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Risk-Sensitive Foraging in Humans Budgeting Time: Correlated with Real-World Financial Situation

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Risk-Sensitive Decision-Making in Humans Budgeting Time,

Correlated with Real-World Financial Situation

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Foraging theory has been studied extensively in non-human animals. Using models developed through animal-study, researchers have recently begun to examine how humans make decisions with regard to resource-expenditure. Using a computer-based task, the proposed study investigated risk-sensitive decision-making, in humans. Participants were asked to “spend” a most valuable resource, time, in order to complete a computer-based task. Participants were asked to choose between two computer-generated selection boxes, each yielding a different delay-value. However, participants were given different feedback as to how each session progressed (i.e. whether ahead or behind) depending on the budget condition to which he was assigned. It was found that both males and females were sensitive to budget condition such that participants were more risk-averse under the positive budget condition and all participants were less risk-averse under the negative budget condition. A questionnaire on participants’ financial situation and goals was also included.

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Introduction

Risk-Sensitive Decision Making and Finances

It is assumed that traits that are useful in the struggle for survival and reproduction have been, and will continue to be chosen through natural selection. Those organisms possessing the more desirable traits typically have more access to mates which leads to increased reproduction of offspring (increased fitness) and the said traits being passed down from generation to generation. Therefore one must examine how organisms allocate resources. After much examination, it is often possible to come up with mathematical models that determine which choice an organism should make under a given circumstance. The best choice serves to maximize caloric intake and minimize caloric expenditure. A forager with more energy will be more likely to meet metabolic requirements and will be able to spend spare energy on important non-feeding tasks like creating shelter, fleeing from or fighting predators, and reproducing. Through studying feeding behavior, an attempt is being made at forming testable predictions about what an organism will choose by knowing which choice uses the least amount of resources and yields the most. Although foraging behavior has been studied extensively, a model offering a complete explanation of risk-sensitive responding has not yet been produced. However, several models offer some insight into part of what will become the final, theoretical model. Molar maximization models (MM) fall under a more broad theory of foraging called Optimal Foraging Theory (OFT). OFT/MM suggest that the organism should prefer a food source that provides the maximum amount of food per unit time (Pyke, Pulliam & Charnov, 1977). According to OFT, organisms should seek to minimize delay to reward and maximize reward amount. If this is true, foragers receiving a mean reward amount should be indifferent to variation in amount of reward per trial. However, numerous studies have shown that some organisms display a bias towards the variable reward (Caraco, Martindale, & Whitman, 1980; Caraco, 1981; Caraco, 1982; Bateson & Kacelnik, 1997). For example, Bateson & Kacelnik (1997) found that under a negative energy budget (caloric-intake requirement not yet met), starlings (*Sturnus vulgaris*) were significantly more likely to choose the variable delay option as opposed to the constant delay. Furthermore, OFT does not consider limitations or environmental restrictions that prevent an organism from making the "best" decision (Stephens & Charnov, 1982).

