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The Prospect Theory Applied to Adolescents from Brazil

Laura Stumpf

Colegio Israelita Brasileiro, Av. Protasio Alves, 943, Porto Alegre, 90410-000, Brazil; laurastumpf15@icloud.com

ABSTRACT: Kahneman and Tversky developed their prospect theory in 1979, showing how the decision-making process in humans can be altered by biases called heuristics. Their theory changed forever how we think about behavioral economics and the expected utility theory. This research paper is intended to replicate the work of Kahneman and Tversky in the adolescent population. 13 adapted questions from the original work of Kahneman and Tversky were sent to high school adolescents from Porto Alegre, Brazil. 57 teenagers replied. The results showed statistical differences in 8 of the 13 questions. Although the adolescents usually answered in accordance with the work of Kahneman and Tversky, they were more prone to taking chances and risks to secure higher gains or avoid a sure loss. These results are significant because they demonstrate that teenagers are more susceptible to online gambling addiction and marketing manipulation. Further studies with larger populations are recommended.

KEYWORDS: Social and Behavioral Science, Behavioral Economics, Prospect Theory, Expected Utility.

Introduction

Daniel Kahneman and Amos Tversky[1] were pioneers in the science of behavioral economics. Their work showed how heuristics can affect the decision-making process, especially when those decisions may involve risk, challenging the Expected Utility Theory, which until then had been dominant in the academic field. From their studies, the "Prospect Theory" was developed, which explains how we make decisions differently when a situation has the potential to generate a loss or a gain. The research conducted by Kahneman and Tversky was carried out with university students and staff. Therefore, this paper aims to observe whether adolescents decide in the same way as adults when exposed to some of the same questions posed by Kahneman and Tversky in their 1979 work.

Before Prospect Theory, Expected Utility Theory was the model most widely used to explain decision-making in behavioral economics. The theory states that when people are confronted with situations of uncertainty, they choose the option that maximizes their expected utility, using the mathematical "expectation" operator. The utility of outcomes derives from their mathematical probability.

The pioneering work of Tversky and Kahneman demonstrated, in adults, that heuristics such as loss aversion (where the "disutility" of losing is greater than the utility of gaining) and the disposition effect (which says that investors sell winning assets too early and hold losing assets too long) influence decision-making when risk or gain is involved.

This paper aims to replicate part of the work of Kahneman and Tversky to determine whether adolescents in Brazil decide in the same way as adults when faced with uncertain situations.

1. Rational Expectations, Expected Utility, and the Prospect Theory:

1.1. Rational Expectations:

In classical economics, there is the assumption of rational expectations. The precursor of this theory was John Muth[2] in 1961, and Lucas[3] later refined it. The theory of rational expectations is based on the idea that people do not make systematic errors when predicting the future and make efficient use of all available information.[4] According to von Neumann and Morgenstern,[5] people are completely rational, use all available information efficiently, and markets are efficient. Thus, all decisions maximize expected utility.

By assuming that all economic agents have access to all available information, the theory argues that past errors do not influence present expectations. Therefore, systematic errors do not occur, and agents, on average, make correct predictions.[6]

Another important premise in economic and financial sciences is the liquidity preference theory, which states that economic agents and investors prefer liquidity and dislike risk. This theory was developed by the English economist John Maynard Keynes,[7] an important economic thinker. The theory states that risk-averse individuals prefer the certainty of a result over a risky outcome. Investors expect a premium to exchange liquid assets for long-term assets. This premium is the interest rate.[8]

However, not all scholars agree with the theory of rational expectations. According to authors such as psychologists Kahneman and Tversky,[1] human beings are often not rational in their decision-making. According to Daniel Kahneman's book Thinking, Fast and Slow,[9] the human brain works with two systems: one fast, intuitive, low-energy system that makes automatic decisions; and another that is analytical, slower, and where we allocate attention to complex cognitive tasks. According to the author, the fast system is the most used one to make our daily life more efficient. The result of this way of thinking is that our decisions are often affected by heuristics, intuitive solutions that can lead to mistakes. According to Tversky and Kahneman,[10] heuristics save time and energy and are generally effective, but they lead to systematic and predictable errors. Thus, humans would not make rational decisions, and a better

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understanding of heuristics and thought biases could improve decision-making in uncertain situations.

