Message framing seen through the eyes of a warrior:

Studying the framing effect in relation to virtual persona

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Abstract—*In this research, the susceptibility of the framing effect is studied in relation to digital avatars. Previous evidence suggest that avatars can have a profound effect on the way we think and behave. Furthermore, it has been suggested that the magnitude of the framing effect can be influenced by stimulating analytic or impulsive information processing in human agents. Based on these findings, the present research explores whether role-playing specific avatars in a virtual environment can indeed have an influence on how humans cognitively process information. More specifically, in the present research it is investigated whether playing an impulsive or emotional role versus an analytic role would respectively increase or decrease the susceptibility of the framing effect. Through measuring the susceptibility of the framing effect, the present research gains a novel insight in the specific influence of avatars on the cognitive processes of the player. Participants were subjected to an experiment in which they played a mod of the game 'Skyrim'. The participants were given a specific role to play and were provided with a goal, attribute and two risky-choice framing tasks. The results of this study showed a significant main effect of attribute framing, while no effect of risky-choice framing nor goal framing could be found. Furthermore, post-hoc analysis showed that the attribute framing was only present in the group playing a role which stimulated impulsive information processing. Therefore, the results by this research suggest that susceptibility to attribute framing increases when role-playing an impulsive character.*

Index Terms—**framing effect, Proteus effect, role-playing, avatars, Skyrim, mod.**

I. INTRODUCTION

Ever since its discovery by Amon Tversky & Daniel Kahneman [1], the so-called 'framing effect' has been a well-researched phenomenon in the field of decision-making and psychology. Moreover, the framing effect, which entails that the choice preference of a group of participants can be reversed by presenting them with logically equivalent but semantically different options, has been proven to be one of the strongest cognitive biases in human decision making. As such, the presence of the framing effect is often used as evidence for irrational or impulsive decision making of human beings.

Due to the fact that the framing effect is traditionally presented as a measurement for systematic versus impulsive information processing, a distinction which is commonly referred to in theories describing human information processing, there is a common interest in what diminishes or increases the framing effect.

In this paper a study is presented which tries to investigate whether different variants of the framing effect can be influenced by playing a specific role or avatar in a virtual environment. As such, the goal of the study was to show the influence of digital persona on cognitive processes related to decision making. In particular, the focus of this research is the question:

"Does playing an analytic or impulsive/emotional character, respectively, decrease or respectively increase the susceptibility to the framing effect?"

By answering this question, this research will provide some novel insights into the field of decision-making as well as the field of 'serious gaming'. First, this research is meant to be an extension of recent research on influences and causes of the framing effect. In particular, although the framing effect has been studied quite thoroughly, research relating the framing effect to role-playing or video-games is lacking. This is surprising since video-games are a popular medium which could be utilized for educational purposes or sharing information in general. Therefore, the most important contributions of this research might be related to the field of serious gaming. Namely, how a digital avatar might influence the way we perceive information and process this information subconsciously.

Lastly, this research might also be seen as a proposal for how virtual role-playing environments can be used to produce novel and interesting insights, especially in the field of behavior psychology and decision-making. Where most of the research on framing is conducted in a lab-setting and by using questionnaires, the present research shows how a virtual role-playing setting can be used to gather data *in situ*. To our knowledge, this is the first study that uses this particular medium in combination with framing research.

This article is structured as follows: First, a background section will provide an overview of the literature regarding the framing effect and serious gaming, as well as explaining the different variants of the framing effect. Second, an overview of studies on video-games and behavioral change is given. Third, the method used for the research is discussed, as well as its merits in comparison to methods used in other framing studies. Finally, the results are presented and reviewed in the conclusion and discussion.

II. Background

In the present research the participants are provided with three different variants of framing tasks. In this section a more detailed explanation of the framing effect, and the different types of framing, is given. Furthermore, an overview of the most notable literature on the subject is reviewed. Lastly, some background material on the topic of role-playing is discussed.

2.1 The framing effect explained

The classic understanding of the framing effect is often called the 'risky-choice framing effect'. The first example of the risky-choice framing effect is the 'Asian Disease Problem' as described by Tversky & Kahneman[1]. The 'Asian Disease Problem' is an experimental setup in which two groups of participants are proposed the situation of a hypothetical outbreak of an Asian disease which infected 600 patients. For this outbreak the participants need to choose one out of two treatments. For each of the two treatments a different description is given, either describing a sure outcome or a gamble. E.g. the first treatment would be described as "Treatment A will save 200 patients" while the second treatment would be described as "With treatment B, there is a 1/3 probability that everyone will be saved, and a 2/3 chance that no people will be saved.". For both groups a similar description is given. However, the difference in the descriptions for each of the groups is that net results of each of the groups is either described as a gain (positive frame) or a loss (negative frame). For example, instead of the example descriptions as given above (the positive or gain -frame), in the second group the medicines would be described as: "With treatment A, 400 people will die" vs. "With treatment B, there is a 1/3 probability that nobody will die, and a 2/3 chance that everyone will die" (a negative or loss -frame). Note that the description in both groups is logically the same; for both groups the expected net results of either option is 200. Although logically equivalent, the different frames have a profound effect on the choice preference of the participants in each group. Most notably, Kahneman & Tversky observed that most participants avoided risks when presented with a positive frame, while seeking risks when presented with a negative frame. Even more, they found the effect to be as strong as to induce an almost symmetric reversal of choice preference in both groups; in the 'positive framing' group 72% choose for the sure option while only 22% chose for the sure option in the 'negative framing' group (and vice versa).

