

Prospect Theory: Does the Original or Revised Leddo, Jayanti and Duan Value Function Better Predict the Decision-Making Behavior of 5th Graders?

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ABSTRACT

Prospect Theory (Kahneman and Tversky, 1979) is a highly influential theory that predicts decision making when people are confronted with choices involving gains or losses with different degrees of uncertainty. Prospect Theory argues that people are generally risk averse when it comes to seeking gains and risk seeking when it comes to seeking losses. However, Prospect Theory was originally created using hypothetical decisions. As a result, Prospect Theory has had mixed results when subject to testing in real-world decision-making contexts. One reason for this is that people tend to have goals that they are trying to achieve or outcomes they are trying to avoid when making their decisions, something Prospect Theory does not take into account. Our previous research investigated the effects of such positive goals (called "aspiration levels") and avoidance outcomes (called "avoidance levels") on decision making (Leddo et al, 2019). Those results found that people were risk seeking, rather than risk averse, for gains below the aspiration level and risk averse for gains above the aspiration level, while being risk averse, rather than risk seeking, for losses above the avoidance level and risk seeking for losses below the avoidance level. The present study investigated whether this revised Prospect Theory could predict the decision-making behaviors of children. 42 5th grade students were given a single scenario of a prospect involving gains or losses. Each scenario offered two options: a risky option and a certain option. For each type of scenario, one version presented a current state below the aspiration level, one presented a current state above the aspiration level, one presented a current state above the avoidance level, and one presented a scenario below the avoidance level. For scenarios involving gains, Participants chose the riskier option more when the current state was below rather than above the aspiration level, consistent with the Leddo et al. (2019) revised Prospect Theory. For scenarios involving losses, there was no statistically significant difference in option choice between current states above and below the avoidance level, which was not consistent with the Leddo et al. (2019) revised Prospect Theory.

INTRODUCTION

The present paper explores extensions to Kahneman and Tversky's Prospect Theory (1979), specifically, examining the effects of goals on the choices decisionmakers make when faced with prospects of gains and losses under different conditions of uncertainty. This paper follows up our previous research (Leddo et al, 2019) finding support for a revised Prospect Theory value function. The present paper discusses whether the original version or the revised version of Prospect Theory explains the decision-making behavior of elementary school students.

Historical Perspective

These terms and concepts are those generally used in decision theory and thus have been around for over seventy years. In the late 1940's, an attempt was made to use the prescriptive theories of economics and statistics as a descriptive theory for individual choice behavior under uncertainty. Put very simply, any individual choice could be presented as a choice among two gambles:

$$\text{gamble 1} \text{ --- } g_1 \text{ --- } (a_1, P_1, b)$$

$$\text{gamble 2} \text{ --- } g_2 \text{ --- } (c, P_2, d)$$

Gamble 1, g_1 thus involves a lottery in which the outcome a (which could be a prize, an amount of money, or even event) occurs with probability P_1 , and the outcome b occurs with probability $1-P_1$. Gamble 2, has an outcome c with probability P_2 and an outcome d with probability $(1 - P_2)$.

Economic theory prescribes that in choosing between the options g_1 and g_2 , a rational, economic person should compute the expected value (EV) of each option and choose that option with the higher EV:

$$EV(g_1) = P_1a + (1 - P_1)b$$

$$EV(g_2) = P_2c + (1 - P_2)d$$

Descriptive experiments quickly indicated that people clearly did not do what economic theory prescribed- -for example, consider:

$$g_1 - (\$10, .5, -\$5) \quad EV(g_1) = +\$2.50$$

$$g_2 - (\$1000, .5, -\$950.00) \quad EV(g_2) = +\$25.00$$

Most people faced with a choice between g_1 and g_2 would choose g_1 even though the expected value of g_2 is ten times as much. Further economic theory prescribes that one should be willing

to pay up to \$25.00 (say \$20.00) for the chance to play g_2 . (\$25.00 is called the maximum buying price of g_2). The theory also indicates that anyone having the gamble should not be willing to sell it for less than \$25.00 (The selling price OE g_2).

In truth, many people having g_2 would be quite willing to give it away or possibly even pay someone to take it! This is because of a phenomenon known as risk aversion. People are typically risk averse and thus buy life insurance even though it has a very negative expected value.

