality score distribution (n = 62)

V-3. Self-reported rationality scores

At the end of the survey all participants were asked to rate themselves on how rational they thought they were. This rating was done with a Likert-scale ranging from 1 (not at all) to 7 (completely). Participants averaged on 5 points, which suggests that participants consider themselves on average moderately rational. This can be seen in Figure 5. This is not normally distributed according to a Shapiro-Wilk test (p=<0.001)
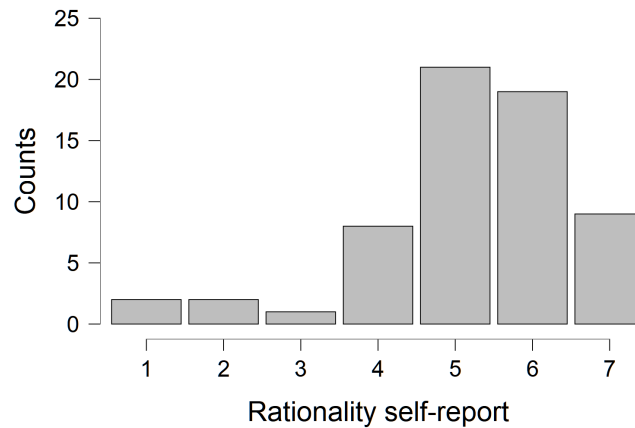

Figure 5: Distribution of self-reported rationality scores (n = 62)

When we compared the participants' self-reports and their test scores, we found a positive correlation (r=0.264) between participants that give themselves a high rationality rating and their score with a significance of p=0.038. This means that participants that think of themselves as rational do score higher on the rationality test than participants that don't think they are very rational.
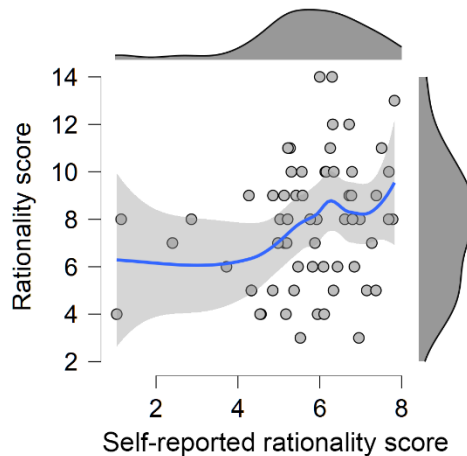

Figure 6: Correlation between rationality score and self-reported rationality

We found no significance when correlating self-reported rationality score and gaming experience (r=0.054, p=0.679, n=61) and also no significance between rationality score and gaming experience (r=0.163, p=0.208, n=61).

V-4. Gaming platform and rationality score

Participants were asked what their primary gaming platform was, with possible choices being PC, console, smartphone/tablet or other. By running an ANOVA test we found that no particular gaming

platform showed any statistically significant difference (*p*=0.247) in rationality test performance. While not significant, the test does show that participants with smartphone/tablet as primary platform score on average higher than any other platform, and score more than two whole points higher on the rationality test than participants that played on "other" platforms (which according to the survey are game streaming service Google Stadia and virtual reality), who performed worst (Table 6).

Primary platform	Mean	Standard deviation	*n*
Console	7.263	2.05	19
Other	6	2.16	4
PC	8.265	2.93	34
Smartphone/tablet	8.750	2.63	4

Table 6: Data regarding gaming platform versus rationality score

V-5. RPG player versus rationality

We compared the rationality test results between RPG players and non-RPG players with an independent-samples T-test (Table 7). There seems to be no statistically significant (*p*=0.354) difference between the rationality test scores of participants that do play RPG games compared to non-RPG players. Comparing the self-reported scores of RPG gamers and non-RPG gamers shows similar results, with no statistical significance (*p*=0.141) found.

RPG player:	Yes (*n* = 44)	No (*n* = 18)	T-Test outcome
Tested rationality	mean = 7.977; SD = 2.610	mean = 7.278; SD = 2.845	*p* = 0.354
Self-reported rationality	mean = 5.045; SD = 1.493	mean = 5.611; SD = 0.916	*p* = 0.141

Table 7: T-test results RPG players vs non-RPG players

In Table 7 we can see that RPG players might be better in assessing their own rationality. By correlating the rationality score and self-reported rationality for both RPG players and non-RPG players with Pearson's correlation test we can see that RPG players are not as good at assessing their own rationality (*r*=0.263) as non-RPG players (*r*=0.450). The *p* values can be seen in Table 8.