Risk-sensitive foraging theory is the name given to a set of models for which the significance of variation between alternative responses is the main tenet. Because risk-sensitive foraging theory does respect the significance of variance associated with differing strategies, one may wish to think of it as "variance-sensitive theory". A "risky-decision" as defined in this paper is one that involves probable variation; it does not imply an increased danger of predation. Imagine that, instead of having a choice between two foraging strategies, an organism has access to two different food patches. Assume that the variances differ but that in the long run, the net caloric intakes possible from each patch offset. An example of a risk-prone foraging decision is a decision to forage in the patch in which caloric intake is variable. A risk-averse decision would be a decision to forage in the patch that produces a relatively constant amount of caloric intake (little variance). It is typical to see risk-averse foraging under positive budgets and risk-prone foraging under negative budgets (Caraco, 1980).There are several models that partially predict decisions made by foraging organisms. According to the energy-budget rule, the most adaptive strategy depends on the energy state of the animal: risk-prone at low energy states, and risk-averse at higher energy states (Caraco, 1980). Jensen's inequality states that the average value of a function of a variable need not equal the value of the function evaluated at the average variable. Therefore, a concave-up function results from an animal experiencing an increasing energy state, at an increasing rate. Thus, given a concave-up situation, it would be most unlikely to see an animal use a risk-prone strategy (Smallwood, 1996). If a forager must meet a certain fixed caloric requirement per unit time for survival, then the forager's response to risk affects its chances of meeting this requirement. The Daily Energy Budget Rule (DEB) assumes that foraging bouts provide an organism with enough energy to survive until the organism can forage again, given an interruption in opportunity to forage (e.g. nightfall) (Houston, 1991). DEB predicts that an animal choosing between food sources yielding equal average rates of gain should be risk-averse when this yields a rate of gain high enough for it to survive the period during which no foraging takes place. On the other hand, the animal should be risk-prone when the low variance option does not meet its metabolic requirement (Stephens, 1981). However, the DEB rule is not a universal predictor of all risk-sensitive foraging models (Bateson & Kacelnik, 1997).

Suppose that a forager must choose between two alternatives: one choice yields ten calories during each foraging bout and the other randomly yields five calories half the time and fifteen calories half the time. If a forager attempted to maximize the mean number of calories obtained, the best choice would be the constant ten calories. However, if the forager needs to consume a minimum of eleven calories per foraging bout in order to survive, it must choose the risky alternative. The forager receives its eleven calories in small bouts throughout the day. The z-score model (Stephens, 1981; Stephens and Charnov, 1982) asserts that rewards from each bout are randomly and independently distributed, so the sum of these rewards (in calories) will be normally distributed. The z-score model asserts that the forager's energy supply at the end of the foraging-period is also normally distributed, and that the forager has some behavioral control over the mean and variance of the distribution. This control might be exercised by choosing where to feed and/or how long to remain foraging in a certain patch (Stephens & Paton, 1986).

Based on conditioning studies examining the effects of delay to reinforcement, Scalar Expectancy Theory (SET) was proposed as another account for risk-sensitive foraging (Bateson & Kacelnik, 1995; Kacelnik & Bateson, 1996). When a conditioned stimulus (CS) is presented to a participant (the smell of the area around the food patch for example), it is remembered for X amount of time. After Y amount of time, the unconditioned stimulus (US) / (food) becomes available. Gibbon (1977) hypothesized that the memory of the CS fades over time in a hyperbolic pattern. The time between the presentation of the CS and the presentation of the US can be thought of as an "anticipatory period". The amount of anticipation is contingent upon the time that passes between the presentation of the CS and US. As the delay increases, the value of the US is discounted, meaning that the reward becomes less appealing. Scalar Expectancy Theory predicts that a constant delay, or a constant time-interval between the presentation of the CS and the presentation of the US, along with a constant reward will result in low discounting. It is also predicted that a foraging organism will highly value a variable reward associated with a variable delay (Kacelnik & Bateson, 1996). According to this model, an organism's behavior is not completely contingent upon its fitness or energy budget, but upon the foraging "events" that take place in the environment during the foraging bout.

In order to completely understand SET, it is important to have an understanding of Weber's Law. Weber's Law states that the accuracy of perception decreases proportionally to stimulus value (Bateson & Kacelnik, 1995). This means that a memory is formed of each event (time interval and/or amount of food) that has taken place in the environment during a foraging bout. According to Weber's Law, when an organism is faced with delay to reinforcement, memories are formed of each delay period and of each reward amount for each option. A value is then associated with each delay period and the reward associated with that delay for each option. If the organism assigns a greater value to one option over the other, the organism should show a bias towards that option. Weber's Law is predominant in organisms' discrimination and reproduction of time intervals, and it is the basis of a theoretical framework for decision-making with respect to time (Gibbon, 1977; Gibbon, Church, Fairhurst, & Kacelnik, 1988).

