Universidade do Minho
Escola de Psicologia

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# Risky Choices: Prospect Theory and Fairness Judgments

junho de 2016

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UMinho | 2016

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# Risky Choices: Prospect Theory and Fairness Judgments

Dissertação de Mestrado
Mestrado Integrado em Psicologia

Trabalho realizado sob a orientação do
**Professor Doutor José Keating**

junho de 2016

DECLARAÇÃO

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Título da dissertação: Risky Choices: Prospect Theory and Fairness Judgments
Orientador: Professor Doutor José Keating
Ano de conclusão: 2016
Designação do Mestrado: Mestrado Integrado em Psicologia



Universidade do Minho, 08/06/2016
Assinatura: _____

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Acknowledgments

I’m deeply grateful to the many people that helped me in this adventurous year!

I’m especially thankful to my mentor, Dr. José Keating, for leading me in my first year of university to this great theme that is decision making. Maybe he doesn’t remember, but he has taught a class that was crucial to the development of my passion for themes around this area. I would like too to thank him for helping me out in all my doubts around this theme.

I’m especially thankful to Laura Pinheiro too, the teacher that allowed me to embark on the writing of this thesis in English, which I did not think I would be able to do. Thank you for the hours spent on my English improvement.

Thank you to Ana Machado for giving me a lot of support when I was doing this thesis. Her motivation in helping me encouraged me a lot. So, thanks for all the inspirational words.

Thank you to Daniel Oliveira for being a person who has always raised questions about my thesis and to Maria Paiva for helping me in all the phases of the development of this thesis.

Thank you to Dr. Isabel Galinha for the permission to use her scale, and for answering my questions related to it.

Thank you to my family and friends for their support.

**Escolhas de Risco: Teoria dos Prospetos e Julgamentos de Justiça**

A teoria dos Prospetos refere que quando estamos envolvidos em contextos de ganho somos mais aversivos ao risco, e que em contextos de perda tendemos a procurar opções de risco. Por outro lado, a *fairness heuristic theory* refere que tendemos a fazer julgamentos de justiça muito rápidos perante as situações com que somos confrontados.

Não temos muita informação sobre a ligação entre os nossos julgamentos de justiça e as nossas escolhas. Assim, temos como objetivo verificar se existe alguma relação entre a forma como tomamos realmente decisões, e a avaliação da justiça das decisões feitas por outros. É esperado que quando confrontados com decisões congruentes com as que tomaríamos, essas decisões sejam avaliadas como mais justas. Exploramos esta hipótese em diferentes contextos de decisão: sobrevivência e não-sobrevivência, que foram testados para verificar se reproduziam os efeitos previstos pela teoria dos Prospetos. Posteriormente foram apresentados como decisões já tomadas, suscitando uma avaliação da justiça pelos participantes.

Os resultados foram de encontro às nossas hipóteses: quer os contextos de sobrevivência quer os de não-sobrevivência foram sensíveis aos efeitos do enquadramento (*framing*); as decisões congruentes com os enviesamentos cognitivos, descritos pela Teoria dos Prospetos, foram avaliadas como mais justas do que decisões não-congruentes.

*Palavras-chave*: Teoria dos Prospetos, *Fairness Heuristic Theory*, Sobrevivência, Não-sobrevivência

**Risky Choices: Prospect Theory and Fairness Judgements**

Prospect theory states that when people decide within gain frames they are more risk averse, and when they have to decide within loss frames they tend to be more risk seeking. On the other hand, Fairness Heuristic Theory states that people tend to form fairness judgments quickly when they are confronted with decisions already taken.

We do not have much information about the connection between our fairness judgments and our individual decisions bias. Thus, our objective is to verify if our bias will be an important information to assess the fairness of a decision made by others. We expected that when people were confronted with decisions that were similar to their cognitive bias, decisions would be considered fairer. We developed and evaluated several survival and non-survival scenarios to see if they were adequate to reproduce the effects predicted by Prospect theory. Those scenarios were then presented as decisions already taken and participants had to judge the fairness of the decision.

The results corresponded to our predictions: survival and non-survival scenarios captured the framing effect; decisions congruent with the bias described by Prospect theory were considered fairer than non-congruent decisions.

*Keywords: Prospect Theory; Fairness Heuristic theory; Survival scenarios; Non-survival scenarios*

## Introduction

Imagine that you were a senior manager of a car manufacturing company that is faced with a crisis that has affected three of its plants, each of which employs 2000 people. "Which option would you select: 1) two of our plants and 4000 jobs will definitely be lost; or 2) 1/3 probability of losing no plants and no jobs, but 2/3 probability of losing all three plants and all 6000 jobs?" (Ganegoda & Folger, 2015, p.31).

Daily we make diverse frame decisions varying in the degree of certainty. In the example above, we could see different degrees of certainty (the first is a riskless option and the second a risky one), and that could be framed in gains (e.g. a sure win …), or losses (e.g. a sure loss …).

Now, imagine you were an employee and the senior manager told you about that scenario with the options that he had to choose and that he had chosen the first option. How fair would you think the option was? (Ganegoda & Folger, 2015)

We are faced with decisions already taken all the time too and those decisions announced can entail justice judgments.

Now, if we think of perceptual illusions, (e.g. the Müller-Lyer illusion), we may see that the context is rather relevant. For instance, we may be aware that the lines have the same length, but we continue to see the line with the endpoint arrows facing outward longer (>---<) than the line with the endpoints inward (<--->) (Dewar, 1967; Ganegoda & Folger, 2015).

Like the Müller-Lyer illusion biases our perception of length, framing biases our decisions: in the first scenario, for example, it is more probable that you will choose the second option.

We want to know if decision frames also bias our perceptions of fairness (e.g. in the second example of the scenario above, whether the first option is judged as more unfair than the second option).