1.2. Expected Utility:

Until the advent of Prospect Theory, published in 1979 by Tversky and Kahneman,[1] the prevailing economic theory on how economic agents decide was Expected Utility Theory. The beginning of studies on expected utility dates back to the 18th century. At the time, decisions made under risk were seen as a rule that associated the values of available alternatives with their mathematical probabilities of occurrence, so that the decision-maker would choose the alternative with the greatest expected utility.[11] Utility was an indicator of the individual's satisfaction with the chosen option.[12]

Later, Daniel Bernoulli refined this theory to demonstrate the logic of human choices by formulating Decision Theory (1738). Bernoulli established a relationship between the psychological desirability of money and the actual amount of money.[9] He observed that most people dislike risk and aim to avoid unfavorable outcomes. The decision theory proposed by Bernoulli was still based on the principle of expected utility (the mathematical weighted average of outcomes). Still, he replaced the objective value scale with a subjective utility scale. He stated that people's choices are not based simply on the monetary value of bets, but on the psychological utility of outcomes, on their utility. Thus, Bernoulli refined expected utility theory, making it more plausible and possibly eliminating its errors.[11]

Utility is therefore not the weighted average of monetary effects, but the average of the utilities of those effects.[9] From Bernoulli's theory emerges the law of diminishing marginal utility, an important axiom of economic theory, which says that as wealth increases, the additional utility of one more unit of money becomes smaller, due to the increase in wealth itself. It would be something like saying: the utility of gaining USD$100 is greater when someone earns USD$2,000 per month than when someone earns USD$20,000 per month. In mathematical terms, this law says that utility as a function of money or wealth is a concave function (Figure 1).

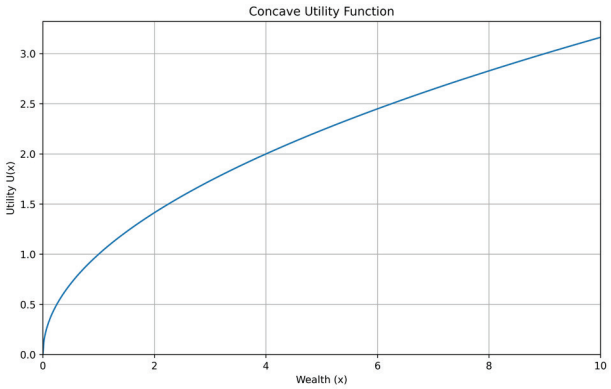

Figure 1: Graph exemplifying a concave utility function.

1.3. Reference Point:

However, according to Kahneman,[9] Bernoulli's model presents an important flaw: it lacks the idea of a reference point. Expected Utility Theory could explain risk aversion, but cannot explain the preference for risk-taking in betting — a behavior often observed in entrepreneurs and generals when all their options are bad.

In his book, Kahneman[9] gives an example of the problem of lacking a reference point: Anthony has 1 million dollars, and Betty has 4 million. Both are offered either a gamble or a sure gain: a 50% chance of ending up with a fortune of 1 million and a 50% chance of ending up with a fortune of 4 million, or a 100% certainty of having a fortune of 2 million dollars. Certainly, they will think differently, because for Betty, neither option is advantageous. She will certainly choose to gamble rather than lose half of her fortune for sure. Anthony, on the other hand, will probably choose to double his fortune with certainty rather than gamble and have a 50% chance of remaining with the same current fortune.

Expected Utility Theory assumes that decision-makers maximize their choices.[11] Despite its many inconsistencies, the theory was used by one of the greatest mathematicians of the 20th century, John Von Neumann, and economist Oskar Morgenstern,[5] who transformed the theory into an axiomatic model prescribing how rational economic agents should make their decisions. The authors used Expected Utility Theory in two ways: as logic determines decision-making and as a description of how economic agents decide.

1.4. Flaws in the Rational Expectations Theory

Authors such as Barreiros, Protil, and Moreira[13] argue that rational behavior in decision-making results in several difficulties, since other human perspectives within organizations began to be seen as political, social, and environmental behaviors. These other dimensions of human behavior and thought make it difficult for pure rationality to be achieved. According to Klacynski,[14] adults often misinterpret statistical base rates, overemphasize the value of vivid, readily available memories, make judgments based on misconstrued probability data, and violate the axioms of inference.

1.5. The Prospect Theory and Heuristics:

As psychologists and scholars of human behavior and heuristics, Kahneman and Tversky[1] questioned the absolute validity of this theory through studies conducted to elucidate how people decide when facing uncertainties. According to Silva and collaborators,[15] Kahneman and Tversky support the thesis of the presence of irrationality through the certainty effect, reflection effect, and isolation effect in decision-making to research the cognitive processes employed in non-rational decisions by individuals. Their work resulted in the Prospect Theory.[1]

■ Methods

A Google Form was sent to high school students at three private schools in Porto Alegre. It contained 13 questions adapted from Kahneman and Tversky's[1] work and an informed consent form. Not all questions of the original appear in Kahneman and Tversky's[1] were used to facilitate the application of the questionnaire, and some questions were presented in a different order to facilitate understanding. The payoffs

on the original paper were directly converted into Brazilian Reais. The consent form was sent through Google Classroom and explained that participation in the research was optional. Anonymity was guaranteed since the form with the questionnaire was stored separately from the consent form, and the filled questionnaire did not have any identifier. The research methodology was approved by the researcher's school ethics committee.

Each problem consisted of two options (A and B). In each option, there was a question involving the possibility of a gain or a loss. The students were instructed to choose between one of the two options (A or B).