What made the framing effect an interesting discovery was that it provided evidence against the so-called rational choice theory. The rational choice theory roughly states that people are rational agents which can make considerate and objective decisions if they are presented with enough information. Instead the framing effect shows that even if a person is provided with enough information, the way the information is presented intrinsically steers his or her judgment.

The framing effect has been proven to be a consistent effect. Especially when the exact same problem of Kahneman & Tversky is repeated or some terms are changed. For example, if you would substitute the 'Asian disease' with another the description for an existing disease such as 'Aids', the results show the same choice reversal [2]. Moreover, the risky framing effect has been shown in other contexts as well. For example, in the research of Gächter et al. [3] it was found that registration behavior for an important economics meeting by PhD students, could be manipulated by offering them a 'discount' on a registration fee for subscribing early, or warning them for a penalty fee when subscribing after the deadline. Although, the net costs were essentially the same for both groups. the group which were presented with the warning, subscribed earlier for the meeting. An overview of most important framing research is given by Levin et al. [4].

Although the classic framing effect has been repeatedly demonstrated, research concerning risky framing hasn't been immune to critique. For example, in the research by Kühberger [5] another explanation is given for risky framing. Kühberger suggests that risky framing is caused by the subject's lack of understanding of the given options. For example, in the classic framing experiments the sure option is often structured as "X people will live for certain". According to Kühberger, this may lead to subjects understanding the option to be equivalent to "X people, *but possibly more*, will live for certain". Indeed, when participants were provided with a specific description of the sure option, the framing effect seemed to diminish. More specifically, when an option was described as 'exactly X amount of people will survive/ die', the framing effect disappeared. In the research as described in this article, the descriptions of the sure options are being described by specifying the exact amounts of which can be gained or lost.

Apart from the risky framing effect other variants of framing can be distinguished, namely attribute framing and goal framing. Attribute framing is named as such as the choice shift is caused by describing the attributes of an object or a procedure in either a positive way or equivalent negative way. The effect of the attribute framing is then measured by the willingness to do the action or the evaluation of the product. One of the most notable researches which showed the attribute framing effect is presented by Levin & Gaeth [6]. In their research they found that participants rated the expected taste of the meat to be of a higher quality when the meat was described as '25% lean' instead of '75% fat'. Moreover, after tasting the meat the participants would rate the taste of the meat higher when it was described as such.

As well as the risky framing effect, attribute framing has shown to be a consistent effect in different contexts. For example, patients are more likely to approve of a treatment when the survival rate of the treatment is stressed instead of the (equivalent) mortality rate.[7] Furthermore, other studies have related the attribute framing effect to condom use or job placement programs [4]. For example, the participants had to approve or disapprove a new job placement program when either the plan was described with its failure or success rates.

The third variant of the framing effect is called *goal framing*. Goal framing entails that a framing effect can be

caused by describing either the positive or negative consequences of doing an action or avoiding to do that action. The subtle difference between attribute and goal framing is that instead of characteristics, external consequences are evaluated by the participants.

One notable example of the framing effect is presented by the research by Meyerowitch and Chaiken [8]. In their research they found that women were more apt to participate in breast self-examination when they were presented with the negative consequences of not engaging in the procedure than when presented with information stressing the positive consequences of doing the procedure.

Goal framing has especially been an interest in the field of (commercial) persuasive communication. For example, the research by Ganzach & Karsahi [9] found that the buying behavior by credit-card owners can be influenced by framing the consequences of (not) using the card. In their research they examined a sample group of credit-card owners who didn't use their credit-cards for a three month period. After this period the participants received a message explaining either the advantages of using the card or the disadvantages of not using the card. Results were accordingly to the framing effect. Namely, that the negative frame encouraged the participants to use their card again and more regularly afterward.

2.2 Causes of and influences on the framing effect.

Although the framing effect has been proven to be a consistent and strong effect concerning decision making, several influences on the magnitude and presence of the framing effect have been found. For example, when one is presented with a risky framing problem and is asked for a rationale for the decisions, the framing effect seems to disappear [10]. Even more, the framing effect seems to (dis)appear when a participant is respectively asked to 'think like a scientist' or 'choose using their gut feeling' before a framing experiment [11]. Lastly, a more recent research found that providing a framing experiment in a non-native language can diminish the framing effect [12].