It is clear that humans as well as non-human animals are especially sensitive to time which means that delay may be factored into making foraging decisions (Caraco, 1980; Bateson and Kacelnik, 1995, 1997). While few studies have applied the aforementioned models to investigate risk-sensitive responding in humans, one such study was conducted manipulating delay using a small-n design (n=4) (Pietras, Locey, and Hackenberg, 2003). Participants chose between fixed and variable trial durations (delays) with the same mean value. Points were acquired to be exchanged for money. It was found that participants were significantly risk-averse under the positive budget and risk-prone under the negative budget. However, the constant option was chosen under the negative budget more frequently than predicted.

Economic theorists have also developed models to account for how humans make decisions. Kahneman and Tversky (1976) studied how people allocate resources and evaluate losses and gains. Kahneman and Tversky called their studies of how people manage risk and uncertainty *Prospect Theory* (Trepel, Fox, and Poldrack, 2005). In prospect theory, participative value is modeled by a value function that is concave for gains, convex for losses, and steeper for losses than for gains; the impact of probabilities are characterized by a weighting function that overweights low probabilities and underweights moderate to high probabilities. Therefore, the main element of prospect theory is an S-shaped value function where gains and losses are measured relative to a reference point (Figure 1). Individuals use “mental accounting” in order to set reference points for the accounts that determine gains and losses (Grinblatt and Han, 2005). One important result of the work of Kahneman and Tversky is demonstrating that people’s attitudes toward risks concerning gains may be quite different from their attitudes toward risks concerning losses. For example, when given a choice between getting \$10 with certainty or having a 50% chance of getting \$25, people have been shown to choose the certain \$10 in preference to the uncertain \$25, even though the mathematical expectation of the uncertain option is \$12.50. This is defined as risk-aversion. Kahneman and Tversky found that when the same people were confronted with a certain loss of \$10 versus a 50% chance of no loss or a \$25 loss, they often chose the risky alternative. This is defined as risk-seeking behavior (Kanner, 2005). This kind of decision making may seem irrational, therefore it is important for analysts to recognize the asymmetry of human choices, and to take this asymmetry into account when developing theories about choice-behavior.

Because humans value money, and because humans value time, it is hypothesized that the allocation-method of one of these two resources may be correlated with the allocation of the other. One study using a large-group design examined human decision-making strategies using variability in delay as the contingency (Kucera, Szalda-Petree, and Deditius-Island, manuscript-in-preparation). It was hypothesized that both males and females would be significantly risk-prone in the negative budget condition and significantly risk-averse in the positive budget condition, as predicted by Scalar Expectancy Theory (Bateson & Kacelnik, 1996). Consistent with this hypothesis, it was found that males assigned to the negative budget were significantly risk-prone whereas males assigned to a positive budget were significantly risk-averse. However, females were significantly risk-averse under both the positive and negative budget conditions. Upon examining the data, it was found that there was *much* individual variation, not just between sexes, but within groups as well. The current study sought to find reasons as to why such large variation was observed. By including a series of questions about each participant's real-world financial situation, it was predicted that significant correlations between the proportion of risk-prone choices and answers to the questionnaire would account for some of the variation between participants. In addition, a within-subject rather than a between-subjects study design was used for the current study to reduce the potential for individual differences across budget conditions.

Method

Participants

Two-hundred-eighty-four University of Montana Undergraduate Psychology students, 153 females and 131 males, received course credit for their participation. Mean age of the sample was 21.4 years, with a range of 18 to 49 years.

Apparatus

The task was programmed in Visual Basic 6.0 and was administered on computers using a Windows XP operating system and a USB mouse. All computers used SVGA LCD panel monitors set at a resolution of 640 x 480 pixels.