The problems are described below:

PROBLEM 1: Choose between
- A: 33% chance of winning R$2,500 + 66% chance of winning R$2,400 + 1% chance of winning R$0
- B: 100% chance of winning R$2,400

PROBLEM 2: Choose between
- A: 80% chance of winning R$4,000
- B: certain gain of R$3,000

PROBLEM 3: Choose between
- A: 80% chance of losing R$4,000
- B: certain loss of R$3,000

PROBLEM 4: Choose between
- A: 50% chance of winning a 3-week trip through England, France, and Italy
- B: certain gain of a 1-week trip to England

PROBLEM 5: Choose between
- A: 5% chance of winning a 3-week trip through England, France, and Italy
- B: 10% chance of winning a 1-week trip to England

PROBLEM 6: Choose between
- A: 90% chance of winning R$3,000
- B: 45% chance of winning R$6,000

PROBLEM 7: Choose between
- A: 90% chance of losing R$3,000
- B: 45% chance of losing R$6,000

PROBLEM 8: Choose between
- A: 0.1% chance of winning R$6,000
- B: 0.2% chance of winning R$3,000

PROBLEM 9: Choose between
- A: 50% chance of winning R$1,000
- B: certain gain of R$500

PROBLEM 10: Choose between
- A: 50% chance of losing R$1,000
- B: certain loss of R$500

PROBLEM 11: Choose between
- A: 0.1% chance of winning R$5,000
- B: certain gain of R$5

PROBLEM 12: Choose between
- A: 0.1% chance of losing R$5,000
- B: certain loss of R$5

PROBLEM 13: Choose between
- A: 45% chance of winning R$6,000
- B: certain gain of R$3,00

After collecting the responses, the percentage of answers (A or B) for each problem was computed, the total percentage for each group was calculated, and then compared with the responses from Kahneman and Tversky's[1] original study. Each problem was analyzed individually, and the percentage of each response from each problem from this research was analyzed statistically, comparing to the reference sample (Kahneman and Tversky[1]). Data was analyzed using the chi-square test and Fisher's exact test. These tests compare two categorical distributions. For statistical analysis, the Jamovi Statistical software was used.

Results and Discussion

1. Results:

A total of 57 responses were received from the emails sent to the students.

Table 1 shows the results obtained from the students in the present study and the data collected in Kahneman and Tversky´s paper,[1] including the chi-square and Fisher´s Exact test p-values. A p-value lower than 0.05 was considered statistically significant. The results are also presented by each individual question, comparing the percentage of adolescents who chose options A or B in this study to the results from Kahneman and Tversky in Figures 2 to 14.

Table 1: Results (in percentage) from the adolescent population vs results from Kahneman and Tversky, and the statistical results of chi-square and Fisher tests.

	ADOLESCENTS		KAHNEMAN AND TVERSKY			
	A	B	A	B	CHI2 P-VALUE	FISHER P-VALUE
PROBLEM 1	42,1	57,9	18	82	0,00036	0,00019
PROBLEM 2	38,6	61,4	20	80	0,00625	0,00502
PROBLEM 3	70,2	29,8	92	8	0,00017	0,00010
PROBLEM 4	45,6	54,4	22	78	0.00072	0,00054
PROBLEM 5	67,7	32,3	67	33	1	1
PROBLEM 6	77,2	22,8	86	14	0,15462	0,14449
PROBLEM 7	29,8	70,2	8	92	0,00017	0,00010
PROBLEM 8	80,7	19,3	73	27	0,26134	0,2393
PROBLEM 9	52,6	47,4	16	84	0,00114	0,0049
PROBLEM 10	56,1	43,9	69	31	0,08211	0,0793
PROBLEM 11	78,9	21,1	72	28	0,3323	0,3239
PROBLEM 12	38,6	61,4	17	83	0,0011	0,0008
PROBLEM 13	21,1	78,9	14	86	0,2568	0,1971

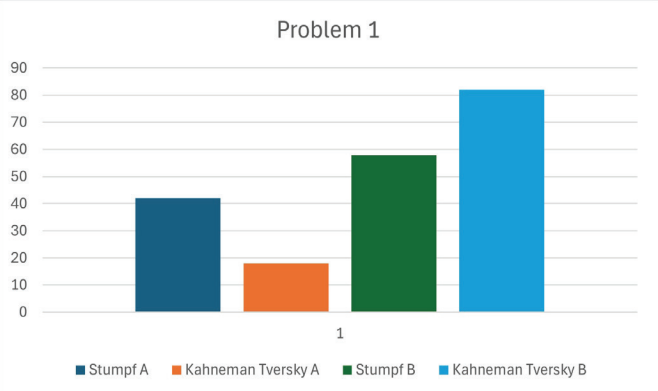

Figure 2: Results from problem 1 show a significant difference between the responses in this study and those in Kahneman and Tversky.