Thus, the theme of my thesis is to evaluate whether the way decisions are made influences our fairness perceptions of such decisions. Furthermore, we will analyse if these responses vary according to the type of situation that we are facing: survival or non-survival situation. Ganegoda and Folger (2015) was the first study, to our knowledge, to combine both

Fairness theory and Prospect theory, but they were more focused on the use of counterfactual thinking and they did not use survival situations.

Two models, one on observed decision processes and other on the formation of justice judgements, seem relevant to this objective and are the basis for this study: Prospect Theory and fairness theory, respectively.

**Prospect Theory**

Prospect theory is about the way we make economic decisions under uncertainty. For instance, if you had to decide between a sure win of 30€ or an 80% chance of winning 45€, which option would you choose? (Tversky & Kahneman, 1981)

If our choices were made according to classical expected utility theory we would choose the second option. According to expected utility theory our choices are made by comparing the expected utilities of the alternatives that we face, that is, their value multiplied by their probability (e.g. Baron, 2006). Therefore, in the decision above we could expect to gain 36€ in the uncertain option (80% of 45€ is equal to 36€), which is more than 30€. However, when people are confronted with this type of question they tend to choose the sure option – in the example before, of 77 participants 78% have chosen the first option (sure win of 30€) and only 22% have chosen the second one (Tversky & Kahneman, 1981).

In the example above, there are two different levels of risk: the riskless option (30€; p=1.0) and the risky one (45€; p=0,8). "The riskless component is the minimum gain or loss which is certain to be obtained; and the risky condition is the additional gain or loss which is actually at stake" (Kahneman & Tversky, 1979, p.276).

In fact, for the process of making a decision, Tversky and Kahneman (1981) reported that the choice between two options of similar value is different depending on what is at stake – which they called the framing effect (Fagley & Miller, 1987). People make decisions based on the information perceived, and not only on the inherent utility of an option. People tend to be risk averse under conditions involving gains, and risk taking in choices involving losses (Tversky & Kahneman, 1981). These gains or losses are what people perceive by results comparing to a reference point, which is status quo. So, a gain is preferred to the reference point, and a loss is less preferred than the reference point (Tversky & Kahneman, 1981).

Therefore, most people tend to choose a sure win of 30€ than an 80% chance of winning 45€, because in a gain frame people tend to be risk averse.

However, if we had to choose between a sure loss of 30€ or an 80% chance of losing 45€ (that is, 80% of 45€ is equal to 36€) we would choose the second one, because in a loss frame people tend to be risk seeking.

This is a very interesting pattern since it contradicts basic economic assumptions about human behaviour. As a model, Prospect theory gives a detailed description of observed decisions made under risk and we will examine some of the authors' observations.

Furthermore, Tversky and Kahneman's (1981) provided a survival scenario in which they presented the same results but using different rephrasing, that is, they made gains or losses more salient in the Asian Disease Problem. The problem is the following:

"Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows" (Tversky & Kahneman, 1981, p.453).

152 participants received a scenario in a gain frame and had to choose between: "if Program A is adopted 200 people will be saved", and "if Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved" (Tversky & Kahneman, 1981, p.453).

155 participants were presented a scenario in a loss frame and had to choose between: "if Program C is adopted 400 people will die", and "if Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die" (Tversky & Kahneman, 1981, p.453).

This focus on gains and losses may influence individuals' views of a problem and their necessary solutions (Nabi, 2003); that is, in this Asian Disease Problem 200 people saved out of 600 is not better or worse than 400 people lost out of 600. However, this frame, of gain or loss, influences our solutions to the problem. In the example above, 72% chose program A, in gain frame; and 78% chose program D, in loss frame (Tversky & Kahneman, 1981).

When faced with a choice people will overestimate very low probabilities, and underestimate high probabilities (Kahneman & Tversky, 1979); when the information is presented on gains or losses the value of the decision becomes distorted (Fig.1). As we can see in the Figure 1 the value function is S-Shaped, i.e. it is concave above the reference point,

and convex below the reference point (Kahneman & Tversky, 1979). In other words, the difference between gaining 100€ or 200€ is greater than the difference between gaining 1100€ or 1200€; as the difference between losing 100€ or 200€ is greater than losing 1100€ or 1200€ (Kahneman & Tversky, 1979).

Besides, the curvature in the 0-point is steeper to small losses than to small gains, describing loss aversion. Owing to the loss aversion for the same prospect we can have different choices, depending on the way the prospect is presented: gains or losses.

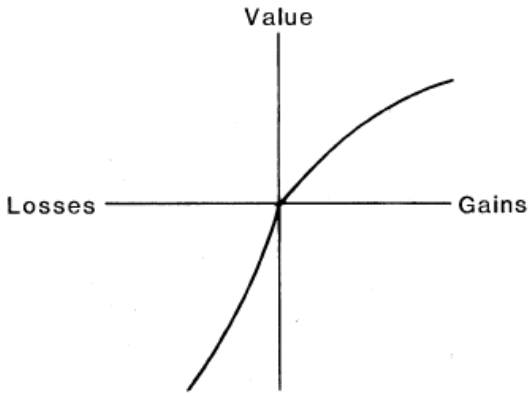



**Fig. 1.** Hypothetical value function – Prospect Theory (Kahneman & Tversky, 1979)

As we can see, the distortion is predictable: people will be more averse to risk when the choices involve gains and they will be more risk seeking when the choices involve losses (Kahneman & Tversky, 1979).

**Fairness Heuristic Theory**

An important process to understand social behavior is to analyze individuals' notion of justice. When people face an uncertain social situation they begin to search for information on which they can build fairness judgements (Bos, Vermunt, Wilke & Lind, 1997). But how do people judge something fair or unfair?