The concept of a subjective transformation on value (which denotes "objection value", e.g. dollars) to yield the subjective value or utility of an outcome was introduced early on to explain such phenomenon as risk aversion. Consider:

g_1 - (\$10, .5, -\$10) and

g_2 - (\$1000, .5, -\$1,000)

These two gambles have the same expected value of zero, but most would prefer g_1 to g_2 if forced to choose. The concept of a marginally decreasing utility for money so that each incremental unit of value has slightly less subjective value than its predecessor is represented by a concave utility curve. A utility curve for losses such that each incremental unit of loss in value is slightly worse than its predecessor is represented by a convex utility curve for losses. Taken together as an individual's utility function over value, these curves predict choices such as g_1 over g_2 . (Gambles g_1 and g_2 also have different variances, and variance outcomes has also been equated with risk.) Friedman and Savage (1948) described the utility curve of an individual that would both gamble (for relatively small amounts) and also buy insurance (against catastrophic losses).

Using such utility curves, rational, economic man was assumed to maximize expected utility (EU). For gambles g_1 and g_2 , the expected utility of each gamble would be less than zero, the expected value of each. Further, assuming the of zero to be zero, the expected utilities of each of these gambles is less than the utility of its expected value (zero). If we denote "zero" value as "zero incremental wealth over the status quo level of wealth", then the utility curve described earlier that is concave for gains, convex for losses, would predict a choice of the sure thing status quo over either of the gambles g_1 or, g_2 .

Further theoretical and experimental work showed that the EU theory fails to describe individual choice behavior many cases, and a subjective transformation over probability was introduced. The experimental finding that subjects overestimated very low probabilities of large negative losses and underestimated large probabilities supported the notion of a subjective transformation

S on the probability function so that the gamble g , $(a P b)$ has as its subjectively expected utility (SEU).

$$SEU(g_1) = S(P)U(a) + S(1-P)U(b)$$

This theory, though mathematically quite general, still assumes that the S and U functions are assigned independently, whereas much of the experimental work produced dependencies between the values and probabilities –e.g., probabilities associated with high gains or extremely likely outcomes were underestimated (where objective data existed), whereas probabilities of extremely unlikely or negative outcomes (e. g., cancer) were overestimated or assessed. Thus, experimental work progressed questioning this economic theory as descriptive of decision making and thus promising in helping to predict behavior and possibly improve or aid it.

The utility theory thus far described views departures from optimal or normative economic behavior as being due to subjective transformations on the information at hand, i.e., values and probabilities. Around 1957, beginning with the work of Simon (Simon, H., 1957), a different view was promulgated, that of man as a semi-rational (some said irrational), certainly non-normative, limited information processor who had limited storage capacity, limited information processing capabilities, and limited ability to handle complexity. This thus mis-perceived the "objective" data and applied often simple decision rules or decision making. Kahneman and Tversky conducted a series of experiments predicated on this viewpoint (See Tversky, A. and Kahneman, D., 1974 and Kahneman et. al. (eds), 1982) and revealed numerous departures from normality predicted from this viewpoint. Thus began the integration of economic theory and psychological (cognitive) theory in explaining choices under uncertainty and risk. (A distinction is sometimes made between risky decision making where outcomes have defined probabilities on a well understood, event mechanism generating them and choice under uncertainty where the probability is ill-defined. For the purposes here, the two will be equated).

Around this time, a different movement also occurred in organizational theory in which the behavior of organizations began to be described as if the organization were an entity that behaved somewhat in the manner described by Simon and also Kahneman and Tversky (though they in fact came later) . Thus, Cyert and March (1963) describe the behavior of the firm in making choices and exerting control as:

- having multiple, changing goals.
- as considering alternatives in an approximately sequential manner.

- as seeking to avoid uncertainty through the use of regular procedures and reacting to feedback rather than forecasting the environment.
- using standard operating procedures and rules of thumb to make and implement choices.

Thus, the organization behaves somewhat like the decision maker postulated by Simon.

The details of these two vast literatures will not be provided here. However, the similarities should be fairly clear, and the relevance to real-world, goal-based decision making should also be clear. Real-world decision making, unlike the hypothetical gambles described above, are often made in environments of high uncertainty and risk and are made in the context of the decision maker trying to achieve particular goals or avoid particular negative consequences. We use as a starting point Prospect Theory and discuss how it could be modified to take into account people's goals and outcomes they wish to avoid.