Procedure

The initial computer screen prompted for the participant's pre-assigned identification number and asked the participant to enter his age and sex. The next series of screens queried the participant regarding his/her perception of his/her financial situation, followed by a series of questions about his/her and his/her parents' actual financial situation (Appendix A). The participant was then asked several questions regarding family history and other demographic information (Appendix B). Finally, the participant was presented with an instruction screen explaining the task (Appendix C).

The experimental task consisted of five blocks of 15 trials (75 trials). For each trial two choice-boxes were presented, one yellow, one blue. The variable choice-option yielded either a 1 or 7 second delay to the next trial. The constant choice option yielded a 4 second delay to the next trial. After a selection was made, the colored choice boxes were removed from the screen, the delay value (in seconds) corresponding to the choice made was displayed on the screen and counted down in whole second increments to zero. Upon reaching zero the next trial began. The trial number was presented in the upper right corner of the screen in order that the participant could keep track of the remaining trials. Each choice was recorded following one mouse click on the choice box.

Participants were told of a “competitor” in the instructions, which indicated that the participant would be competing for a better time (e.g. faster completion rate) compared to the participant who completed the task just before. A feedback screen was presented every 15 trials, informing the participant of his/her “status” (Figure 2). The feedback screen was displayed for 10 seconds and consisted of a continuum bar indicating the participant’s “pace” on an ahead/behind continuum. Each participant was randomly assigned to either the positive (ahead) or negative (behind) budget condition after entering her/his participant ID number in the first screen of the task. If a participant was initially assigned to the “ahead” condition (positive budget), s/he remained in the positive budget until trial 45 at which time the budget condition switched to “behind” (negative). If a participant was initially assigned to the “behind” condition (negative budget), s/he remained in the negative budget until trial 45 at which time the budget condition switched to “ahead” (positive). The feedback screen display was pre-programmed based on the initial budget group assignment and was not contingent upon the participant’s choices during the task.

The side of presentation (left or right) of the colored-choice boxes was pseudo-randomized such that neither choice box appeared on the same side of the screen for more than two consecutive trials. Additionally, the choice box designations, either constant delay or variable delay, were counterbalanced across participants. These measures were taken in an effort to minimize color or side bias. For each trial during the free-choice portion of the task, the choice box selection and latency to complete the choice were recorded.

Results

Data were analyzed for each participant under each budget condition. The risk-prone proportion for each budget condition was calculated by subtracting the risk-prone proportion for the previous budget condition from the risk-prone proportion for the current budget condition. In the case of the first budget condition presented, the risk-prone proportion was calculated by subtracting the risk-prone proportion for the first fifteen "neutral" trials from the risk-prone proportion for the first budget condition presented. Thus, a negative change value indicates a decrease in the risk-prone proportion (or a shift in the risk-averse direction) and a positive change value indicates an increase in the risk-prone proportion (or a shift in the risk-prone direction). Data from participants who selected either the risk-prone or risk-averse option exclusively across all trials were excluded from all analyses due to potential lack of motivation or misunderstanding of instructions (7 participants: 1 female 6 males).

A 2(sex) x 2(budget) mixed ANOVA was conducted using the change in risk-prone proportion. The results revealed a significant main effect for Budget ($F(1, 273) = 15.23$, $p<.01$, eta = .053), a significant main effect for Sex ($F(1, 273) = 7.41$, $p<.05$, eta = .026) and no Budget X Sex interaction ($F(1, 273) = .02$, $p>.05$, eta = .053); that is to say that participants made significantly fewer risk-prone choices under the positive budget condition than under the negative budget condition, and that females made significantly fewer risk-prone choices compared to males under both budget conditions (see Table 1 and Figure 3).

The change in risk-prone proportion for the positive budget (Positive Total) and the negative budget (Negative Total) were then correlated with the variables from the pre- and post-task questionnaires (see tables 2 and 3). The most striking finding may be the difference between males and females. The Positive Total for females was significantly negatively correlated with increased student loan debt, increased overall debt, and likelihood of contributing to a savings/retirement account. This is to say that females who report having more debt and less money invested in savings/retirement accounts in the real-world are more likely to be risk-averse when under a positive budget in the task. Analyses also show that females who reported being parents made significantly fewer risk-prone choices under the positive budget condition (N=14).