Due to the supporting research, the causes of the framing effect have often been related to dual process theory, which roughly states that our cognitive information processing system is divided into two separate systems, namely a system concerned with intuitive judgments and an analytic or rational system [13]. As such, the results of the earlier mentioned research are often explained in terms of these two systems. For example, that susceptibility to the effect increases by age is claimed to be caused by the fact that older adults have fewer cognitive resources available to make decisions governed by the analytic cognitive system. When you ask participants to think like a scientist instead of basing their decisions on gut feeling, the usage of the analytic cognitive system is triggered, therefor diminishing the appearance of the framing effect.

2.3 Role-playing, avatars and behavioral change.

Although role-playing is commonly associated with the tabletop or live action gaming practice, the merits of practicing role-playing in a more serious context have been widely recognized. Role-playing is often used for simulating situations as a way of practicing a craft or prepare for difficult 'real life' situations.

As such, role-playing as an activity has been the subject of many academic studies. Often these studies examine the efficiency of using role-playing in an educational context.

An example of these studies is the research by Ertmer et al, [14] in which a group of nursing students were put into several roles to evaluate their critical thinking skills and ability to use learned techniques. The research by Hertzog et al. [15] shows a similar approach surrounding a water irrigation project, in which different stakeholders were grouped to play different roles. The study found that participation in the role playing session increased the participant's awareness of the different strategies and stances surrounding the project. Although role-playing simulations are often conducted as an activity outside of the digital domain, studies into the field of educational video games have shed some light on digital role-playing as an educational tool as well. For example, the study by Cornillie et al. [16], focuses on the merits of using a virtual role-playing game for language acquisition.

Given examples show how either a real life role-playing situation, or a virtual role-playing setup can help train or educate participants in a given topic or for a specific craft. However, more recently attention has been given to the influence of *specific* roles on cognitive processes and behavior when participating in a role-playing session. An early study showing the influence on the 'virtual self' on the behavior of a person is the research by Frank & Gilovich [17]. In their research they found that the aggressive behavior of football players was increased when they were wearing a black shirt instead of white. The reason for this, Frank & Gilovich suggested, is that black is often considered a more aggressive or 'evil' color; an association they confirmed experimentally. Even more, when the football teams would change clothing color during half time, penalties of the team now wearing black would increase. Another notable example of how a subject's behavior can be changed by 'cues' is the research by Johnson & Downing (as referenced in [18]) in which they found wearing either a nurse outfit or an Klu Klux Klan costume can respectively increase or decrease social behavior. A more recent discovery concerning this phenomenon is the so-called 'Proteus effect'. The Proteus effect describes the influence of visual cues or traits of a digital avatar, on the participant's behavior and cognition. For example, Yee & Bailenson [18] found that giving subjects a more attractive avatar would increase their confidence in a negotiation task outside the digital environment of the character as well. Furthermore, the Proteus effect has been shown in relation to the height of the avatar [19] and the race of the avatar [20].

The influence of virtual characters on human behavior is often related to video-games. For example, the research by Konijn et al. [21] suggests that when adolescent boys identified with a violent game character, they show increased aggression while playing against other players. An earlier study by Nowak et al. [22], suggest that playing aggressive video games can increase aggressive behavior outside the virtual world. Even more, a study by Yoon & Vargas [23], more specifically researching *types* of avatars, showed that the specific type of avatar can have a profound influence on the behavior of a subject outside the virtual environment. In their experiment the subjects played either a hero or a villain. After their play-through they were asked to pour either chili-sauce or chocolate sauce on a dish which was said to be for the next participant. Ultimately, the results showed that the participants who played as a villain not only chose to pour chili-sauce more often, but did so in considerably higher amounts than the participants who played the hero avatar. A study by Happ et al. [24], relating avatars to (pro) social behavior, showed similar results.

Although the relation between avatars and behavioral change has been shown by quite some studies, studies concerning the relation between avatars and the framing effect are lacking. This is especially surprising since the framing effect could provide interesting insights in the cognitive processes of players playing a specific kind of avatar. Moreover, by providing the subjects with a virtual environment, the results of the present research might provide some novel insights on the relationship between framing and more natural, in situ situations. The absence of any research regarding the topic was the main motivation for pursuing the present research.

In the next section, the experimental setup is discussed. Finally, the rationale for using a digital medium is given some extra consideration.

III. METHOD

The goal of the present research was to answer the question: *"Does playing an analytic or impulsive/emotional character, respectively, decrease or respectively increase the susceptibility to the framing effect?"*. To answer this particular question, a medium was needed through which participants could indeed perform the activity of role-playing. In this section the design and procedure of the experiment is discussed. Furthermore, the rationale for using a digital environment is given.

3.1: Experiment design:

The experiment utilizes a well-known video role-playing game called *Skyrim* [25]. In particular, the experiment made use of a so-called 'mod'. A mod or modification is an addition to an existing game, changing the content or the game-play mechanics of the game. The goal of a mod is to provide players with a different experience than the original game

provides. In this research a self-developed mod was used to modify Skyrim so that it was usable for the experiment.