Prospect Theory

One of the most prominent and influential theories of decision making and choice behavior is Kahneman and Tversky's Prospect Theory (1979), which evolved from attempts to understand the place of expectation-based theories in describing individual decision making. Prospect Theory proposes a value function which relates actual outcome value to subjective utility and a decision weighting function which translates the stated probability of an outcome to a subjective weight that the stated probability carries in assessing the attractiveness of that outcome.

The value function has two distinct properties: a) it is concave for gains and convex for losses so that for example, the difference in utility between 0 and 100 dollars is not the same as the difference in utility between 100 and 200 dollars, and; b) the function for losses is steeper than the function for gains so that a given amount of loss is more aversive than the same amount of gain is attractive. The decision weighting function has the properties that very small probabilities are overweighted, while moderate and large probabilities are underweighted. Figures 1 and 2 show Prospect Theory's value function and decision weighting function, respectively.

The properties of these two functions in describing individual decisions predict that: people are risk averse when it comes to gains and risk seeking when it comes to losses.

For example, most people would rather have a sure \$500 than a 50% chance to win \$1000 (in fact they would even take a sure \$400 to a 50% chance to win \$1000) but would rather have a 50-50 chance at losing either \$1000 or nothing than a sure loss of \$500 (Kahneman and Tversky, 1979).

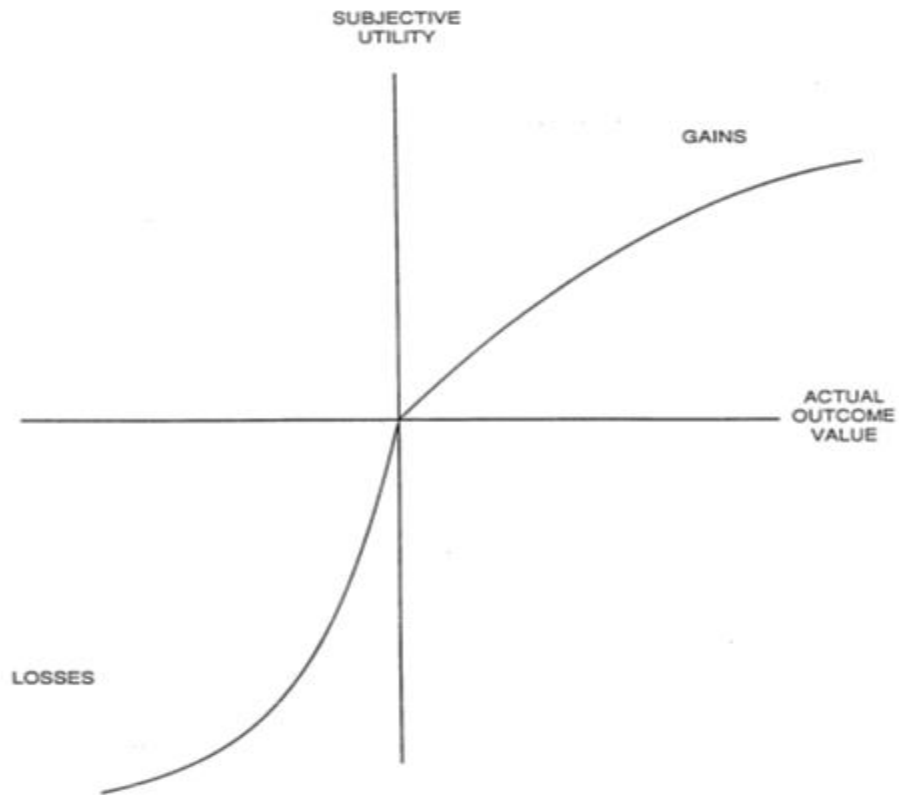


FIGURE 1. Kahneman and Tversky's (1979) value function showing relationship between actual outcome value and subjective utility.