Social justice has focused on how people react to four distinct forms of justice: procedural justice, which focuses on the procedures aspects on making a decision, like transparency, consistency, freedom from bias (Folger & Greenberg, 1985; Leventhal, 1980); interactional justice, focusing on the quality of the interpersonal treatment and it is divided in informational justice (explanations) and interpersonal justice (dignity and respectful

treatment) (Colquitt, 2001); finally, distributive justice, which emphasizes the perceived fairness of outcomes (Folger & Greenberg, 1985).

Fairness heuristic theory has focused on how people can form and in each situation they will use fairness judgements, including these types of justice. This theory suggests that judgments of justice are made in two phases (Lind, 2001).

The first is the judgmental phase; according to fairness heuristic theory, people form judgments quickly and without complete information about all aspects of a situation (Lind, 2001). Therefore, fairness judgments showed a strong primacy effect, because they were formed with the first relevant information (Lind, 2001).

A study by Van den Bos, Vermunt and Wilke (1997) has confirmed this primacy effect, in two experiments. In the first experiment, some participants had received information about the procedure before the outcome, and the other ones had received information about the outcome before the procedure. They found people's judgment of fairness is rather affected by the information that comes first than by the information that comes later. In the second experiment, some participants were informed before about the outcome and after about the procedure and the other ones were informed about the procedure before receiving information about the outcome. Then, they were asked about the procedure fairness judgement, distributive fairness judgement, satisfaction and intention to protest. Getting information before about the procedure and after about the outcome influences satisfaction and the intention to protest. On the other hand, getting information before about the outcome influences satisfaction and the intention to protest too (Bos, Vermunt, Wilke, 1997).

Thus, they found the evidence for the primacy effect, that is, depending on the first justice-relevant information received, procedural or distributive, it will have the highest impact on fairness judgment (Bos, Vermunt, Wilke, 1997).

The second phase, the use phase, occurs quickly too, and it is guided by the judgmental phase. It consists of a reinterpreted view of the general fairness judgment. In other words, it means that if some type of justice is missing, people will generalize the other types of fairness available, as they make fairness judgements (Lind, 2001). Therefore, the relevant information in the judgmental phase will function as a heuristic and guides the following events (Bos & Lind, 1997).

Consequently, the first relevant information used to form the general fairness judgement, in the first phase, will affect other types of justice during this use phase (Fig. 2) (Lind, 2001).

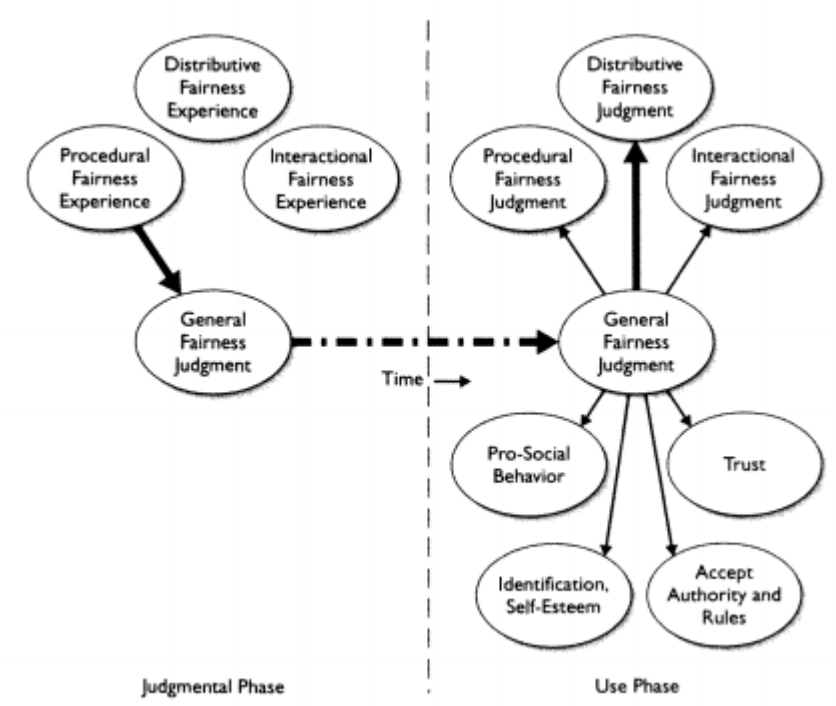



**Fig. 2.** The Fair Process as a Substitution Effect (Lind, 2001).

Another implication of fairness heuristic theory is the access to information that can be used to form our fairness judgements. For example, when we do not have information about the others' outcomes, the procedural fairness could be easier to interpret than the distributive fairness. Or, when people have information about the others' outcomes, they will depend less on procedural information to judge the fairness of a situation (Bos, Vermunt, Wilke & Lind, 1997).

As Lind (2001) suggests with the fairness heuristic hypothesis, people make a general judgment of fairness using the first relevant information. Although they are able to distinguish between different types of justice, individuals develop an overall sense of fairness. Greenberg (2001) argues too that when people are making justice impressions, they do it in a holistic way (as cited in Ambrose & Schminke, 2009).

We argue that this justice judgment process has an impact on risky assessment decisions. When people are confronted with a risky decision the individual risk-seeking or

risk-avoiding bias will affect the judgmental phase. Consequently, people will judge as fairer the decisions congruent with their own bias.

Ganegoda and Folger (2015) did two experiments to study the justice perceptions as a function of framing effects, drawn on Prospect theory and Fairness theory.

In the first, they adapted the Asian Disease problem to a situation in a university. The participants read the scenarios with the option already chosen and had to answer 6 fairness items referring to the three types of justice: outcome fairness, procedural justice and informational justice. When decisions were taken congruent to Prospect theory people reported the decisions significantly fairer than decisions incongruent to Prospect theory.