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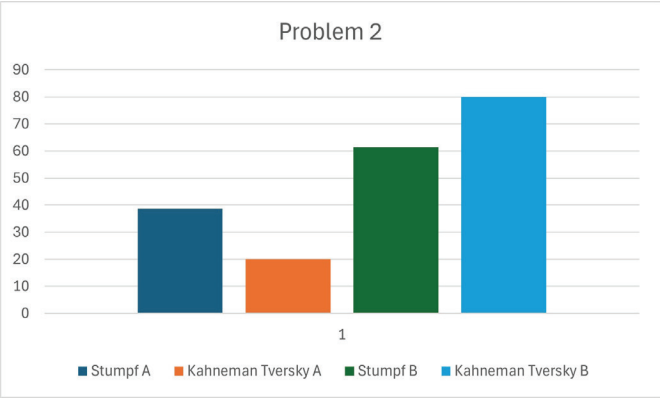

Figure 3: Results from problem 2. It shows that adolescents seek greater gain.

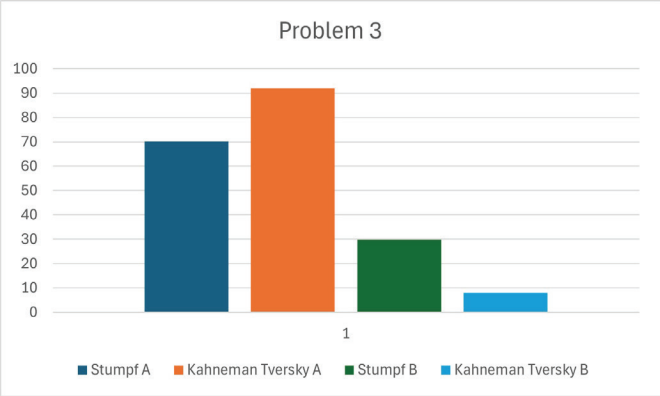

Figure 4: Results from problem 3. Here, there were significant differences because some adolescents prefer certain losses.

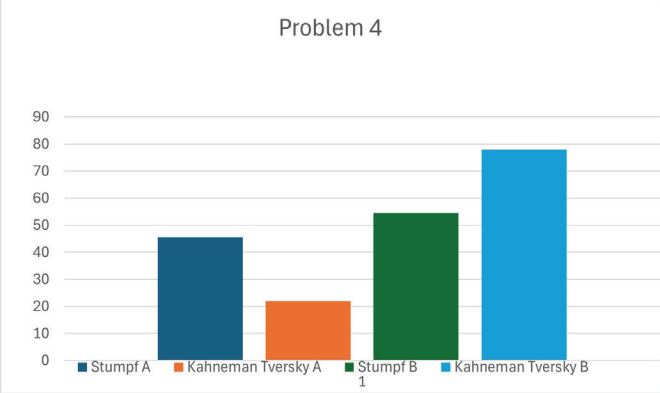

Figure 5: Results from problem 4 showed that teenagers try to secure better outcomes even when there's risk involved.

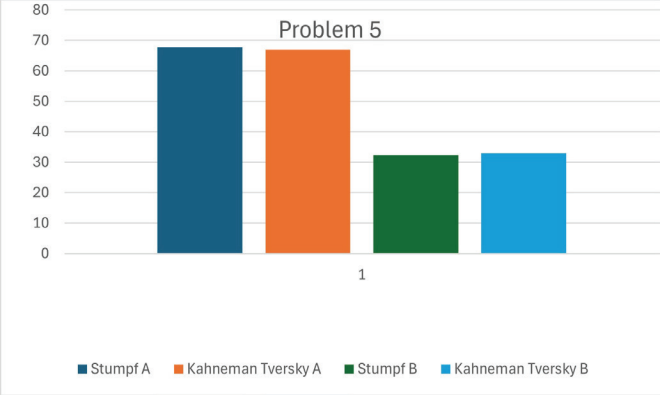

Figure 6: Results from problem 5. Here, adolescents behaved like adults, trying to obtain the best benefit.

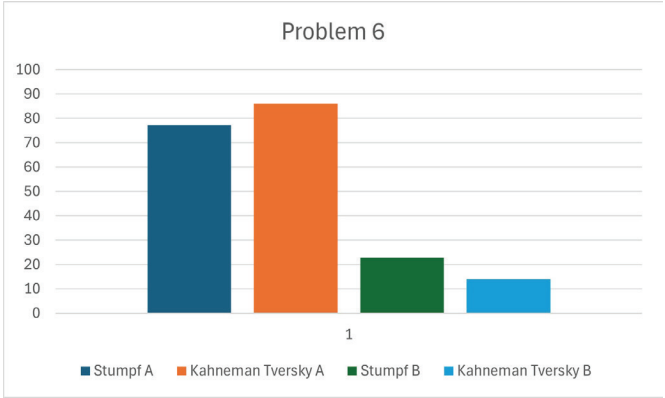

Figure 7: Results from problem 6 show that when the chance of winning is small, adolescents behave just like adults.