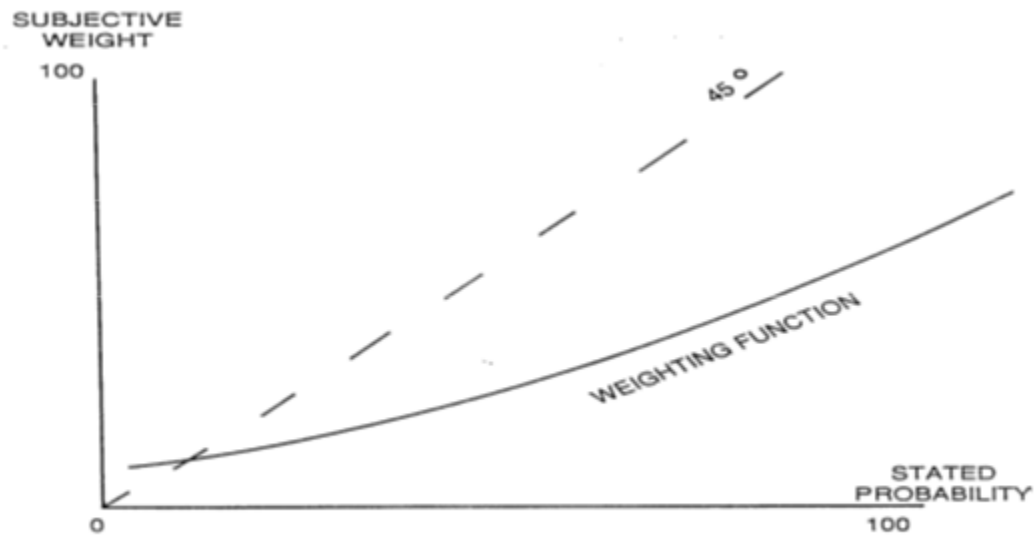


FIGURE 2. Kahneman and Tversky's (1979) decision weighting function showing relationship between stated probability of outcome and subjective probability.

One implication of Prospect Theory that is both interesting and troublesome to decision making theorists is that presenting (framing) the same pair of choices either in terms of their relative gains or their relative losses can lead the same person to pick opposite choices. In a classic example (Tversky and Kahneman, 1981), people were given a scenario which involved trying to protect 600 potential victims of a disease through one of two programs. The effectiveness of the two programs was described either terms of how people would be saved or how many people would die. Specifically, in the save version, program A would save 200 lives whereas program B had a one-third chance of saving all 600 people and a two-thirds chance of saving no one. In the mortality version, program A would result in 400 deaths whereas program B would have a one-third chance of no deaths and a two-third chance of 600 deaths. Although the two versions describe the programs' effectiveness equally, when presenting the programs in terms of lives saved, 72% of the subjects surveyed preferred taking the sure saving of 200 lives to gambling on the lives of all 600 people. Whereas presenting the programs in terms of lives lost, 78% of the subjects surveyed preferred risking all 600 lives to save potentially all of them as opposed to allowing people to die for sure.

A very important theoretical issue that becomes a practical issue in using Prospect Theory (or any utility formulation) to describe real-world, goal-based decisions concerns the maintaining of gains and losses. It is assumed that the decision maker considers options with respect to some reference point, say his status quo, and options are characterized as gains or losses from that status quo. Thus, in terms of preference orderings, given a series of gambles $[G_i]$ involving gains and losses, several important issues must be clarified. If the objective gain is g , (this implies g be measured on some objective continuum) will obtain with "objective" or "stated" probability p , this means that the probability of the outcome that yields the gain g is well understood, possibly universally agreed upon as P , and the same holds true for the losses. Thus, the decision maker knows the objective probabilities. The utility (U) and probability (S) functions then represent functions which can be used to describe the results of the subjective transformation made by the decision maker on the gamble inputs $(g, p, 1)$ so chat the subjective worth of the gamble $G_i - (g_i, P_i, 1_i)$ is $U(g_i) = S(P_i) U(g_i) + S(1 - P_i) U(1_i)$ which is the earlier discussed subjectively expected utility theory. Prospect theory has added some very important psychological aspects to this theory by introducing gains, for the decision maker in choosing among the (G_i) looks at each G_i , from his status quo using the utility and probability functions described.

This is not a single utility function defined over some defined, invariant continuum, say total wealth (Note, the continuum could be a single vector that is a linear combination of several others thus accommodating multi-dimensional value problems. It is required that the continuum is understood to the decision maker in some way and that the utility function is defined over this meaningful continuum). Rather, the utility function is defined over losses and gains, so that when

the total wealth of an individual changes, his status quo changes, and options are considered from the new reference point which becomes the new origin for the same function.