In the second experiment, they used an organizational situation. The scenarios were also given with the option already chosen. Subsequently, the participants had to answer several questions: one on overall justice; another about the acceptance of the company's decision; and a third about the engagement with the company. Then, they had to list thoughts they experienced when they were reading the scenarios – counterfactual thinking. The participants in conditions congruent to Prospect theory mentioned higher fairness ratings than those in conditions incongruent to Prospect theory. Besides, the participants were more disposed to accept the chosen decision and were more engaged in decisions congruent to Prospect theory. Finally, the authors found that counterfactual thinking mediated the effect between decision frame and option riskiness on perceived justice (Ganegoda & Folger, 2015).

Therefore, when decisions were taken congruent to Prospect theory, people reported higher levels of perceived fairness, and less counterfactual thinking (Ganegoda & Folger, 2015).

All in all, we expect that the decision bias explained by Prospect theory could act similarly to the way fairness perceptions are constructed (Ganegoda & Folger, 2015). We expect that a risky choice will be perceived as fairer when it is reported in a loss frame than in a gain frame and vice-versa.

## Method

### Overview of the research plan

The purpose of the study was to test if our bias influences our fairness judgments, in other words, if a risky decision is perceived as fairer when it is reported as a loss than as a

gain frame; and if a riskless decision is perceived as fairer when it is reported as a gain than as a loss frame (Ganegoda & Folger, 2015).

Two types of scenarios were developed and tested: survival and non-survival, to see if they were adequate to reproduce the effects predicted by Prospect theory. The dependent variable was the proportion of risk or riskless options, and the independent variable was the gain or loss frame. Subsequently, the scenarios were showed with the decisions already taken, for the evaluation of fairness. The dependent variable was the perceived fairness of the decision, measured with an overall fairness question, and the independent variables were the type of situation (survival, non-survival) and the congruence of the decision taken with the Prospect theory (gain or loss frame X congruent, non-congruent).

Participants

Data was collected through an online survey with a university population: students, former students and professors. There were 364 participants (*M*= 27,69; *SD*= 9.35), 231 female (*M*= 27,10; *SD*= 9,00) and 133 male (*M*= 28,76; *SD*= 9,95). The youngest was 18 years old, and the oldest was 65 years old. The majority of participants were from areas like: psychology, engineering, medicine, management and sciences. The participants were fully informed about the conditions and the purposes of the experiment.

Design

We used a within subject factorial design with 2 (survival vs non-survival) x 2 (gain vs loss frame) x 2 (congruent decision x non-congruent decision).

The survey included two distinct parts and the individuals were randomly assigned to them. For the first part, there were two different version questionnaires and individuals were randomly assigned to answer one of them. In the second part, they were randomly assigned to one of four questionnaires to give their opinion on an overall fairness question (see Fig. 3 below).

Materials

The data for this study were collected with an online survey; Google Docs was used, because it allows us to counterbalance the options that people have to choose and it allows the inclusion of mandatory questions.

We used an affective state questionnaire, the *Positive and Negative Affect Schedule: Versão Reduzida Portuguesa – PANAS-VRP* – by Galinha, Pereira and Esteves (2014),

validated to Portuguese, with the authors' permission. The scale uses a 5-points Likert Scale, in that 1 was "*Nothing or Very slightly*", and 5 was "*Extremely"*. PANAS gives a measure of the momentary positive and negative affect experienced by the participant. The momentary mood of the participants could affect the way they answered the scenarios, consequently it is important to control so that the scenarios might be validated (Gross & D'Ambrosio, 2004; Keller, Lipkus & Rimer, 2003).

Therefore, two different types of situations were created: survival and non-survival. For each type two different scenarios were developed with the purpose of guaranteeing the parallel of scenarios. Thus, participants could react to either the gain or the loss scenarios in each type of situation. For example, if one person saw a gain frame in survival scenario 1, the same person would see the loss frame in survival scenario 2.

Survival situations were based on the Asian Disease Problem (Tversky & Kahneman, 1981) and on the National Cancer Institute Problem (Fagley & Miller, 1987). The non-survival situations intended to be different from money situations, because the latter have already been the subject of several studies (for example, Fagley and Miller, 1997; Kühberger, Mecklenbeck & Perner, 2002); based on Ganegoda & Folger (2015) we developed two scenarios more similar to daily life scenarios.

It was also used an overall fairness question by adapting the measure by Ambrose and Schminke (2009).

Procedure

All participants first filled the demographic questionnaire with simple questions like, gender, age, educational qualifications and the study area. Then, they filled the *Positive and Negative Affect Schedule* (PANAS – VRP (Versão Reduzida Portuguesa)) (Galinha, Pereira, & Esteves, 2014).

Subsequently, all participants read four scenarios, two survival scenarios, and two non-survival scenarios. They were randomly allocated, by the anniversary date – even or odd –, to a gain or loss version of each scenario; that is, if one participant saw a gain frame of the first survival scenario, in the second survival scenario he/ she would see the loss frame; and if the participant saw a gain frame of the first non-survival scenario, in the second non-survival he/ she would see the loss frame (see Fig. 3 and Table 1 below). The order in which questions and

options (riskless/ risky) appeared was randomized across surveys, for each participant, in order to minimize any effect of sequence.

Survival 1: *Surgiu uma nova estirpe de uma doença que se estima que vá afetar 900 pessoas e os médicos têm de optar entre 2 planos de tratamento. Qual das opções considera que os médicos deviam escolher?* Under option 1, *se escolher o plano de tratamento A salvam-se 300 pessoas* (gain frame)/ *se escolher o plano de tratamento A morrem 600 pessoas* (loss frame).On the other hand, under option 2, *se escolher o plano de tratamento B há 1/3 de probabilidade de que das 900 pessoas as 900 sejam salvas, e 2/3 de probabilidade de que das 900 pessoas nenhuma das 900 seja salva* (gain frame)/ *se escolher o plano de tratamento B há 1/3 de probabilidade de que das 900 pessoas nenhuma das 900 morra, e 2/3 de probabilidade de que das 900 pessoas as 900 morram* (loss frame).