As seen in females, males were consistently risk-averse under both budget conditions, but no interpretable significant correlations between the variables on the pre- and post-task questionnaires were found. This is counter to data reported in previous studies using both human and non-human animals, all of which have shown males to be the more “predictable” of the two sexes in that SET can typically be used to predict decision-making strategies in males (Bateson & Kacelnik, 1997; Caraco, Martindale, & Whitman, 1980; Caraco, 1982; Deditius-Island, Kucera, and Szalda-Petree, in-press; Kucera, Szalda-Petree, and Deditius-Island, manuscript-in-preparation).

Discussion

As predicted by Scalar Expectancy Theory, it was hypothesized that both males and females would be significantly risk-prone in the negative budget condition and significantly risk-averse in the positive budget condition, (Bateson & Kacelnik, 1996). In fact, both males and females were consistently risk-averse under both budget conditions. However, both males and females were sensitive to budget condition in that both sexes were more risk-averse under the positive budget and less risk-averse under the negative budget condition.

It was also hypothesized that those individuals in a real-world financially positive budget would make significantly more risk-averse choices and that those in a financially negative budget would make significantly more risk-prone choices. In fact, the only significant relationship regarding real-world financial situation was that between females under a positive budget behaving in a more risk-*averse* manner when under a real-world financially negative budget.

The finding that both females and males consistently behave in a risk-averse manner is counter to real-world financial data. Research shows that most Americans are operating under financially negative budgets. The average household has at least four credit cards which carry a total balance of around $5,000. By making the minimum payment (which many chose to do) at the average rate of 17% interest, it would take approximately 40 years to pay off the $5,000, and it would end up costing around $16,000. That means that many Americans are paying around *eleven thousand* additional dollars for $5,000 worth of goods/services. It is common for Americans to carry $33,000 in *additional* non-mortgage household debt (school loans, auto loans). Americans make $1.1 *trillion* worth of credit card purchases in an average year. Over 40% of US families spend more than they earn (at the rate of approximately $1.22 for every $1.00 earned). And perhaps the most shocking statistic of all; 62% of full-time workers will retire with less than $10,000 of planned income *per year*. To put this data into language used in the current study: it would appear that in general, people are making consistent risk-prone choices in their real-world financial lives.

Studies on risk-sensitive responding make sense in the context of evolutionary theory. It seems that organisms may be “pre-wired” to make certain decisions under certain contingencies. As predicted by SET, subjects were sensitive to budget condition (more risk-averse under a positive budget, less risk-averse under a negative budget). However, inconsistent with the expectations made by SET, it was found that participants were consistently risk-averse, regardless of budget condition with females being consistently more risk-averse than males. This sex-difference has been clearly demonstrated in only a few studies (Szalda-Petree, Deditius-Island; Szalda-Petree and Kucera) the risk-sensitive foraging literature. This difference can be accounted for either because large-group contingencies used previously in human studies have not been sensitive to this difference and research done in nonhumans is almost exclusively conducted using males only.

Parental Investment Theory argues that natural selection favors females who demonstrate conservative choice-making strategies unless it is absolutely necessary to choose otherwise. This difference is seen between males and females of species in which the female is the primary caregiver of offspring. The difference seen in conditions of choice is made necessary by maternal responsibility and high parental investment. Applied to risk in humans, one would expect women to be risk-averse except under an extremely negative budget. It is also reasonable to assume that males, who have a low level of investment when it comes to caloric expenditure from conception to birth of offspring, would display less risk-averse tendencies. Since decisions made by a female will more-likely have an impact on the survival rate of her offspring, it is reasonable to assume a biological tendency for risk-aversion unless otherwise necessary.