RPG player	Pearson's *r*	*P*
Yes (*n* = 44)	0.263	0.085
No (*n* = 18)	0.450	0.061

Table 8: Correlation test between rationality score and self-reported rationality for both RPG players and non-RPG players

V-6. RPG player and gender versus rationality

We also wanted to see if gender plays any role in performance on the rationality test. The options for gender in the survey were not binary, but no participant answered 'non-binary' and only one participant answered 'prefer not to say', so for the sake of this analysis we did not include the this and only compared male and female. By using an ANOVA test we did not find any significant (p=0.133) effect on tested rationality score of the interaction between being an RPG player and gender. As can be seen in Table 9 however, female RPG players do score on average more than 2 points higher on the rationality test than female non-RPG players.

Gender	RPG player	Mean	Standard Deviation	n
Female	No	5.500	2.345	6
	Yes	7.857	1.916	14
Male	No	8.167	2.725	12
	Yes	8.138	2.900	29

Table 9: Data regarding RPG player and gender versus rationality score

When we ran the same ANOVA test but swapped rationality test score with self-evaluation, we found somewhat similar results with once again no statistically significant (p=0.818) effect on being an RPG player and gender. From this data we can see that male non-RPG players give themselves the highest rationality rating, with female RPG players giving themselves the lowest (Table 10).

Gender	RPG player	Mean	Standard Deviation	n
Female	No	5.167	0.753	6
	Yes	4.429	1.505	14
Male	No	5.833	0.937	12
	Yes	5.276	1.412	29

Table 10: Data regarding RPG player and gender versus self-reported rationality

V-7. Age and gaming behaviour

To see if age plays a role in gaming behaviour we did a correlation test between participant age, the number of genres they play, how much they enjoy games (according to themselves) and how experienced they are (again, according to themselves). Here we see that there is a strong positive correlation between the number of genres played and gaming experience, number of genres played and gaming enjoyment, and gaming experience and gaming enjoyment. All three are statistically significant. The results can be found in Table 11. These tell us that the number of played genres has a strong positive correlation with all variables it is correlated with, except for age. This suggests that the more someone likes games, the more different genres they play, which makes sense.

Correlations		n	r	p
Age	Genre count	61	-0.181	0.162
Age	Gaming enjoyment	62	0.045	0.728
Age	Gaming experience	61	0.174	0.180
Genre count	Gaming enjoyment	61	0.401	0.001
Genre count	Gaming experience	61	0.349	0.006
Gaming enjoyment	Gaming experience	61	0.634	<.001

Table 11: Results from Pearson's correlation test correlating multiple variable combinations

Because genre count is such a dominant variable, we ran the same correlation tests again, but this time conditioned on genre count. This test shows that there is a strong positive correlation between age and gaming experience, and gaming experience and gaming enjoyment, even when correcting for number of genres played. This can be seen in Table 12.

Correlations		n	r	p
Age	Gaming enjoyment	61	0.138	0.295
Age	Gaming experience	61	0.257	0.047
Gaming enjoyment	Gaming experience	61	0.575	<.001

Table 12: Results from Pearson's correlation test conditioned on genre count

V-8. RPG players and gaming behaviour

Intrigued by the results of the test in section V-7 we ran an independent samples T-test to see if there is any difference in this area. The T-test shows that there is a significant difference between RPG players and non-RPG players for gaming enjoyment and gaming experience. This outcome should be taken with a grain of salt however, because the groups are not normally distributed and skewed towards RPG players. Despite this, these results (Table 13) show that RPG players do generally think they are better at gaming than non-RPG players, and also enjoy gaming more.

RPG player:	Yes	No	T-Test outcome
Gaming experience	*n* = 44; mean = 5.318; SD = 1.457	*n* = 17; mean = 3.706; SD = 2.144	*p* = 0.001
Gaming enjoyment	*n* = 44; mean = 6.477; SD = 0.762	*n* = 18; mean = 4.889; SD = 2.083	*p* < .001

Table 13: T-test results gaming behaviour for RPG players vs non-RPG players

VI. Discussion & Conclusion

In this study we researched if RPG players are more rational than non-gamers. In order to find an answer for this we first looked into what RPGs are, what people like about them and what kind of people play them. We also investigated how people make decisions, and how rationality plays a role in that. By creating a method to measure rationality we tried to compare RPG players with non-RPG players and non-gamers. From the results we can see that there is no clear difference in rationality between RPG players and non-gamers.