Tests of Prospect Theory

Since its inception, there have been many tests of Prospect Theory in a variety of contexts such as business and political decision making (Kahneman & Tversky, 2000; Jones 2001; Gilovich, Triffen & Kahneman, 2002; Weyland 2006). Many studies have cited support for some of Prospect Theories main claims. However, results have not always been consistent. For example, Weyland (1996) found that in Latin American countries, politicians facing economic hardships would sometimes enact bold, risky policies and others would enact conservative ones. Similarly, Alghalith (2012) found that investors tended to be risk seeking regardless of whether they were gaining or losing money. Riabacke (2006) examined several lumber companies. These were first grouped into established companies and new and upcoming companies. The companies were asked to choose between a new risky technology not used yet but promised to be more efficient vs the current/old technology. The established company chose the old one while the new company chose the newer technology. Thus, when confronted with the same decision, established companies were risk averse (which generally seems to be the case), whereas the newer companies were risk seeking (which generally seems to be the case).

Extension of Prospect Theory

Kahneman and Tversky have done an excellent job in explaining cases where people would be risk averse versus risk seeking and have shown how framing choices can lead to one tendency or the other. However, Prospect Theory fails to account for the real-world decisions described above. The reason for this may be reflected in the critique of Prospect Theory offered by Nwogugu (2005) that Prospect Theory was created based on hypothetical decisions that do not reflect the types of real-world decisions involving risk and reward that people typically face. In the real world, gains and losses may not be uniform in how they appear to the decision maker.

Our previous study (Leddo et al., 2019) addressed this issue and extended the framework of Prospect Theory to the situations where people have stated goals they are trying to achieve or outcomes they are trying to avoid, thus examining decisions that may more realistically reflect real-world choices. Specifically, Prospect Theory was extended by refining the value function to take into account the goals of the decision maker. It is argued that real life choices involve decisions whose outcome are related to the goals of the person making that choice. Examples, of these goals are outcomes a decision maker is trying to attain and outcomes a decision maker is trying to avoid. These we will label the aspiration level and the avoidance level as illustrated Figure 3.

Consider the Prospect Theory's value function once aspiration and avoidance levels have been incorporated. A person striving to become a millionaire will value the one-millionth dollar earned more than s/he will the second dollar earned. In fact, each successive dollar earned gains in importance as it brings the person closer to the goal of becoming a millionaire. Similarly, in a race, finishing first instead of second is valued more highly than finishing 99th instead of 100th. This is the opposite of what is predicted by Prospect Theory.

On the other hand, once the person has achieved his or her goal of having \$1,000,000, each successive dollar becomes increasingly less important (unless the person updates the goal to achieve more money). Accordingly, once the aspiration level has been attained, the value function reverts to the shape proposed by Prospect Theory. As a result, the revised value function for gains is convex for gains between the current level and the aspiration level and concave for gains above the aspiration level.

A similar argument can be made for losses. If a company is losing money and risks going bankrupt (an avoidance-level outcome), each successive dollar lost becomes increasingly important. Thus, we would expect to see, and we do in the real world, companies becoming increasingly conservative, rather than risky, as losses mount. This is the opposite of what Prospect Theory predicts. On the other hand, once the avoidance level is reached, we would expect the company to be willing to take risks to undo the losses. We see this expressed in sayings such as "nothing left to lose." As a result, the revised value function for losses is concave for losses between the current state and the avoidance level and convex for losses beyond the avoidance level.

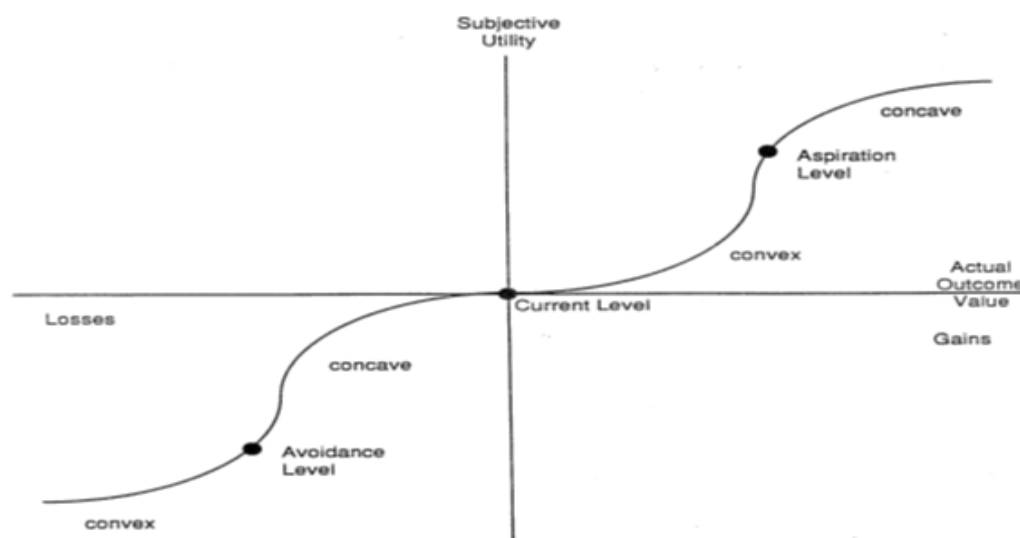


FIGURE 3. A value function showing aspiration and avoidance levels as reference points.