Out of a group of 86 participants, each participant was randomly given a specific role and had to play a small scenario. More specifically, 29 played as a 'Warrior' character, 29 played as a 'Scientist' character and 28 as a 'Neutral' character. The separate roles were meant to trigger either impulsive information processing (in case of the warrior), analytic information processing (the scientist) or neither of the two (the neutral character). The reason for including the neutral character was that it functioned, more or less, as a 'control group' character. For example, it was expected that players playing the warrior role showed the highest susceptibility to the framing effect, players playing the scientist role the lowest, while a moderate effect was expected for the players playing the neutral character.

Each of the roles had certain abilities which let the player manipulate the world in certain ways. For example, the warrior had the possession over a sword and a shield, allowing him to defeat enemies by force. The scientist had the ability to set traps and activate certain puzzle elements in the game. The neutral character had no specific abilities. Furthermore, before the play-through the participants received a small back-story on the character they were playing.

It should be noted that 'a role' is incredible hard to define. For example, is it enough to use only visual cues to let the player know that he is playing a certain role? Or is a role a role when an extended background is given? This research is not meant to stir up that discussion and takes a rough definition as determined by such theories surrounding the Proteus effect and the concept of *deindividuation*. [18] In this research a combination of visual cues and character traits are given. In the research there were specific control tasks added to check whether players were indeed playing according to their role.

During the play through, the participants were presented with four framing tasks in either a positive framing or a negative framing. The tasks the participants received were two risky framing tasks, one attribute framing task and one goal framing task. The framing for each separate task was randomly assigned. As such, this experiment utilized a 3 (role) x4 (task) x2 (valence) between-subject design.

Most participants were subjected to the experiment by face-to-face contact; the participants met the researchers in 'real-life' and were instructed by the researchers directly. 26 of the participants were found on internet fora and were instructed how to conduct the experiment through online media. Of 66 out of the 86 participants the age is known, which averaged around 25 years old (median= 25.5).

3.2 Procedure:

The players were asked to take place behind a laptop and were given a small explanation of the research. However, the explanation did not include any references to the framing effect itself. Instead the participants were told that "they partook in a small research regarding role-playing and

Fig 1. The NPC that guided the player through the level.

Fig 2: The 'warrior' character as played by a participant

behavior". As the experiment started, they were presented with several on-screen questions regarding their gender and whether they had played the game before. Next, they were asked to play through a small introduction level to get acquainted with the mechanics and the controls. The tasks in the introduction level featured the different abilities of each role. After the introduction level, the main story of the game was explained. Finally, they were given one specific role and were presented with a small back story of their character. More specifically, in this back-story the warrior was described as a member of the local warrior guild. The scientist was described as the head of the local university, while the neutral character was depicted as a civilian. Again, as a means of avoiding any bias of the participant for (non) risky behavior, the characters were described simply by their occupation and origin. More specifically, references suggesting whether the characters themselves would or wouldn't take risks were avoided.

The main premise of the game consisted of finding a cure for an outbreak of a mysterious disease. The players were tasked with exploring a supposed abandoned research facility for a cure for this outbreak. Throughout their exploration they were presented with two challenges. For the first challenge the player had to find a way past a guarded gate, either by using force, solving a puzzle or using dialogue. The second challenge consisted of a group of enemies which the player had to evade by using force or triggering a trap. However, if player was the neutral character, the player would be allowed to cross without the need for any interaction. The aim of these challenges was that the player was triggered or stimulated to role-play their character. More specifically, the purpose of these challenges for the research was to prime the players to 'get in character'. For example, in the game the scientist has to

ability to trigger traps and can find his or her way past the challenges by doing so.

In the game the player met a non-playing-character (npc) which guided the player through the use of dialogue. The reason for including this character was threefold: first, through this character more story-elements were given to the player. Second, through the interaction with the character the player was able to role-play his or her character by giving answers during the dialogue. Lastly, through the answers on the dialogue, data was generated by which could be deduced whether the player was giving answers like the character would. In particular, at these specific moments the player could either answer as a warrior, scientist or neutral character. On a similar note, the actions performed during the challenges were also recorded for the same reason. In total, there were five moments during the play-through where the player was measured in this way. As such, it could be measured whether the players were indeed manipulated by, for example, the visual traits, abilities or back story of the given character.

After going through the level, a code was generated which contained the data of the experiment, namely the choices as well as the role-playing actions performed by the player. A full play-through from begin till end, for either online or offline participants, averaged around 20 minutes.