Survival 2: *O Instituto de Oncologia tem 2 possíveis tratamentos de um certo tipo de cancro que afeta 1200 pessoas. Há recursos adequados para implementar apenas um plano de tratamento. Qual dos dois tratamentos considera que devia ser escolhido?* Under option 1, *se o tratamento 1 for adotado salvam-se 400 pessoas* (gain frame)/ *se o tratamento 1 for adotado morrem 800 pessoas* (loss frame). Under option 2, *se o tratamento 2 for adotado há 1/3 de probabilidade de que das 1200 pessoas as 1200 sejam salvas, e 2/3 de probabilidade de que das 1200 pessoas nenhuma das 1200 seja salva* (gain frame)/ *se o tratamento 2 for adotado há 1/3 de probabilidade de que das 1200 pessoas nenhuma das 1200 morra, e 2/3 de probabilidade de que das 1200 pessoas as 1200 morram* (loss frame).

Non-Survival 1: *Um investigador informou 300 participantes, da área da biologia, que lhes iria dar um microscópio por participarem na sua experiência. Para poder comprar os microscópios, apelou, tal como outros investigadores, a um fundo do laboratório e, por isso, terá de escolher entre duas opções. Qual das duas opções considera que o investigador devia escolher?* Under option 1, *se escolher o fundo A garante 100 microscópios* (gain frame)/ *se escolher o fundo A não tem 200 dos microscópios* (loss frame). On the other hand, under option 2, *se escolher o fundo B há 1/3 de probabilidade de que dos 300 miscroscópios consiga os 300, e 2/3 de probabilidade de que dos 300 miscroscópios não consiga ter nenhum dos 300* (gain frame)/ *se escolher o fundo B há 1/3 de probabilidade de que dos 300 miscroscópios nenhum dos 300 lhe fique a faltar, e 2/3 de probabilidade de que dos 300 microscópios os 300 lhe faltem* (loss frame).

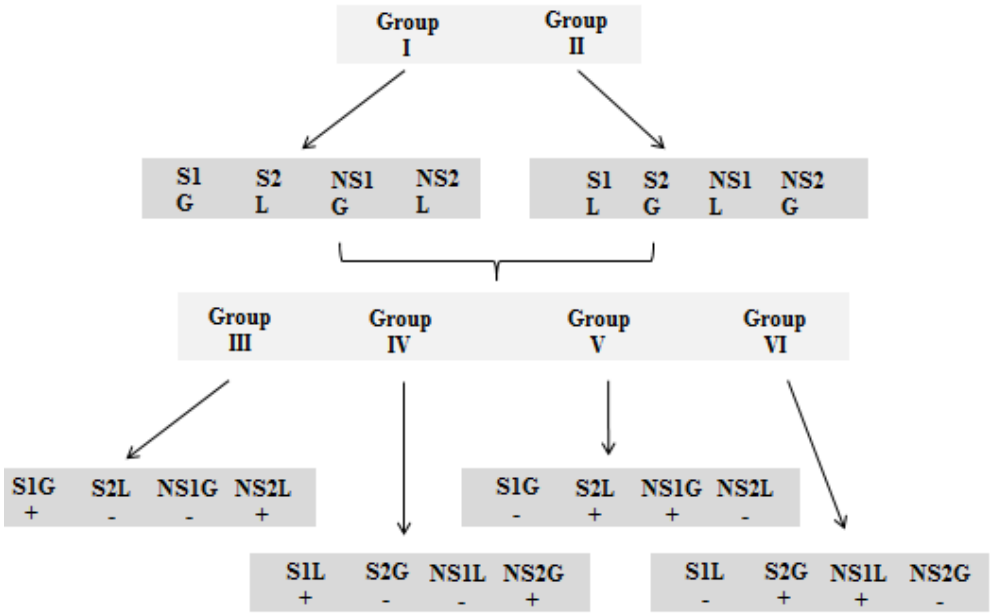
Non-Survival 2: *Um professor dá aulas a 180 alunos e informou-os que lhes iria oferecer um estetoscópio. Dois laboratórios, que souberam desta intenção do professor, disponibilizaram-se para oferecer os estetoscópios. O professor terá no entanto de escolher entre os dois laboratórios. Qual das opções considera que o professor devia escolher?* Under option 1, *se escolher o laboratório A garante 60 estetoscópios* (gain frame)/ *se escolher o laboratório A não tem 120 dos estetoscópios* (loss frame). Under option 2, *se escolher o laboratório B há 1/3 de probabilidade de que dos 180 estetoscópios consiga os 180, e 2/3 de probabilidade de que dos 180 estetoscópios não consiga ter nenhum dos 180* (gain frame)/ *se escolher o laboratório B há 1/3 de probabilidade de que dos 180 estetoscópios nenhum dos 180 lhe fique a faltar, e 2/3 de probabilidade de que dos 180 estetoscópios os 180 lhe faltem* (loss frame).

Subsequently, in the second part of the survey, people were randomly allocated by the anniversary date too, to the four different types of questionnaires, gain or loss frame; decision taken or not according to Prospect theory (Table 1). Thus, participants were confronted with the same four scenarios answered before, but then they were informed that the decisions were already taken. Then, they were informed that after careful considerations those persons involved had chosen Option 1 (riskless option) or Option 2 (risky option). Therefore, participants could see the same situation they had chosen before, or not, depending on the randomization (Fig. 3).