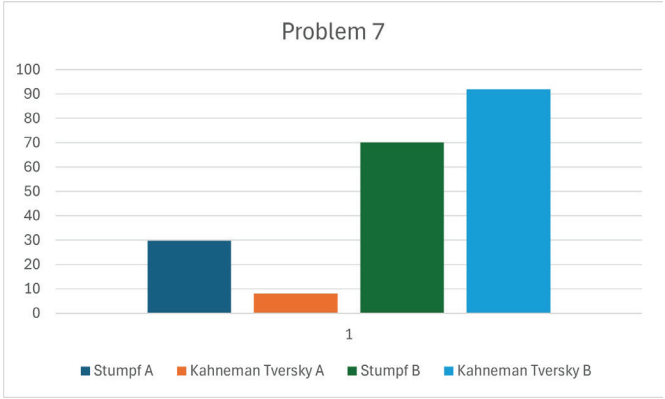

Figure 8: Results from problem 7 demonstrate that teenagers take less risk, trying to avoid greater losses.

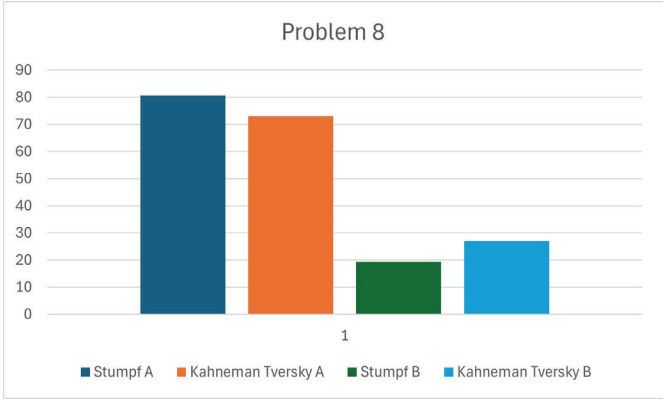

Figure 9: Results from problem 8 show significant differences between the two studies.

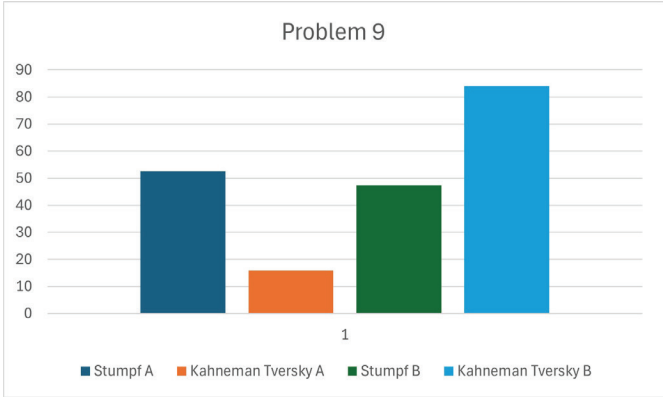

Figure 10: Results from problem 9. They show that teenagers take risks seeking greater rewards.

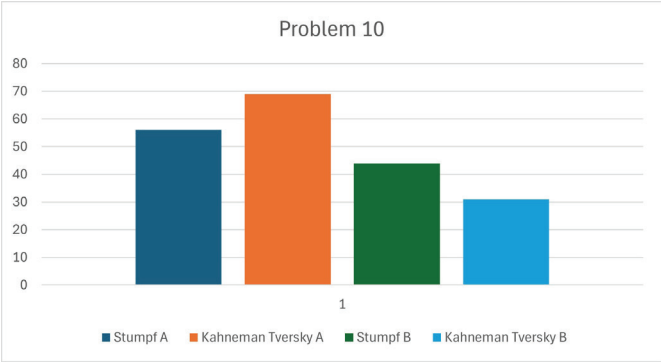

Figure 11: Results from problem 10 show there were no differences when adolescents and adults were trying to avoid losses.

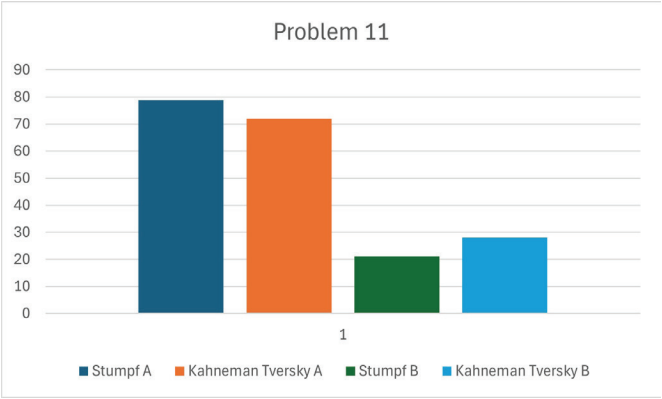

Figure 12: Results from problem 11. They show no significant difference in a problem simulating a lottery prize (a tiny chance of winning a lot).