In Kahneman and Tversky's studies of how people manage risk and uncertainty, they found that participants may display risk-aversion when offered a choice presented in one way, but behave in a risk-prone manner when presented with the same choice that has been framed in a new way. For example, people may take the trouble to mail in a rebate offer to save $10 on a $50 watch, but would not bother to send in the rebate to save $10 on a $500 watch. As previously mentioned, one important finding from studies using the Prospect-Theory model is that people's attitudes toward risks concerning gains may be quite different from their attitudes toward risks concerning losses. According to the same reasoning, it may be that the significant correlations found in females when under the positive budget condition were not found in females when under the negative budget condition because the underlying construct of the negative budget may be different than that of a positive budget.

Differences in decision making strategies are not yet well-understood. It may be useful to do additional research using a population consisting of more parents (including parents of step- and adopted-children), which would mean expanding the study population to include older adults (using an equal percentage of parents and non-parents). It is also important to study a more diverse population when it comes to age as it may be true that more life-experience makes a difference in how people spend resources. It may also be useful to include an additional questionnaire with hypothetical questions about real-world spending behavior ("If you were allowed to put money on credit/wait to pay etc"). Research on how individuals make decisions when it comes to using resources is important in the fields of psychology, ecology, economics and biology. We have seen that decision-making strategy changes based on an individual's sex and on acute budget-condition. Are these differences primarily due to an innate difference between males and females? Or could they be partially due to individual variability? Answering these questions would provide greater insight into resource expenditure in general, and into the problems of debt, gambling, spending compulsion, and basic foraging behavior.

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Websites (financial statistics)

http://www.primedebtsoft.com

http://www.coeinc.org/financialstatistics.htm

http://www.federalreserve.gov/

http://www.cardweb.com

Appendix A

Student's Perception Questionnaire

1. How worried are you about having enough money to pay your necessary expenses **next month**?
    a. Very worried, I probably won't be able to pay my bills.
    b. Somewhat worried, I may not be able to pay all of my bills.
    c. Neither worried nor confident.
    d. Somewhat confident that I'll be able to pay most of my bills.
    e. Completely confident, I always manage to pay my bills.
2. How worried are you about having enough money to pay your necessary expenses **5 years from now**?
    a. Very worried, I probably won't be able to pay my bills.
    b. Somewhat worried, I may not be able to pay all of my bills.
    c. Neither worried nor confident.
    d. Somewhat confident that I'll be able to pay most of my bills.
    e. Completely confident, I always manage to pay my bills.
3. How worried are you about having enough money to pay your necessary expenses **10 years from now**?
    a. Very worried, I probably won't be able to pay my bills.
    b. Somewhat worried, I may not be able to pay all of my bills.
    c. Neither worried nor confident.
    d. Somewhat confident that I'll be able to pay most of my bills.
    e. Completely confident, I always manage to pay my bills.

Financial Questionnaire

1. What is the total amount of your current student loans?
    a. $0.00
    b. Less than $10,000
    c. Over $10,000 but less than $20,000
    d. Over $20,000 but less than $30,000

    e. Over $30,000

2. What is the total amount of other debt (auto loans, stereo equipment, credit-card debt etc.)?
    a. $0.00
    b. Less than $10,000
    c. Over $10,000 but less than $20,000
    d. Over $20,000 but less than $30,000
    e. Over $30,000
3. What is your household's (you plus spouse/partner if applicable) total annual income, before taxes?
    a. Less than $15,000
    b. $15,000 - $25,000
    c. $25,000 - $55,000
    d. $55,000 - $75,000
    e. Over $75,000
4. Do you have health insurance?
    a. Yes
    b. No
5. Do you have auto insurance?
    a. Yes
    b. No
6. Do you have life insurance?
    a. Yes
    b. No
7. Do you currently contribute to a retirement package and/or have any other investments (stocks, mutual funds etc.)?
    a. Yes
    b. No
8. Do you currently have an "emergency fund" in order to pay for unexpected expenses such as auto repair or medical emergencies?
    a. Yes