For each scenario they saw an overall fairness question: "*Globalmente considera que a decisão tomada foi*:", and they had a 6-point Likert scale to answer, in that 1 was 'extremely unjust', and 6 was 'extremely just' (Ambrose & Schminke, 2009).

Table 1.

| *Randomization - Anniversary* | *Group* |
|---|---|
| Day: Even | I |
| Day: Odd | II |
| Month: 1st Quarter | III |
| Month: 2nd Quarter | IV |
| Month: 3rd Quarter | V |
| Month: 4th Quarter | VI |




**S** – Survival Scenario; **NS** – Non-Survival Scenario; **G** – Gain Frame; **L** – Loss Frame; **(+)** According to Prospect theory (PT); (–) Not according to PT.

**Fig. 3 –** Procedural organization

Data analyses

In order to test my hypothesis, data analyses were processed using Microsoft Excel and software IBM SPSS, version 23. The data analyses were focused on finding the framing effect in the scenarios tested; and, on finding if our bias influences our fairness judgments. It was conducted an *independent-samples t-test*, a binomial test and a two-way analysis of variance. Exploratory data analyses were made for the t-test and the two-way analysis of variance, to see whether the assumptions were fulfilled, in order to use these parametric tests.

## Results

There were 364 participants ($M$ = 27,69; $SD$ = 9.35), 231 female ($M$ = 27,10; $SD$ = 9,00) and 133 male ($M$ = 28,76; $SD$ = 9,95). The major areas of study of those participants were: psychology (26%), engineering (24%) and medicine (7%) (Table 2).

Table 2.

| *Major Areas* | |
|---|---|
| Psychology | 26% |
| Engineering | 24% |
| Medicine | 7% |
| Health | 5% |
| Sciences | 5% |
| Education | 5% |
| Management | 5% |
| Languages | 4% |
| Economy | 4% |
| Others | 15% |

With the purpose of verifying if the four scenarios produced the framing effect, and because participants were divided in groups to answer the scenarios, it was important to guarantee that their affective state was the same.

Hays (1963) postulated that although the population distribution deviates from normal, when we have a large sample, in our case 364 participants, and the variances ae similar, the inferences made about means are valid (as cited in Havelicek & Peterson, 1974). So we conducted a *t-test* in order to analyse if there were differences between the means of the two groups, in the positive or negative affect.

An *independent-samples t-test* indicated there was no significant difference for positive affect between the two groups, $t_{(362)} = -0{,}132$, *n.s*; and there were no significantly main effect for negative affect between the two groups, $t_{(362)} = -0{,}723$, *n.s* (Table 3).

Table 3

*Independent t-test.*

| | Group I (n=180) *Mean (SD)* | Group II (n=184) *Mean (SD)* | t (362) |
|---|---|---|---|
| Positive Affect | 2,82 (0,84) | 2,84 (0,82) | -,132 |
| Negative Affect | 1,39 (0,63) | 1,44 (0,67) | -,723 |

The midpoint scale was 3, which represents people experiencing the emotions *moderately*. In both groups, the mean was 2.8 for the positive affect, which means that this value is at the midpoint scale. For the negative affect, the mean was 1.4, which means that the value is below the midpoint responses: the mean of the negative affect was below the value of positive affect, as expectable.

These data allowed us to analyse the scenario's data together: group I and group II.

Analysing all the scenarios we found that the cognitive bias predicted by Prospect theory was reproduced (Fig. 4).

For survival scenarios, a binomial test revealed when participants saw the gain-frame, they were more likely to choose the riskless option (55%), than a risky one (45%), $p_{binomial}$ = 0.02, 95% CIs [.50, .61], [.39, .50], correspondingly. In contrast, when they saw the loss-frame, a binomial test showed that participants were less likely to choose the riskless option (30%), than choose the risky option (70%), $p_{binomial} < .001$, 95% CIs [.26, .35], [.65, .74], respectively.

For non-survival scenarios, a binomial test revealed that in the gain-frame participants were more likely to choose the riskless option (60%), than to choose the riskless one (40%), $p_{binomial} < .001$, 95% CIs [.55, .65], [.35, .45], correspondingly. When in the loss-frame, participants were less likely to choose the riskless option (33%), than to choose the risky one (67%), $p_{binomial} < .001$, 95% CIs [.28, .38], [.62, .72], respectively.