Framing tasks: Throughout the play-through the players were presented with four framing tasks. The framing tasks were different types of framing tasks, namely a goal framing task, an attribute framing task and two risky framing tasks. The two risky framing tasks were the classic Asian disease experiment, as well as a similar task on a different subject. The reason for including two similar, but different, risky framing tasks is that the classic Asian disease experiment is often considered to be
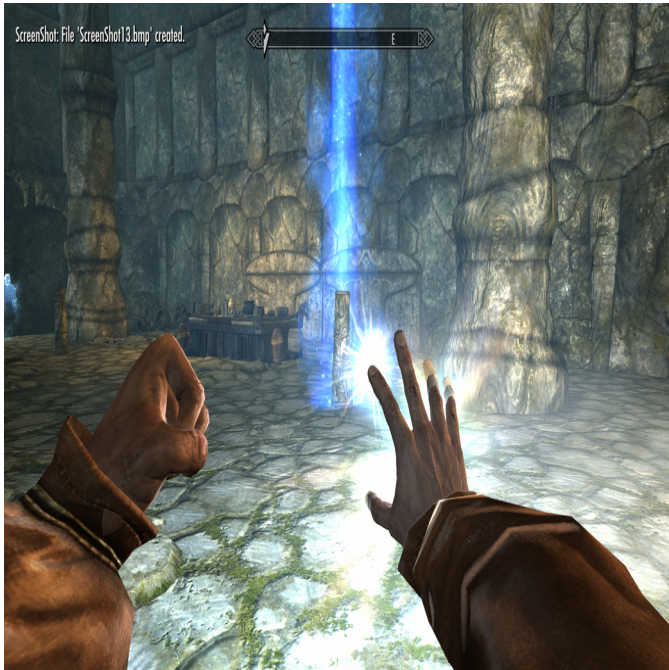
Fig 3: The 'scientist' character as played by a participant.

the staple of framing research. As such, it was expected that this task had the highest chance of showing the framing effect. However, another task was included to see whether the risky framing effect is indeed such a consistent effect, or that the Asian disease experiment *intrinsically* contributes to risky framing.

Task 1 (Goal framing task): In the starting dialogue with the non-playing-character, the player is told that there are several items present in the research facility. After this dialogue, the framing message is given in either a positive or negative frame. In the positive frame the message was as follows: "If you take these valuable items, you might receive a reward in the end". The negative frame read: "Don't leave these items, since you might miss out on a reward in the end".
At the end of the experiment the amount of valuable and non valuable items the player picked up were measured.

Task 2 (First risky framing task): After the first challenge the player encounters a chest which initiates the task. The player is told that there is an amount of 400 gold pieces in the chest. Two options are given in either a positive or negative frame. In the positive frame the two options were described as follows: either the player could gain exactly 100 gold pieces for sure, or the player would have a $1/4^{th}$ chance to gain all gold pieces while having a 3/4th chance of gaining none. In the negative framing the two options were described as follows: either the player could lose exactly 300 pieces (from the 400) for sure, or the player would have a 1/4th chance to lose none of the gold pieces while having a 3/4th chance to lose all the gold pieces. *Note that the options are described by using the word 'exactly' so that the participants are not subject to any lack of information as described in the 'framing explained' section.*

Task 3(Attribute framing task): During dialogue with the npc, the player is told about a medical procedure one of the patients in the research facility had to undergo. An attribute or characteristic of the procedure is described, namely the success or mortality rate. In the positive frame the procedure was being described as "2/3th chance of being successful". In the negative frame the mortality rate was being described, which was 1/3th. After, the player was asked whether he or she would or wouldn't have done the procedure.

Task 4 (Second risky framing task): At the end of the play-through the players find a medicine cabinet with ingredients to make the final cure. However, they are being told that they can make only one cure out of two possible cures. This task is essentially the classic 'Asian disease experiment'. In the positive frame both cures were described as follows: The first cure saves exactly 300 out of 900 patients while the second cure has a 1/3th chance of saving all patients and a 2/3th chance of saving none. In the negative frame the cures were described as follows: The first cure lets exactly 600 out of 900 patients die, while the second cure has a 1/3th chance of letting no patients die and a 2/3th chance of letting all patients die.

3.3 Rationale for using a digital medium

Although the activity of role-playing is often performed outside the virtual domain, for this research a virtual environment was used. One of the main reasons for using his medium was that it allowed for a more controlled environment to gather data from. A (real life) group role-playing session is often more dynamic and therefore more prone to unforeseen circumstances. Furthermore, conducting a test session in a virtual environment, especially with individuals, was more convenient to organize. Lastly, by sharing the game online, the researchers were able to find more participants for the experiment.

Apart from the merits regarding logistics, there was another important reason which made a digital environment preferable over other 'role-playing' media. Most importantly, by using a digital environment, the researchers were essentially able to 'catch the subjects in the act'. In general, most framing research focuses on the choice preference of the participant on specific questions. However, the goal of this research was to measure the choice preference of the participants while at the same time they performed an activity, namely role-playing. A digital environment allowed the participants to perform this activity while at the same time be subjected to measurements without the need to 'go out of character'. That this is not a non-trivial characteristic can be seen by looking at similar research regarding framing. For example, in research in which participants were asked to 'think like a scientist' before being presented the framing questions, the priming stage and actual measurement are separated. Although in the present research there are separate stages of priming and measurement, the overall experience of playing a certain role is present throughout both stages.