b. No

9. What is your parents' total gross annual income?
   a. Less than $15,000
   b. $15,000 - $25,000
   c. $25,000 - $55,000
   d. $55,000 - $75,000
   e. Over $75,000
   f. I don't know
10. Do your parents
    a. Own a home
    b. Rent a home
    c. I don't know
11. Are your parents (grandparents, trust fund) paying for your tuition?
    a. Yes
    b. no
12. Are your parents (grandparents, trust fund) paying your living expenses?
    a. Yes
    b. no
13. Are your tuition expenses classified as in-state or out-of-state?
    a. In-state
    b. Out-of-state

Appendix B

Family History/Demographics Questionnaire

1. How many siblings do you have? (brothers/sisters)
2. What is the highest level of education you have completed?
3. What is the highest level of education completed by your father?
4. What is the highest level of education completed by your mother?
5. Are your parents
   a. Married
   b. Separated
   c. Divorced
   d. Living together
   e. Were never together
6. Are you
   a. Single
   b. Married
   c. Separated
   d. Divorced
   e. Living with partner
7. Do you have children? Yes/No
   a. How many?
8. How much, on average, do you pay for childcare each month?
   a. $0
   b. $1- $250
   c. $251 - $500
   d. $500 - $1,000
   e. Over $1,000

Appendix C

Task Instructions

You will now complete 75 trials during which you will simply click on either the yellow or the blue box presented on the screen. Again, both a YELLOW BOX and a BLUE BOX will appear on the screen at the same time. You are to choose between the two by clicking on one of the boxes. Clicking on either of the boxes will cause both boxes to disappear and a number, the same color as the box that was clicked, to appear in the center of the screen. Each number represents the NUMBER OF SECONDS until the next trial starts. One of the boxes will yield the same number of seconds each time you click on it. The other box will yield a varying number of seconds each time you click on it. You will be competing against the person who completed this task before you. Your goal is to finish the 75 trials faster than he did. You need to decide whether choosing blue, choosing yellow, or choosing a combination/pattern allows you to finish faster. You will be told how your performance compares periodically throughout the task. If you have any questions about what you are being asked to do, please ask the researcher now. Good luck!

Table 1. Percent change in risk-prone proportion by budget

	BUDGET			
	Negative		**Positive**	
	MEAN	SE	MEAN	SE
Male (n= 131)	3.00	2.10	-5.04	1.81
Female (n= 153)	-0.50	1.63	-7.32	1.54

Table 2

Correlations (Positive Budget)

	All Participants		Males		Females	
	Positive Total	**N**	**Positive Total**	**N**	**Positive Total**	**N**
Age	-.045	277	-.084	125	-.014	152
Siblings	-.017	277	-.010	125	-.005	152
Children	-.211**	277	-.058	125	-.297**	152
Cost of childcare	-.152*	20	-.155	6	-.144	14
Worry now	.072	277	-.010	125	.126	152
Worry in five years	-.035	277	-.064	125	-.019	152
Worry in ten years	-.051	277	-.053	125	-.048	152
Worry total	.000	277	-.054	125	.036	152
Student loan debt	-.153*	277	-.038	125	-.230**	152
Other debt	-.101	277	-.098	125	-.096	152
Total debt	-.160**	277	-.079	125	-.208**	152
Participant's income	.033	277	-.030	125	.080	152
Parents' income	.045	233	.012	111	.144	122
Parents home-owners	-.148*	271	-.142	120	-.143	151
Health insurance	-.040	277	.026	125	-.093	152
Auto insurance	.029	277	.042	125	.019	152
Life insurance	-.028	277	.059	125	-.104	152
Retirement savings	-.088	277	.061	125	-.217**	152
Emergency savings	-.012	277	-.070	125	.039	152
Total $ planning	-.053	277	.041	125	-.131	152
Who pays tuition	-.041	271	-.043	123	-.052	148
Who pays expenses	-.034	268	.008	123	-.066	145
In-state tuition	-.077	276	-.062	124	-.082	151
Participant's education	-.037	277	.082	125	-.078	152
Father's education	.056	277	.014	125	.067	152
Mother's education	.036	277	-.046	125	.097	152
Parents Marital Status	.093	277	.086	125	.116	152