The revised value function can be reconciled with the Prospect Theory one. If we take out the portion of the function between the avoidance level and the aspiration level, we see a value function that is the same as that in Prospect Theory. Since Prospect Theory was developed using abstract gambles where no goals (positive or negative) were explicitly stated, it is reasonable that the portion of the function between the avoidance and aspiration levels would be omitted from Kahneman and Tversky's work. The present reformulation takes into account the existence of real-world goals and modifies the value function accordingly.

Framing effects and attitudes toward risk. As discussed earlier, Tversky and Kahneman (1981) showed that people will often make different choices regarding the same set of options depending upon whether they view those choices in terms of gains or losses. It is argued that a similar effect will occur depending upon whether they are view those choices in terms of outcomes above or below the aspiration and avoidance levels. In fact, it is argued that people will use the aspiration and avoidance levels to frame decisions spontaneously. Figure 3 presents a revised value which is in essence the Prospect Theory function with two reference points instead of one.

When one's current level lower than one's aspiration level for gains, it is hypothesized that people naturally frame their decision terms of losses (e.g., "I'm less than where I want to be."). Here, the value function is convex as is illustrated in Figure 3. Hence, one should be risk seeking in those situations since increases in gains (reduction of loss from the aspiration level) are valued more highly than decreases in gains (increases in losses from the aspiration level) for that part of the curve. The amount of risk seeking should depend on the distance between the current level and the aspiration level: the smaller the distance, the greater the risk seeking due to the convexity of the function.

If a person's current level is equal to or above than the aspiration level, it is hypothesized that this person will spontaneously frame his or her decision in terms of further gains (since the goal is already reached). Here, the value function is concave. Hence, one should be risk averse further increases in gains diminish in value the farther the person gets above the aspiration level. The amount of risk aversion should also depend on the distance between the current level and the aspiration level: the lesser the distance (and hence the closer one is to falling below the aspiration level), the greater the risk aversion due to the concavity of the function.

When faced with losses, and a person's current level is greater than the avoidance level, then is hypothesized that this person will naturally frame his or her decision in terms of losses (to avoid reaching the avoidance level). Here, the value function is concave. Hence, one should be risk averse in those situations since the positive of decreasing one's losses should be less than the negative utility of increasing one's losses. The amount of risk aversion should depend on the

distance between the current level and the avoidance level: the smaller the distance, the greater the risk aversion due to the concavity of the function.

If a person's current level is equal to or below the avoidance level, it is hypothesized that this person will naturally frame his or her decisions in terms of gains (to get above the avoidance level). Here, the value function is convex. Hence, one should be risk seeking since the positive subjective utility of decreasing one's losses should be greater than the negative subjective utility of increasing one's losses. The amount of risk seeking should also depend on the distance between the current level and the avoidance level: smaller the distance, the greater the risk seeking due to the convexity of the function.

The threshold nature of the aspiration levels and avoidance levels leads to systematic effects on framing of expectations. As people move closer to their avoidance level, it is proposed that in some cases, the absolute value of this level increases so that people mentally prepare themselves for bigger losses while accommodating current losses. This hypothesis is consistent with findings by Loewenstein and Linville (1986) who find that people lower their expectations as the possibility of a loss approaches. This is also similar to the adaption level discussed by Helson as early as 1948 (Helson, H, 1948). This cognitive shifting of the avoidance level would reduce risk aversion in loss situations because the magnitude of the loss the decision maker is willing to accept is increasing. These two effects should occur in domains where outcome level a continuous variable such as money. In other situations where outcome can be viewed as a threshold type, dichotomous variable e.g. graduating from college versus not graduating, winning a game versus losing, the aspiration and avoidance levels should not change over time. Other situations may have aspiration level that evolve over time as people change their goals in response to different outcomes. For example, companies that meet certain sales figures during the year may revise those figures. The United States Congress sets a debt ceiling to specify maximum allowable national debt (presumably, an avoidance level), but it continually modifies that ceiling every time it is reached.