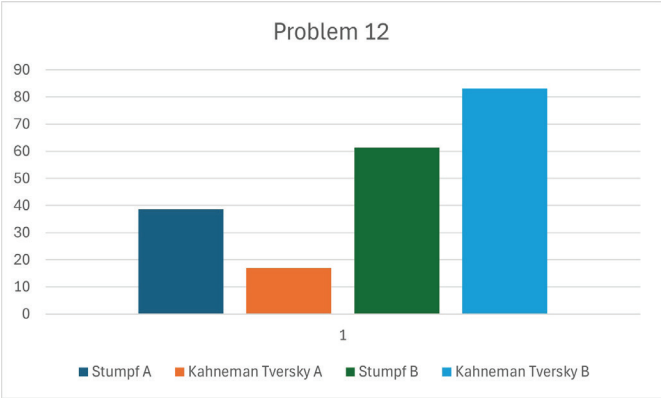

Figure 13: Results from problem 12. They demonstrate that adolescents try to avoid a sure loss.

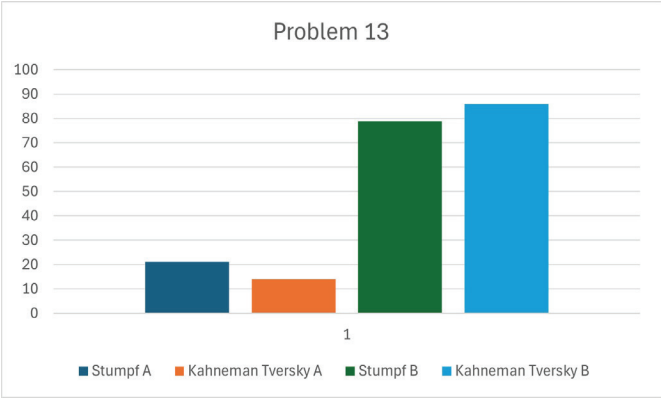

Figure 14: Results from problem 13. When the chances of winning are small, adolescents prefer a sure gain rather than risking, like adults.

2. Discussion:

Daniel Kahneman´s book "Thinking Fast and Slow"[9] explains that our reasoning process is formed by what he calls System 1 and System 2. System 1 is fast, intuitive, stores our memories, has low energy consumption, and tends to believe any information. System 2 is the system we use when doing calculations, analyses, or when we need to focus and exercise self-control. It is slower and consumes much more energy. To make daily life easier, human beings tend to rely primarily on System 1, which results in what we call heuristics.

Heuristics are simple and efficient mental strategies used in decision-making that, although not always leading to the best solution, work very well in everyday contexts. Some examples include:

• Representativeness heuristic: When we judge something only by how it appears, using insufficient information (since System 1 tends to believe any information), this is almost analogous to prejudice.

• Availability heuristic: When we evaluate the probability of an event based on how easily we can recall it.

• Affect heuristic: When emotions affect decisions (people in a good mood tend to decide one way, while those in a bad mood decide another). If something makes us feel good, we tend to judge it as low risk. The opposite occurs when something makes us feel bad.

• Anchoring heuristic: when irrelevant information influences the decision-making process.

• Disposition effect: investors tend to sell profitable assets too early and hold onto losing assets for too long, hoping to reverse the losses.

• Certainty effect: people are predisposed to give more weight to certain events than to probable ones, even when the difference in probability is small. Kahneman and Tversky based themselves on the study by Maurice Allais[16] to demonstrate the "certainty effect," proving that people give more importance to "certain" outcomes than to those involving uncertainty.

• Framing effect: when the way the information is presented affects people's decision-making process. The same information can lead to different choices depending on whether it is framed in terms of positive or negative outcomes.

2.1. Problem 1:

When analyzing problem 1, some differences between the samples can be observed. In Kahneman and Tversky's study[1] 82% of people chose option B, showing a violation of Expected Utility Theory. The population chose option B as if the utility of $U(2400) > 0.33U(2500) + 0.66U(2400)$, when in fact option A has a higher expected utility. In the present study, 57.9% of students chose option B, but 42.1% chose option A, a statistically significant result compared to Kahneman and Tversky's. This may indicate that some school-age students are more attentive to mathematical issues or more careful in calculating before responding, thus confirming Expected Utility Theory for 42.1% of the population.

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2.2. Problem 2:

In problem 2, subjects are faced with a certain gain or an 80% possibility of an even larger gain. In the Kahneman and Tversky study, 80% chose option B, even though the expected value of option A is identical. According to the authors, this demonstrates that people prefer the certainty of a gain; certainty is overestimated compared to uncertainty. In this study, 61.4% of students chose a certain gain, following the same trend but at a significantly lower rate. These results may indicate that younger people are more willing to take risks (considering the high 80% probability of winning) in search of a higher gain rather than settling for a certain gain.

The certainty effect defines the behavior where, in a bet involving positive outcomes, people prefer to avoid risk to secure a guaranteed gain. This was confirmed in this study, but at a significantly lower intensity among teenagers compared to adults, showing that a significant number of adolescents tend to seek risk trying to obtain higher gains, or maybe adolescents are more willing to seek the emotion of gambling than adults, or they did not fully understand the question.