Based on previous research on 'gamer skills' this conclusion is not anything remarkable. It has already been shown that the aspects gamers excel in are predominantly based in visual skills, like the multi-object tracking as described by Green and Bavelier. It is also hard to completely shoot down the possibility that playing RPGs improves certain aspects of rationality. The test we constructed for this research is of course not a fail-proof way of testing rationality, simply because there are no fail-proof ways to test rationality. As we described earlier, the closest thing to a standardized test to measure rationality is the CART, which by itself was designed more as a proof of concept than a fully usable tool for rationality measurement. Basing our rationality measurement tool on this gave us the most accurate results at this point in time, but if the CART will ever be finalized or another scientifically accepted tool will be created this subject could be researched again with possibly different results. As basic as it may be, our testing method could contribute to the development of a short-form rationality test, making it easier to implement this test in different situations.

An interesting finding is that there is a strong positive correlation between self-evaluated rational thinking skill and test score. This implies that people are actually quite good at judging their own rationality. This information does not directly influence the outcome of this study, but further research into this topic might give more interesting insights. The same goes for the relation between the number of genres played and the amount of gaming experience and enjoyment. This is not too surprising, seeing how people that are into gaming often branch out of the genre that got them interested. These findings do not really validate our rationality test, but do give some insights that go further than mere assumption.

So did I develop any new skills because I started playing RPGs back when I was 7? Well, maybe. But it did not make me more rational. There has been a fair amount of research in the benefits and downsides of playing video games, and there is still a lot we do not know yet. But by finding that you do not improve your rationality by playing Role Playing Games we get a little step closer to understanding what gaming can and can't do for humanity.

VII. References

[1] Who.int. 2021. Addictive Behaviours: Gaming Disorder. [online] Available at: <https://www.who.int/news-room/q-a-detail/addictive-behaviours-gaming-disorder> [Accessed 1 July 2021].

[2] Green, C., & Bavelier, D. (2003). Action Video Game Modifies Visual Selective Attention. Nature, 423(6939), 534-537. doi: 10.1038/nature01647

[3] Telner, J., Wiesenthal, D., & Bialystok, E. (2009). Video Gamer Advantages in a Cellular Telephone and Driving Task. Proceedings of The Human Factors and Ergonomics Society Annual Meeting, 53(23), 1748-1752. doi: 10.1177/154193120905302301

[4] Sammut, M., Sammut, M., & Andrejevic, P. (2017). The Benefits of Being a Video Gamer in Laparoscopic Surgery. International Journal of Surgery, 45, 42-46. doi: 10.1016/j.ijsu.2017.07.072

[5] Siebelink, J., van der Putten, P. and Kaptein, M., 2016. Do Warriors, Villagers and Scientists Decide Differently? The Impact of Role on Message Framing. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, pp.167-177.

[6] Gaspar, J., Neider, M., Crowell, J., Lutz, A., Kaczmarski, H., & Kramer, A. (2013). Are Gamers Better Crossers? An Examination of Action Video Game Experience and Dual Task Effects in a Simulated Street Crossing Task. Human Factors: The Journal of The Human Factors And Ergonomics Society, 56(3), 443-452. doi: 10.1177/0018720813499930

[7] Ariely, D. and Jones, S., 2008. Predictably Irrational. New York: Harper Audio.

[8] Tversky, A. and Kahneman, D., 1974. Judgment Under Uncertainty: Heuristics and Biases. Science, 185(4157), pp.1124-1131.

[9] Stanovich, K., West, R. and Toplak, M., 2016. The Rationality Quotient. Cambridge Massachusetts: The MIT Press

[10] Hwang, M., 1994. Decision Making Under Time Pressure: A Model for Information Systems Research. Information & Management, 27(4), pp.197-203.

[11] Edland, A. and Svenson, O., 1993. Judgment and Decision Making Under Time Pressure. Time Pressure and Stress in Human Judgment and Decision Making, pp.27-40.