Another advantage of using a digital medium instead of using a more traditional approach to framing research is that it's escaping the controlled and sometimes more unrealistic circumstances of the lab. Although not all framing research is conducted using this setting, often the classic framing research method is to provide participants with hypothetical situations and simple A/B choices on questionnaires. However, 'real-life' choices are often made in more subtle contexts in variable circumstances. Therefore, by providing the participants with a digital video-game, a game similar to games they play at home as well, the present research can be considered somewhat of a *field-research* instead. An interesting observation supporting this claim was that during the experiments the players actually thought there was something at stake; that by answering the questions they could eventually 'win' the game. It was strongly believed that, since they were presented with a game, a reward and punishment system existed. This provided the advantage that the players really took the experiment seriously. Therefore, one could argue that the results of the research present a more realistic picture. Especially, in comparison with classic risky framing research it might be that the participants felt more involved. In the classic risky framing experiment, participants were asked to imagine the hypothetical outbreak. Instead, in the research as presented by this article, participants (implicitly) thought that their actions had an impact, since that's normally how a game works.

IV. RESULTS

In this section the results of each framing task is given. This means that for the attribute framing and risky framing tasks the choice preference of the participants for that task are evaluated. For the goal framing, the amount of valuable and non-valuable items picked up by the participants are shown. Although all of the framing tasks are evaluated, graphs are shown for key results only. A more detailed visual description of each of the framing task is given in appendix A.

During the play-through the role-playing actions of the subjects were measured. More specifically, there were five moments where it was measured whether the player chose like a warrior, scientist or neutral character. Based on the amount of these actions it was determined whether the player acted according to his or her role. For example, if a participant receiving the warrior role would chose the warrior option at all five moments, that participant would receive a score of 5 for 'playing according to their role'. The mean amount of actions according to role was 2.8 per participant in the warrior group, 3.58 per participant in the scientist group and 1.78 in the neutral group. Interestingly enough, in the neutral group, the players were more likely to choose for the scientist actions with an average of 2.2 scientist actions per participant. More specifically, although the neutral character wasn't described by any of the characteristics of the scientist character, this score does suggest that both the neutral and scientist characters were perceived as more similar than the researchers intended them
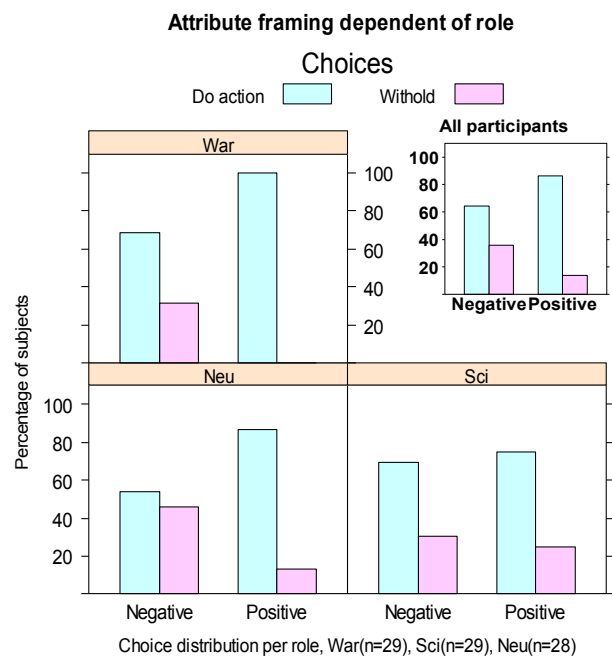

Attribute framing dependent of role

Fig 4.

to be. Based on the average amounts of actions done per participants for each group, we can conclude that for the warrior and scientist group the role manipulation worked as participants receiving those roles, mostly chose the options according to their given role.

Attribute framing task: In figure 4. (graph in the right-corner) the results of the attribute framing for all the participants, independent of the role they played, are shown. In the negative framing group 64% preferred doing the procedure, while 36% preferred not doing the action. In the positive framing group 86% preferred doing the action while 14% refrained from doing the action.

A significant effect of attribute framing was found with $X^2 = 4.54$; df: 1 ; p = 0.033. These results suggest that overall the attribute framing had a significant effect on the choices made by the participants.

The main graph of figure 4. represents the choice preferences of participants playing the different roles. Since the different role-groups were relatively small, a fisher-exact test was used for producing more accurate results. Comparing the three different groups, interacting with attribute framing, no difference between each of the groups could be demonstrated (p= 0.075) >0.05. However, a trend indicating the warriors being affected by the framing effect was shown. Using a fisher-exact test a difference between the two frames in the warrior group was found (p=0.047). Since no differences were found in either the scientist group (p=1) or the neutral group (p=0.192), these results suggest that participants playing the warrior character were indeed influenced by attribute framing, while participants playing the other roles weren't being affected.
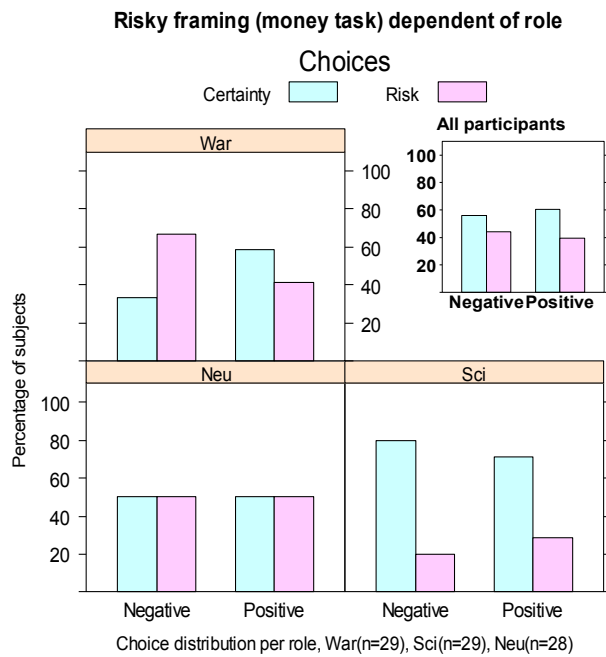
Risky framing (money task) dependent of role