The reformulated value function is useful in explaining the empirical results described earlier that appear at odds with the original version of Prospect Theory. For example, investors presumably have a very high aspiration level, so it makes sense for them to be risky as they are gaining money since they would be below whatever aspiration level they set. Since their goal is to make money, any loss would be below the avoidance level, which would also predict risky decision making.

For the lumber companies, new companies have not yet established themselves. Therefore, we would expect new companies to be below their aspiration levels and be willing to engage in risky behaviors. On the other hand, an "established" company has already achieve the goal of

becoming successful (its aspiration level), so we would expect to see it to be more risk averse in decision making.

The revised value function is useful in explaining apparent discrepancies in economic policies. For example, when countries show modest economic declines, they often enact austerity programs (e.g., Greece in recent years or the sequester in the US) that are marked by reduced government spending and attempts to reduce debt. On the other hand, severe economic downturns (e.g., the Great Depression in the 1930's or the Great Recession in 2008 in the US) are often marked by bold economic initiatives like high government spending, new programs (e.g., the New Deal during the Great Depression), and incurring large amounts of debt. This apparent contradiction can be explained using the avoidance level. As long as the economy has not reached disastrous conditions (the avoidance level), governments are risk averse, but once those levels are reached, they become risk seeking.

Hypotheses to be tested

In Leddo et al. (2019), we found that when both positive (aspiration level) and negative (avoidance level) goals were introduced, people's behavior conformed to the predictions made by the revised value function (Figure 3) than those made by Prospect Theory's original value function (Figure 1). Since previous work in Prospect Theory looked at adult decision making behavior, it would be interesting to explore whether children exhibit the same preferences. This is the focus of the present paper.

METHOD

Participants

Participants were 22 5th graders recruited from an elementary school in Miami, Florida.

Materials Used

There were four scenarios created, each one depicting one of the potential areas of the revised value function: a gain below the aspiration level, a gain above the aspiration level, a loss above the avoidance level (meaning the avoidance level had not been reached yet) and a loss below the avoidance level (meaning the avoidance level had been reached). In order to make the scenarios and accompanying prospects meaningful to the Participants, the scenarios described options that could be taken in a basketball game as they relate to winning (gain) or losing (loss). The four scenarios are shown below.

Scenario 1: Gain below the aspiration level

You are playing basketball with your friends. You need 20 points to win the game. Your team has 17 points. You have the ball, but there is only enough time for you to take one more shot before the game ends. You can take a hard 3 point shot or an easy 2 point shot. If you make the 3 point shot, you will win the game. If you take the 3 point shot, there is a 50% chance you will make the shot and win and a 50% chance you will miss the shot and get no points. If you take the easy 2 point shot, you will make it for sure, but your team will then have 19 points and not win the game. Do you take the 2 point shot or the 3 point shot?

Circle one: 2 point shot 3 point shot

Scenario 2: Gain above the aspiration level

You are playing basketball with your friends. You need 20 points to win the game. Your team has 20 points, so you already have enough points to win. You have the ball, but there is only enough time for you to take one more shot before the game ends. You can take a hard 3 point shot or an easy 2 point shot. If you take the 3 point shot, there is a 50% chance you will make the shot and a 50% chance you will miss the shot and get no extra points. If you take the easy 2 point shot, you will make it for sure. Do you take the 2 point shot or the 3 point shot?

Circle one: 2 point shot 3 point shot

Scenario 3: Loss above the avoidance level

You are playing basketball with your friends. If the other team gets 20 points, you will lose the game. The other team has 17 points. They have the ball, but there is only enough time for them to take one more shot before the game ends. You can play hard defense and make them try a 3 point shot or an easy defense and let them try a 2 point shot. If you do the hard defense and they make the 3 point shot, you will lose the game. If they miss the 3 point shot, you will not lose the game. If you do the hard defense, there is a 50% chance they will make the shot and a 50% chance they will miss the shot and get no points. If you do the easy defense, they will make the shot for sure and get 2 points, but you will not lose the game. Do you make them try the 2 point shot or the 3 point shot?