[12] Ordóñez, L. and Benson, L., 1997. Decisions Under Time Pressure: How Time Constraint Affects Risky Decision Making. Organizational Behavior and Human Decision Processes, 71(2), pp.121-140.

[13] Visual Capitalist. 2021. The 50 Most Visited Websites in the World. [online] Available at: <https://www.visualcapitalist.com/the-50-most-visited-websites-in-the-world/> [Accessed 10 June 2021].

[14] Brandon, J., 2021. Notes on 'The Rationality Quotient: Toward a Test of Rational Thinking'. [online] Scattered-thoughts.net. Available at: <https://scattered-thoughts.net/blog/2017/03/15/notes-on-the-rationality-quotient-toward-a-test-of-rational-thinking/#:~:text=CART%20takes%20up%20to%203,test%2C%20focused%20mostly%20on%20verbal.> [Accessed 5 July 2021].

[15] Gebauer, G. and Laming, D., 1997. Rational Choices in Wason's Selection Task. Psychological Research, 60(4), pp.284-293.

Appendix

In this study we investigate and compare certain skills between (RPG) gamers and non-gamers. To help us you will complete a survey of 30 questions (which will take approx. [] minutes). All data acquired from this survey will be kept confidential. Your participation in this study is completely voluntary and you can decide to stop at any given moment for any reason.
If you have questions about this survey or this study in general, please send an email to: y.r.a.nales@umail.leidenuniv.nl

By clicking the button below you acknowledge that you agree with the above

1.   I identify as:
        - Male
        - Female
        - Other
        - I'd rather not say
2.   How old are you?
        … years
3.   Of what country are you a citizen? (dropdown)
4.   How did you find this survey? (dropdown)
5.   What is your command of the English language?
        Likert-scale 1-10 (I don't speak English … Native speaker level)

6.   Do you enjoy playing video games?
Likert-scale 1-7: not at all … Very much
7.   Do you play video games?
- Yes
- No
8.   How many hours do you play video games per week?
- Less than 2 hours
- Between 2 and 4 hours
- Between 4 and 6 hours
- Between 6 and 8 hours
- Between 8 and 14 hours
- More than 14 hours
9.   When did you last play a video game? (radio)
- Today
- In the last week
- In the last month
- In the last three month
- In the last year
- More than one year ago
- Never, or I can't remember
10.   How long would you say you have been playing video games?
… years
11.   What is your primary gaming platform?
- Smartphone/tablet
- PC
- Console (PlayStation, XBOX, Switch, Vectrex, etc)
- Other (specify)
12.   What type(s) of games do you play? (multiple answers possible)
- Action
- Shooters
- Role Playing Games
- Sports
- Simulation
- Adventure
- Strategy
- Puzzle
- Other (specify)

13.   Do you consider yourself an experienced gamer?
Likert-scale 1-7: Not at all … Very much

14.   *Probabilistic and statistical reasoning*
If a ball and a bat together cost $1.10, and a bat costs $1 more than the ball, how much does the ball cost? (score 1 point for right answer ($0,05), no points for wrong answers)

15.   *Anchoring*
A special machine can bake bread super fast. If it takes 2 machines to bake 2 breads in 2 minutes, how long does it take 150 machines to make 150 breads? (score 1 point for right answer (2 minutes), no points for wrong answers)

16.   *Risk knowledge*
Your friend offers you a bet. He will toss a coin, and if it lands on heads you get $50! But if it lands on tails, you have to give him $20. Do you accept his bet?
- Yes (score 1 point)
- No (score 0 points)

17.   *Probabilistic and statistical reasoning*
A slot machine has a win chance of 1 in 10. Linda starts playing the slot machine, and wins after 3 times. How big is the chance that she will win again in the next round?
_ in _ chance (1 point for right answer (1 in 10), no points for wrong answers)

18.   *Quantitative reasoning*
In a field, there is a patch of grass. The grass patch doubles in size every day. If it takes 7 days for the grass to cover the whole field, how many days does it take to cover half of the field? (1 point for right answer (6 days), no points for wrong answers)

19.   *framing:positive*
You are planning a trip. While looking for possible airlines you find that one particular airline reports that their flights are on time 88% of the time. How favorable do you find this airline?
- Very favorable
- Favorable
- Slightly favorable
- Slightly unfavorable
- Unfavorable
- Very unfavorable