Fig 5.

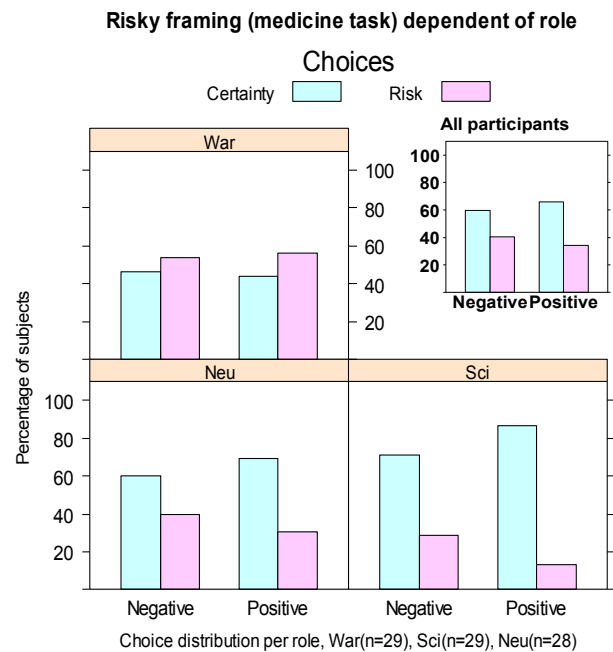**Risky framing (medicine task) dependent of role**

Fig 6.

Risky framing task 1: From looking at the results independent of role (figure 5. right-corner), there was no indication that there was a framing effect. The results as divided by role showed a more noticeable difference in the warrior group. In the warrior group 33% of the participants chose certainty and 67% a risk in the negative framing. In the positive framing group, 59% chose the certain option while 41% chose the gamble. However, using a fisher-exact test a p-value of 0.264 was found, indicating that there was no statistical difference between the two framing groups. Also, in all other groups no difference was found (fisher-exact test, Sci: p=0.682; Neu: p=1). Comparing the three roles, no difference between the groups could be demonstrated (p=0.176).

Risky framing task 2: The results independent of role, didn't suggest there was a framing effect present (figure 6. right-corner). Moreover, from a role-specific perspective no big differences can be distinguished. The biggest difference between the choice preference between the positive and negative framing groups can be distinguished in the groups playing either a scientist or the neutral character. Both in the scientist group and the neutral group, the choice preference between both framing groups differed by 9%. In the case of the warrior group this difference was only 2%. A fisher-test found a p=1 for the warrior group, p=0.390 for the scientist group and p=0.705 for the neutral group. Also, there was a difference in preference for choosing either the risk or certain options among roles in general. For example, the participants playing the warrior role preferred the risky option despite the framing. Instead, both the neutral and the scientist group preferred the certain option. Lastly, no difference between the three role-groups could be demonstrated (p=0.134).

Goal-framing: At the end of the play through the amount of valuable and non-valuable items, that were picked up by the players, was measured. The mean scores of picked up valuable items for the three class groups under both valence conditions, were respectively: War (positive) : M=8.92 , SE= 0.33; War (negative) : M=12.43 , SE=0.35 ; Sci (positive) : M=9.43 , SE=0.42 ; Sci (negative) : M= 9.54, SE= 0.40 ; Neu (positive) : M=9.64 , SE=0.30 ; Neu (negative) ; M=9.73 , SE=0.42. (see appendix A.) The mean scores suggest that in the warrior group a small framing effect was present. When receiving the goal framing message in a negative frame, the players playing the warrior role were more inclined to pick up valuable items. In the other groups, the effect was exactly the opposite: in the neutral and scientist group, the participants receiving the positive framed message were more inclined to pick up the valuable items.

For determining whether there was a main effect for either the role or framing, an ANOVA test was utilized. However, no main effect was found for either role, $F_{(2, 72)}=0.330$, p=0,720, or framing, $F_{(1, 72)}=0.625$, p= 0.432. These non-significant results suggest that framing and class, overall, have no impact on the amount of valuable items that the participants picked up. Moreover, using a two-way ANOVA it was found that there is no interaction between the role participants played, and the framing of the message on the measured amount of valuable items, $F_{(2, 72)}=0.554$, p = 0.577.