2.3. Problem 3:

This case shows the reverse — the certainty of a loss. Here, people tend to take risks to try to avoid a sure loss. In Kahneman and Tversky's study, 92% chose option A, even though the probabilities were the same. They describe this as the reflection effect: when faced with gains, people are risk-averse; when faced with losses, they take risks to avoid a sure loss. Markowitz[17] had already suggested that decision-making focuses on losses or gains, not on absolute magnitudes.

In this study, the same behavior was confirmed, but with lower intensity: 70.2% chose to gamble to avoid a sure loss. This may indicate that teenagers either did not fully understand the question or that around 30% feared the possibility of an even greater loss compared to the certain one. Adolescents may even have a different interpretation of "chance" than adults.

Overall, both for positive and negative outcomes, Expected Utility Theory is violated. Adolescents, however, seemed more inclined to calculate the math involved, as in Question 1, where 42.1% chose option A (which presented the higher utility). These results also show that adolescents are more willing to take risks in search of larger gains, contradicting some of Kahneman and Tversky's findings[1].

2.4. Problems 4 and 5:

Problems 4 and 5 will illustrate the certainty effect of non-monetary outcomes. In the original study, 78% chose option B in Question 4, evidencing the preference for certain gains. In Question 5, 67% chose A in the original study, as there was no certain gain and people tended to select the more favorable outcome even with lower expected utility.

In this study, most adolescents also chose a certain gain in Question 4, but a significant portion opted to gamble for a more favorable outcome. Again, this implies adolescents' willingness to risk searching for better outcomes. In Question 5, their responses matched Kahneman and Tversky's sample, with no significant difference — once again suggesting that teenagers seek better outcomes and are more willing to gamble.

2.5. Problems 6, 7, and 8:

These show how Expected Utility Theory fails to capture behavior under risk fully.

In Question 6, 86% of Kahneman and Tversky's participants chose A, preferring the higher probability of winning. In this study, 77.2% chose A, which is not significantly different.

In Question 7, 92% in the original study chose B (taking the smaller probability of loss, even if the loss was larger). Here, 70.2% chose B — the same trend but at significantly lower rates. This may indicate that adolescents have noticed the mathematical equivalence or that they want to avoid a larger loss.

In Question 8, 73% in the original study chose A (when probabilities were very small, people picked the option with the larger prize). In the present study, results were statistically similar to theirs.

2.6. Problems 9 and 10:

Both problems 9 and 10 involve identical expected utilities.

In Question 9 (certain gain vs. possible higher gain), 84% in the original study chose the certain gain. Here, however, 52.6% of the students in this sample chose to gamble — contradicting the prospect theory, which says people avoid risks to secure gains but take risks to avoid losses. In the present study, adolescents preferred gambling, maybe trying to obtain a higher prize.

In Question 10 (certain loss vs. gambling to avoid loss), teenagers behaved like the original sample, but at a lower (not significant) intensity. This matched the prospect theory for losses, but not for gains.

Thus, in this sample, the prospect theory was confirmed only for losses. Teenagers may prefer to take risks to get higher gains.

2.7. Problems 11 and 12:

Both problems 11 and 12 involve a very small probability and are discussed below.

In Question 11, 72% in the original study chose the tiny chance of a big prize over a sure small gain — comparable to buying a lottery ticket. Adolescents answered similarly, with no statistical difference.

In Question 12, 83% of adults choose the sure small loss (like buying insurance). Teenagers responded similarly, but a statistically significant portion preferred to gamble instead of losing R$5 for sure. Possibly, they calculated the minimal probability of losing R$5,000 and preferred to take the risk, or maybe R$5.00 means more to an adolescent than to an adult, or they misunderstood the question.

2.8. Problem 13:

Again, problem 13 will address how Expected Utility Theory fails when people are faced with a certain gain. Mathematically, both options are identical, but both adults and teenagers choose a certain gain.

However, adolescents showed differences compared to earlier questions. In Question 2 (80% chance to win R$4,000 vs. a certain gain of R$3,000), many preferred to gamble; maybe the 80% probability of gain seemed high enough to justify gambling to adolescents. In Question 13 (45% chance to win R$6,000 vs. a certain R$3,000), most preferred the certain gain. The probability of gaining R$6,000 being below 50% may explain why these teenagers preferred the safer choice in this problem.

2.9. General Observations:

Kahneman[9] states that humans tend to focus on changes relative to a reference point. For example, losing 100 or 200 feels more significant than losing 1,100 or 1,200, even though the absolute loss is the same. Another point of Prospect Theory is that losses matter more than gains, and the value function is:

- depending on a reference point,
- concave for losses and convex for gains,
- steeper for losses than for gains.

Figure 15 illustrates the Prospect Theory curve, which is concave for losses and convex for gains, showing that we are risk-averse when securing a gain and risk seekers when trying to avoid losses. The steepness of the loss curve demonstrates that losses are more important to us than gains.