Circle one: 2 point shot 3 point shot

Scenario 4: Loss below the avoidance level

You are playing basketball with your friends. If the other team gets 20 points, you will lose the game. The other team has 20 points, which means you will lose the game. They have the ball, but there is only enough time for them to take one more shot before the game ends. You can play hard defense and make them try a 3 point shot or an easy defense and let them try a 2 point shot.

If you do the hard defense, there is a 50% chance they will make the shot and get 3 more points and a 50% chance they will miss the shot and get no points. If you do the easy defense, they will make the shot for sure and get 2 points. Do you make them try the 2 point shot or the 3 point shot?

Circle one: 2 point shot 3 point shot

Procedure

All scenarios were administered in paper and pencil format. Participants received a single scenario so as not to have their choices biased by previous decisions. The scenario that each Participant received was randomly chosen with 11 Participants receiving scenarios 2 and 4 and 10 Participants receiving scenarios 1 and 3. Prior to answering the scenario question, the classroom teacher reviewed with the Participants the probabilistic concepts of 50-50 and sure thing.

RESULTS

Since there were only two options available for each scenario, the proportion of students picking one option was the complement of the proportion picking the other option. Accordingly, Table 1 presents the percentage of participants who selected the risky option (3 points) in each scenario.

Table 1: The Percentage of Participants Picking the Risky Option by Condition

	Gain Below Aspiration Level	Gain Above Aspiration Level	Loss Above Aspiration Level	Loss Below Aspiration Level
Percent Choosing Risky Option	80	54.5	60	36.4

A key feature of Prospect Theory is that people are expected to be risk averse when confronted with prospects involving gains. Prospect Theory is silent with regard to goals and does not predict behaviors involving risk when goals are present. As Table 1 shows, the majority of Participants picked the riskier option in scenarios involving gains, regardless of whether a goal was met or not met. This runs counter to the predictions of Prospect Theory.

Similarly, Prospect Theory predicts that people are risk seeking when confronted with prospects involving losses. Across all Participants, regardless of condition, 10 out of 21 picked the risky option in scenarios involving losses, which was statically equally to the 11 out of 21 who picked the non-risky option. This, too, is not consistent with the predictions of Prospect Theory.

A third principle of Prospect Theory is that, in general, people are more risk seeking when confronted with prospects involving losses than they are with those involving gains. Our present theory is silent with regard to this main effect prediction. In the present study, 14 of 21 Participants in scenarios involving gains picked the risky option while 10 of 21 Participants in scenarios involving losses picked the risky option. This, too, runs counter to the predictions of Prospect Theory. Collectively, none of the predicted trends specified by Prospect Theory were reflected in the current data.

With regard to the present framework, our value function predicts that for gains, there will be a greater preference for risky options when the current state is below the aspiration level than when it is above. From Table 1, the data appear consistent with that (80% selecting the risky option when the current state is below the aspiration level vs. 54.5% when the aspiration level has been achieved). This difference is statistically significant, $z = 1.24$, $p = .05$, one-tailed.

Similarly, our value function predicts that for losses, there will be a lower preference for risky options when the current state is above the avoidance level than when it is below. From Table 1, the data suggest an opposite trend with 60% selecting the risky option when the current state is above the avoidance level and 36.4% selecting the risky option when the avoidance level has been achieved. This difference is not statistically significant though, $z = 1.08$, ns.

DISCUSSION

The data conclusively show that the 5th grade Participants did not behavior in ways that would be predicted by the original Prospect Theory. The data did show that with regard to gains, the 5th graders did show a greater preference for risky options when the scenario presented a prospect involving gains where the current state was below the aspiration level (winning a basketball game) than when the scenario presented a prospect involving gains where the current state was at the aspiration level (the game was already won). This is consistent with the predictions made by the Leddo et al. (2019) revised value function. On the other hand, when the scenario presented a prospect involving losses, there was no statistically significant difference between the percentage of 5th graders who chose the risky option when the current state was above vs. below the avoidance level (losing a basketball game). This was not consistent with predictions made by the Leddo et al. (2019) value function. It is noteworthy that, in general, 5th graders seemed to show a preference for risky options.

Therefore, the present study supported the revised value function for gains but not for losses as applied to 5th grade decision making. Further research could help elucidate the decision making of children with regard to decision making under conditions of uncertainty and perhaps reveal at what age people's choices start to show greater conformity to the predictions made by the

revised value function. It would be also interesting to uncover the underlying cognitive processes that mediate this gradual shift as well.

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