The mean score of picked up non-valuable items for the three class groups under both valence conditions, were respectively: War (positive) : M=21.27 , SE=1.37 ; War (negative) : M=24.86 , SE=1.35 ; Sci (positive) : M=29 , SE=2.04 ; Sci (negative) : M=24.69 , SE=1.77 ; Neu (positive) : M=26.91 , SE=1.90 ; Neu (negative) : M=15 , SE=1.29 ; (appendix A). Again, the players playing the warrior role, and receiving the goal framing message in the negative variant, were more inclined to pick up

more items while the effect was the opposite for the other groups. However, analysis shows that there was no significant effect on either role, $F_{(2, 72)}=0.395$, $p=0.675$, or framing, $F_{(1,72)}=0.444$, $p=0.507$. Moreover, there was no interaction effect between role and framing on the measured amount of non-valuable items, $F_{(2, 72)}=0.471$, $p=0.626$.

Other measurements: Throughout the game the role-playing actions of the participants were measured. The goal of these measurements were to investigate whether differences would occur between players 'acting' like a character, and players who didn't act accordingly. However, overall no significant differences were found between the two groups. Despite the fact that most differences weren't significant, there was an interesting result found when comparing the warrior group and all the participants that 'acted' as a warrior (i.e. also participants who were in the scientist or neutral groups but showed more warrior-like behavior based on the role-playing actions). Namely, when the latter group received the attribute framing task, there was no framing effect found. In contrast, a strong framing effect was found in the group where participants received the warrior role. This might suggest that 'being forced into the warrior role' plays a big role in whether the framing effect occurs.

Some other measurements were also taken into account. For example, the gender and whether the players played the game before was included in the data. However, no differences were found which would suggest that these factors had an influence.

V. Conclusion

In this research an answer was sought to the question whether playing an impulsive or analytic character respectively induces or respectively reduces the framing effect. The results did not show an effect of risky-choice framing or goal framing. However, a main effect of attribute framing was found. Furthermore, it was found that the group playing the warrior character were indeed influenced by the attribute framing effect, while the other groups weren't being affected. In conclusion, these results suggest that playing an impulsive character can make the participant more susceptible to framing, but only to attribute framing.

VI. Discussion

The results as presented by this research bring some interesting implications to light. First, since the framing effect has often been regarded as one of the stronger cognitive biases, the fact that the results as presented by this research didn't show the framing effect in most tasks raises some interesting questions. Most importantly, how can the results as presented by this paper be explained when the bulk of framing research have shown the effect in many different contexts? Therefore, the results of the present research provide not only some interesting insights on the particular topic of role-playing and the framing effect, but framing research in general.

Furthermore, how can it be explained that the framing effect could be found when participants were presented with the attribute task, while it was absent when participants were provided with the other tasks? One possible explanation for this interesting result can be found when considering the research by Kuhberger[5]. In accordance to the results found in that specific research, the framing effect was non-existent when describing the options in an exact matter. This could be an explanation for the fact that a framing effect was found when an attribution framing task was given, in contrast to the risky-choice framing tasks. As such, the results can be considered as support for the idea that framing problems are caused by the subject's lack of understanding in contrast to impulsive decision making. Although this explains the results to some degree, it still does not explain the presence of the attribute framing effect when considering the warrior group. Therefore, further research might be needed regarding ambiguous descriptions of attribute framing and framing tasks in general.

Another explanation for the results can be found in relation to the 'foreign-language' effect. Due to the fact that this experiment was conducted in English, a non-native language for most participants, the experiment might have been influenced by this very fact. Therefore, it might be interesting to repeat the same experiment in a participant group with only native English speakers.

Apart from these considerations, the medium itself, namely a video-game, may have been an influence on the absence of the framing effect in most cases. In this research it was roughly assumed that there is a direct relation between playing a game and, for example, the emotional involvement of the players. However, this immediately raises the problem of immersion. When is a participant really involved in a video game? And can the game, if the player isn't feeling immersed, make the player more rational about their decisions instead of acting out of emotional or impulsive considerations? As such, for future research, factors such as immersion or 'emotional involvement', could be interesting factors to measure. Finally, one could wonder what the relationship is between behavior in a virtual role-playing environment, in comparison to 'real' behavior. Can playing a video-game really be compared to a real role-playing session? For this research it was decided that these matters were beyond the scope of the research. However, the question whether immersion can play a role in framing research such as this particular research, is one that needs to be given further attention.

The given points raise the question whether the framing effect can really be considered such a prominent effect. Especially, considering the risky-choice framing effect, research often show that it is a consistent effect in a controlled environment; an environment which utilizes more traditional methods, such as questionnaires. The results of this research show that, using an environment different than most environments used in framing research, the framing effect may not be as prominent as usually thought. This is especially

interesting since the medium as used by this research is a medium which is often considered as a great potential for educational purposes. As such, an important contribution of this research may well lie within this fact. Namely, to show how utilizing media other than the more traditional or 'go-to' methods can provide some interesting and unexpected insights.

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Appendix A.

Amount valuable items picked up

Amount misc items picked up

Amount valuable ite

Amount other item