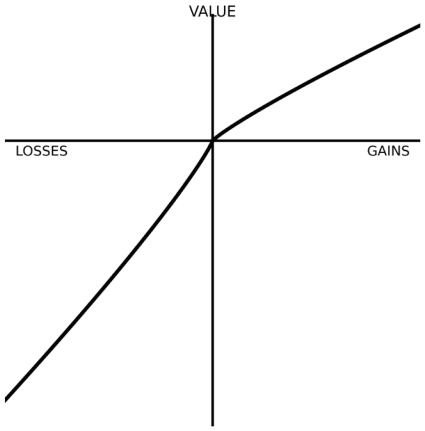

Figure 15: Prospect theory graph taken from Kahneman and Tversky´s paper.

In this study, reference points were not directly tested, but it can be inferred that the monetary amounts in the questions may seem larger for teenagers than for adults.

The results of this study show that adolescent behavior regarding gains and losses generally follows the trends of Prospect Theory. Still, in many of the proposed problems, the results were significantly different, with adolescents showing a higher disposition to gamble.

Chien *et al.*[18] tested 92 adolescents using Tversky and Kahneman decision problems for framing effects. The response pattern obtained by the authors resembled the general pattern exhibited by adults tested by Tversky and Kahneman. Negative frames led them to accept risk to avoid certain loss; positive frames prevented them from risking securing a certain gain. Chien *et al.*[18] only found the framing effect in some of the young adolescents, but the influence of the framing effect was consistent. This corroborates the findings in this study. A study by Rosebaum *et al.*[19] showed that adolescents are more prone to risk-taking than adults. The authors suggest that these point to a complex interaction between multiple psychological constructs that develop across adolescence. In this study, more than half of the questions had responses that differed significantly from those of adults, showing greater risk propensity. This propensity might be concerning, given teenagers' exposure to online gambling sites and online marketing. The tendency towards gambling obtained in this study can also be caused by a lack of proper understanding of the nature of the questions.

A 2024 Guardian[20] report stated that online betting sites are a public health problem, rapidly expanding via mobile phones and harming more people than previously thought. Teenagers are a vulnerable group, exposed to sophisticated marketing and gambling integrated into video games. Montiel *et al.*[21] reviewed studies on online gambling among youth aged 11–21 from the past 20 years and found that between 0.77% and 57.5% showed some pathological degree of gambling, depending on measurement instruments, sample, cut-off points, and criteria applied, and between 0.89% and 1% had a full disorder. They stated that, although illegal among adolescents, online gambling is a common practice and it´s expanding alongside the expansion of technology. 5-15% of adolescents gamble online, and 40-70% gamble offline, which puts their mental health and well-being at a serious risk.

Together with the present findings, which suggest teenagers are more risk-prone, these studies reinforce the need for regulation of online gambling for minors. In a meta-analysis by Ding *et al.*,[22] 40 relevant studies across 12 databases were reviewed, and the authors found that sensation seeking and risk taking are typical in adolescents, and the incidence of risky behaviors is significantly higher in teenagers. Adolescents' still-developing brain functions may lead to cognitive dissonance in decision-making. According to these authors, adults are more developed physically and mentally, and are more cautious when making risky decisions. Although the present study did not investigate online gambling among adolescents, but instead the choices they make when confronted with a gamble, a possible tendency towards risk was observed which may come to the encounter of the results found by Ding *et al.*[22] This might suggest that lawmakers should consider the adolescent decision-making process in matters such as marketing regulation and online gambling site regulation to protect adolescents' mental and financial well-being.

■ Limitations

This study shows some important limitations. Firstly, the obtained sample is relatively small (only 57 subjects participated in this study), especially when compared to Kahneman and Tverski[1] original work that used a larger sample. Furthermore, the sample was drawn entirely from three private schools in a single city, which may not represent adolescents in general. Students from private schools usually come from affluent families; hence, their relationship with monetary values may differ from that of students from public schools, especially in Brazil, where socioeconomic inequality is profound. Both limitations

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may jeopardize the possibility of generalization of these results to broader populations. Further studies with larger samples and samples drawn from different socioeconomic backgrounds are recommended.

Conclusion

The present study replicated some of the questions originally asked of adults in Kahneman and Tversky's work and applied them to high school adolescents in Brazil. Significant differences were found in more than half of the proposed problems.

It was shown that teenagers tend to take more risks to obtain more favorable outcomes, both in the face of gains and losses, contradicting some classic heuristics of Behavioral Economics Theory. This behavior may indicate that teenagers are more audacious and less responsible with money than adults. It may also reflect a greater search for excitement compared to adults.

These results might highlight the dangers of exposing teenagers to online gambling sites and manipulative marketing. We recommend that new studies with larger samples be conducted to confirm the trends identified in this study.

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Author

Laura is a high school student from Brazil and a squash athlete. During the last few years, she developed an interest in Behavioral Economics and Finance. She´s particularly curious about the adolescent decision-making process and how it can affect daily life choices. She´s eager to learn more about nudging in Behavioral Economics.