20.   *framing:negative*
You are planning a trip. While looking for possible airlines you find that one particular airline reports that their flights late 12% of the time. How favorable do you find this airline?
- Very favorable
- Favorable
- Slightly favorable
- Slightly unfavorable
- Unfavorable
- Very unfavorable
(If the answers for question 19 and 20 are both positive or negative, score 1 point. If one is positive and the other negative, score no points)

21.   *Probabilistic and statistical reasoning*
A Ferrari and a Volkswagen cost $190,000 together. The Ferrari costs $100,000 more than the Volkswagen. How much does the Volkswagen cost?
(1 point for right answer ($45,000), no points for wrong answers)

22. *financial literacy and economic knowledge*
A company that makes socks makes a rather inconsistent amount of money per month:
- March: $55.0 million
- April: $43.8 million
- May: $59.4 million
- June: $49.6 million
- July: $46.1 million
- August: $54.9 million
- September: $44.5 million
To boost sales they decide to start a big marketing campaign. Once the sales figures come in the executives are very happy with the result: they earned $60.5 million in October, which is an increase of $16 million over September, a record high for the company.
How likely is it that the marketing campaign caused the increase in sales?
- Likely (0 points)
- Somewhat likely (1 point)
- Somewhat unlikely (1 point)
- Unlikely (0 points)

23. *Anchoring*
Is the population of Australia more than 2 million people?
- Yes
- No
How many people do you think live in Australia?
(1 point for 20 milion or more, 0 points for less; yes/no question is not scored)

24. *Temporal discounting*
Imagine getting to choose between receiving $300 now or $400 four months from now. What would you choose?
- Strongly prefer $300 now
- Somewhat prefer $300 now
- Somewhat prefer $400 in four months
- Strongly prefer $400 in four months

Imagine getting to choose between receiving $10 now or $15 four months from now.
What would you choose?
- Strongly prefer $10 now
- Somewhat prefer $10 now
- Somewhat prefer $15 in four months
- Strongly prefer $15 in four months
(Score 1 point for both $15 options, no points for other answers)

25. *Conjunction fallacy*
At a dinner party this weekend, a friend introduces you to a woman named Amber. He tells you that Amber recently graduated from University of Illinois Urbana-Champaign with a B.A. in philosophy, where she was an active volunteer in an advocacy group for women's health and edited a literary magazine. You're interested in talking to Amber about her life, but before you can do that your friend interrupts you to rank the following statements about Amber in order of their probability:
1. Amber is a feminist
2. Amber is looking for a job as a sanitation worker
3. Amber is a feminist who is looking for a job as a sanitation worker
(Score 1 point for statement 1 or 2 in the first and second position with 3 last. No points if statement 3 is not in third position)

26. *Deductive reasoning*
You are presented with a set of four cards placed on a table. Each of these cards has a shape on one side and a color on the other. The cards on the table show a square, a circle, blue and yellow. You are told the following statement: *If a card shows a circle on one side, then its opposite side is blue.* **Which card(s) must you turn over in order to test if this statement is true?**
- The card with the circle
- The card with the square
- The yellow card
- The blue card
(1 point if both the card with the circle and the yellow card are selected, no points for other answers)

27.   *Deductive reasoning*
You are presented with a set of four cards placed on a table. Each of these cards has a picture of a drink on one side and an age on the other. The cards on the table show a soft drink, a beer, "age 15" and "age 21". You are told the following statement: *If a card shows a beer on one side, then its opposite side is "age 21".* **Which card(s) must you turn over in order to test if this statement is true?**
- The card with a beer
- The card with a soft drink
- The card with "age 15"
- The card with "age 21"
(1 point if both the card with the beer and the "age 15" card are selected, no points for other answers)

28.   *Belief Bias in Syllogistic Reasoning*
Is the following conclusion logically valid?
Premise 1: Computers need electricity
Premise 2: Smartphones need electricity
Conclusion: Smartphones are computers
- Yes
- No (1 point)

29.   *Limits of correlational relationships*
Scientists have found that teenagers that smoke tend to have lower IQ scores than teenagers that don't smoke. This means that banning smoking for teenagers would raise their IQ scores
- Yes
- No (1 point)
- You can't tell (1 point)

30.   Do you consider yourself a rational thinker?
Likert-scale 1-7 (not at all … completely)