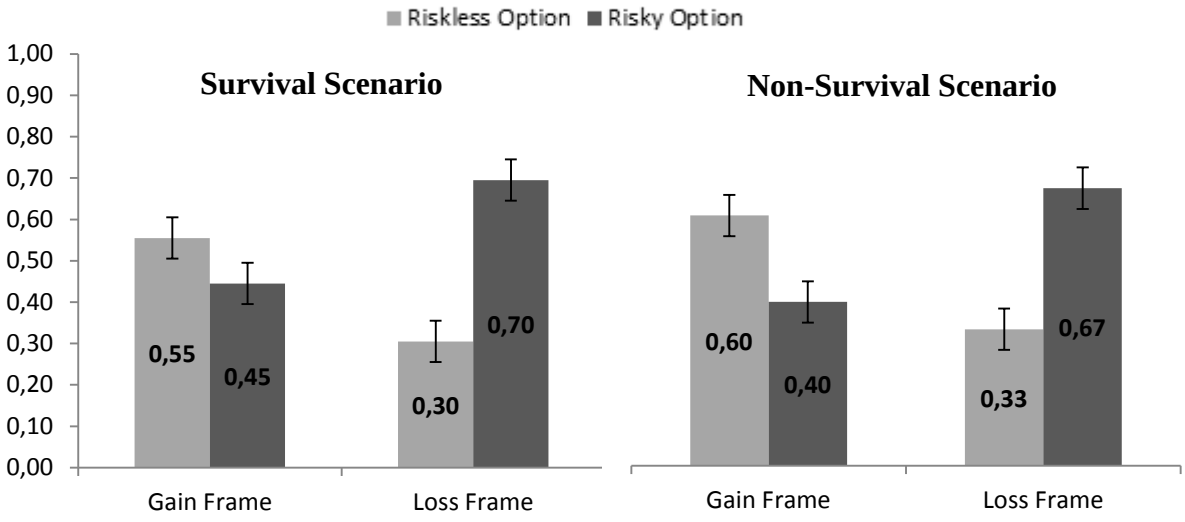



**Fig. 4 –** Choices as a function of framing and risk

To test the hypothesis that this cognitive bias also happens in fairness perceptions we analysed the participants' judgments of fairness of decisions taken in survival and non-survival scenarios combined with congruence (or not) with Prospect theory for both gains and loss frames. We had to exclude some participants in order to have the same number in each condition; so, a randomized number was attributed to each participant in Excel, and then we eliminated the first ones. So, there were 348 participants in this assessment.

A two-way analysis of variance was conducted to examine the effect of the type of situations (survival or non-survival) and congruence with Prospect theory on fairness perceptions (gain frame: congruent and incongruent; loss frame: congruent and incongruent). There was no statistically significant main effect of the scenarios type: survival and non-survival, $F(1, 1384) = 3.12$, $p = .08$, $\eta_p^2 = .002$. There was a statistically significant interaction between the effects of type of situations (survival or non-survival) and congruence on fairness perceptions, $F(3, 1384) = 7.48$, $p < .001$, $\eta_p^2 = .016$ .

The Gabriel post-hoc test revealed that the fairness judgments of decisions congruent with Prospect theory, in gain frames, were lower than the incongruent decisions. Also revealed the fairness perceptions of decisions congruent with Prospect theory, in gain frames, were significantly higher than decisions incongruent, in loss frames. In loss frames, the fairness perceptions of decisions taken congruent with Prospect theory were significantly higher than decisions incongruent.

Table 3

*Two-way Analysis of Variance on Fairness Perceptions in Prospect Theory and Scenarios Type.*

| Source | *SS* | *df* | *MS* | *F* |
|---|---|---|---|---|
| Scenarios Type | 8,38 | 1 | 8,38 | 3,12 |
| Prospect Theory | 340,90 | 3 | 113,63 | 42,37*** |
| Scenarios*PT | 60,16 | 3 | 20,05 | 7,48*** |

*Note.* $R^2$=.099 ($R^2$ Adjusted =.095)

***p < .001

Table 4

*Test Gabriel Post-Hoc*

| | *Gain Congruent vs Gain Incongruent* | *Gain Congruent vs Loss Congruent* | *Gain Congruent vs Loss Incongruent* | *Gain Incongruent vs Loss Congruent* | *Gain Incongruent vs Loss Incongruent* | *Loss Congruent vs Loss Incongruent* |
|---|---|---|---|---|---|---|
| Fairness Judgements | ** | *ns* | ** | ** | ** | ** |

**p < .01

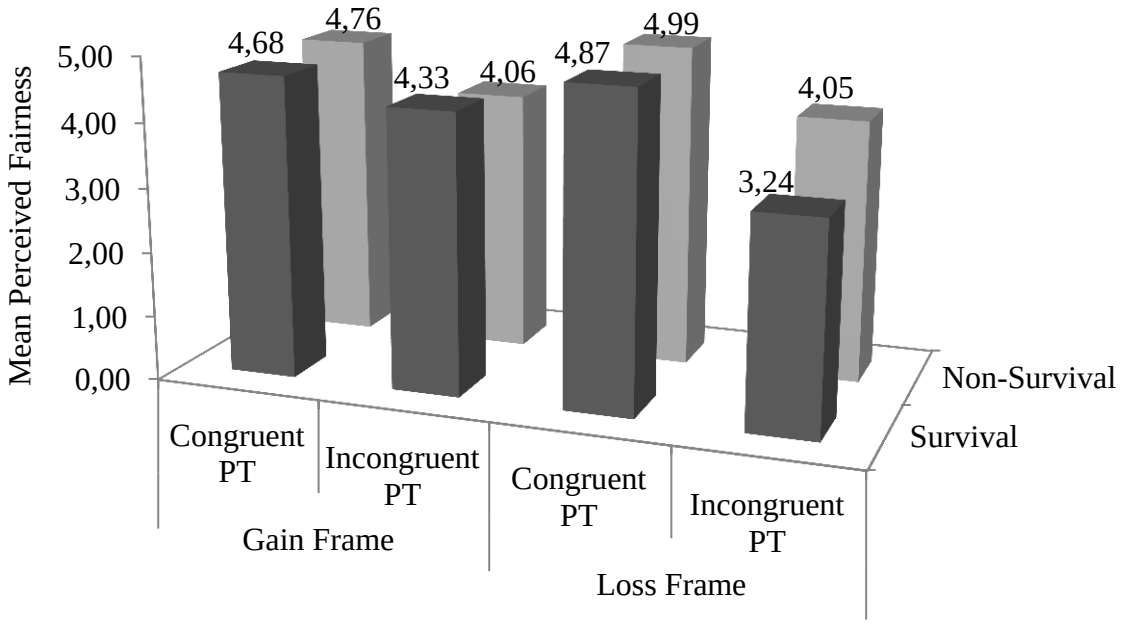



**Fig. 5 –** Perceived fairness as a function of scenarios type and decision frame.

**Discussion**

Our findings lend some support to our expectations. When we tested scenarios we found that the survival and non-survival followed the effect predicted by Prospect theory. Second, in situations where the decision taken is according to their intuition (as per Prospect theory), people judge these decisions as fairer than the decisions not congruent to Prospect theory.

In the case of the scenarios, if we compare our results with the Asian disease problem (Tversky & Kahneman, 1981), we found a difference in the magnitude of the effect. Instead of 72% (riskless option) vs 28% (risky option) in gain frame, we observed 55% vs 45% in survival scenarios, and 60% vs 40% in non-survival scenarios. And, instead of 22% (riskless option) vs 78% (risky option) in loss frame, we observed 30% vs 70% in survival scenarios, and 33% vs 67% in non-survival scenarios.

However, we could argue that those differences are not surprising, because it is known that the framing effect is very sensitive to contextual changes (e.g. Bless, Betsch, Franzen, 1998; Fagley & Miller, 1997; Kühberger, 1995). We adapted to Portuguese, and made some adjustments, in the survival scenarios; in the non-survival ones they were completely new; so, we really made significant contextual changes. Besides, our population was related to university. The majority of population (26%) was from psychology, and it is known that they have learnt about the framing effect. So, we argue population aware of this effect could also influence its size.

Furthermore, the difference in loss frames, between the riskless and risky option, was more remarkable than the differences in gain frame. Kühberger (1995) has already noticed this effect, since he did not find framing effects in gains as large as in a loss frame.

Besides, the main effect between survival and non-survival scenarios was not found for the fairness perceptions. We speculate that this has happened because the cues of the non-survival scenarios (related to academic research) were significant to our participants, all connected with the university: students, professors and former students. Also, the differences that seem to exist in decisions incongruent to Prospect theory, in both gain and loss frames, between the survival and non-survival scenarios, might be hidden by other small differences in decisions congruent to Prospect theory.

However, we found an interaction between scenarios (survival x non-survival) and congruence to Prospect theory.

We observed that when people are judging the fairness of the decisions taken according to the choices they would possibly have taken too, those decisions were judged fairer than the decisions taken incongruent to Prospect theory, in both gain and loss frames. So, maybe they judge a decision according to the choice they would have taken too. Fairness heuristic theory refers that fairness judgments were formed with the first relevant information (Lind, 2001).

Maybe the first important information that individuals get to judge fairness is the congruence or incongruence to Prospect theory, and not the types of justice (distributive, procedural or interactional).

Our results seem to support my hypotheses, that the decision bias explained by Prospect theory could act similarly to the way fairness perceptions are constructed (Ganegoda & Folger, 2015). We argue that the pattern of choice found between the riskless and risky options, in gain and loss frames, is similar to the pattern of the perceived fairness.

Taken the scenarios together, the difference between the risky and riskless choice in loss frame is bigger than in gain frames. As we saw in Figure 4, there are large differences in the response rates of the options that are not supported by Prospect theory, between gain and loss frames. Whereas in loss frames there are just about 30% of participants answering the riskless option, in the gain frame there are about 45% answering the risky option. In other words, people took more in account the Prospect theory in loss than in gain frames. And, although we found differences between the perceived fairness of decisions taken congruent to Prospect theory ($M$ = 4.73), and decisions taken not congruent ($M$ = 4.19); in loss frames, these differences were much larger ($M$ = 4.94), and ($M$ = 3.66), respectively. In other words, it seems that participants were more likely to judge severely when they were in loss frames, than in gain frames.

Therefore, maybe this type of bias influenced the fairness judgments, as we expected, and people evaluated like more just the option against Prospect theory in gains, than in loss frames.

**Limitations**

The current study has some limitations that should be considered when looking at the results. First, related to the scenarios, the major limitation found was the use of completely new situations. It is known that slight differences in this type of scenarios could make differences in the effect size, so it was some risk in the use of new scenarios (Fagley & Miller, 1997). Moreover, using new scenarios is more susceptible to the emergence of new issues, which should already be controlled for in tested scenarios.

Second, we really expected to find the framing effect in our scenarios; so we tested the scenarios in the same survey in which we collected the data about the fairness judgments. However, the participants could have been familiar with the scenarios, because as we could see in Figure 3, they saw the same scenarios. The difference was the frame of the scenario, and the decision taken, congruent or not to Prospect theory. So other studies might consider collecting the data in two parts: first test scenarios, then assess the fairness judgments; or collect the data within subject, in other words, the same participant answers the test scenario, and then sees the same scenario with the decision taken.

Finally, the generalizability of our findings, e.g. whether they can be applied in our fairness perceptions in our daily life, cannot be determined because we do not know why people judge fairness differently in gain and loss frames. We argue this may happen because the way people take decisions can be similar to the way they judge fairness. However, we do not know if there are some conditions that influence these responses, such as, the outcomes of the options, the procedures of the decision… It would be useful to replicate and extend the current findings to understand the cognitive processes involved in decisions and judgements of fairness.

**Future Considerations**

These framing effect scenarios need to be replicated with an additional consideration: the ambiguity in the risky option. Kühberger (1995) had found that the Asian Disease Problem (Tversky & Kahneman, 1981) and the National Cancer Institute (Fagley & Miller, 1987) were interpreted by participants with ambiguity. Some of them saw the values as estimates, and the others saw them as an exact numerical data.

In our two pilot studies (with 20 participants), we found that people understood differently the risky option. For example, in survival scenario 1, gain frame, "*1/3 probability that 900 people will be saved and 2/3 probability that no people will be saved*", some participants understood that either everyone lives or everyone dies while others understood that either everyone lives or 300 live (900/3).

However, Kühberger (1995) found that ambiguity was not directly related to the choices. So, we followed the procedures normally, but we understand that it will be significant in the future to analyse the ways that people apprehend this kind of problems.

Finally, it is also important that future studies may take into account the use of scenarios already tested in the Prospect theory, because as we told before, slight differences in context may influence the framing effect.

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