S's Marital Status	.121*	277	.139	125	.091	152
Q1 Clarity	.019	277	.045	125	-.001	152
Q2 Motivation	.034	277	.148	125	-.070	152
Q3 Task length	.016	277	-.036	125	.043	152
Q4 Engaging	-.095	277	-.141	125	-.029	152

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Participants who answered "I don't know" were eliminated when applicable.

Table 3

Correlations (Negative Budget)

	All Participants		Males		Females	
	Negative Total	**N**	**Negative Total**	**N**	**Negative Total**	**N**
Age	.001	277	-.086	125	.072	152
Siblings	-.004	277	-.010	125	-.003	152
Children	.054	277	.061	125	.065	152
Cost of childcare	.024	20	.077	6	-.008	14
Worry now	.101	277	.114	125	.076	152
Worry in five years	-.029	277	-.056	125	-.009	152
Worry in ten years	.011	277	.065	125	-.038	152
Worry total	.043	277	.059	125	.019	152
Student loan debt	.037	277	.078	125	.017	152
Other debt	-.018	277	-.031	125	.001	152
Total debt	.016	277	.040	125	.012	152
Participant's income	-.074	277	-.102	125	-.058	152
Parents' income	.138*	233	.156	111	.106	122
Parents home-owners	-.004	271	-.142	120	.020	151
Health insurance	.012	277	.151	125	-.106	152
Auto insurance	-.021	277	-.049	125	.004	152
Life insurance	.031	277	.129	125	-.063	152
Retirement savings	.022	277	-.008	125	.044	152
Emergency savings	-.105	277	-.007	125	-.197*	152
Total $ planning	-.025	277	.075	125	-.114	152
Who pays tuition	.075	271	.110	123	.072	148
Who pays expenses	.058	268	.120	123	.001	145
In-state tuition	-.061	276	-.110	124	-.016	151
Participant's education	.018	277	.214*	125	-.061	152
Father's education	.041	277	.007	125	.049	152
Mother's education	-.003	277	-.023	125	.003	152
Parents Marital	-.056	277	-.075	125	-.026	152

Status						
S's Marital Status	.025	277	.073	125	-.032	152
Q1 Clarity	-.010	277	.055	125	-.073	152
Q2 Motivation	.071	277	.106	125	.037	152
Q3 Task length	.090	277	.119	125	.045	152
Q4 Engaging	-.068	277	-.029	125	-.081	152

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Participants who answered "I don't know" were eliminated when applicable.

Figure 1.

Kahneman and Tversky's S-shaped value function

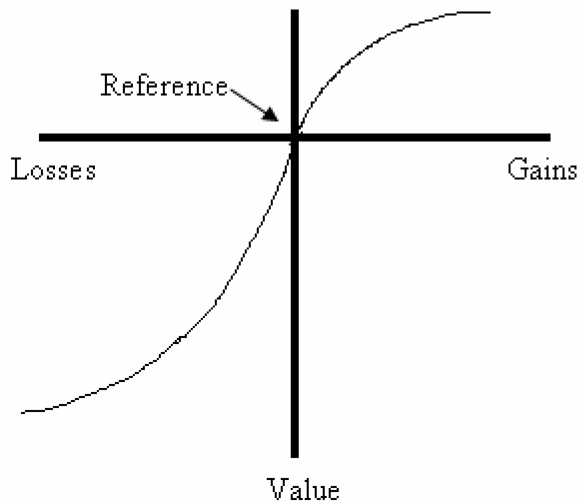

Figure 2

Feedback Screen

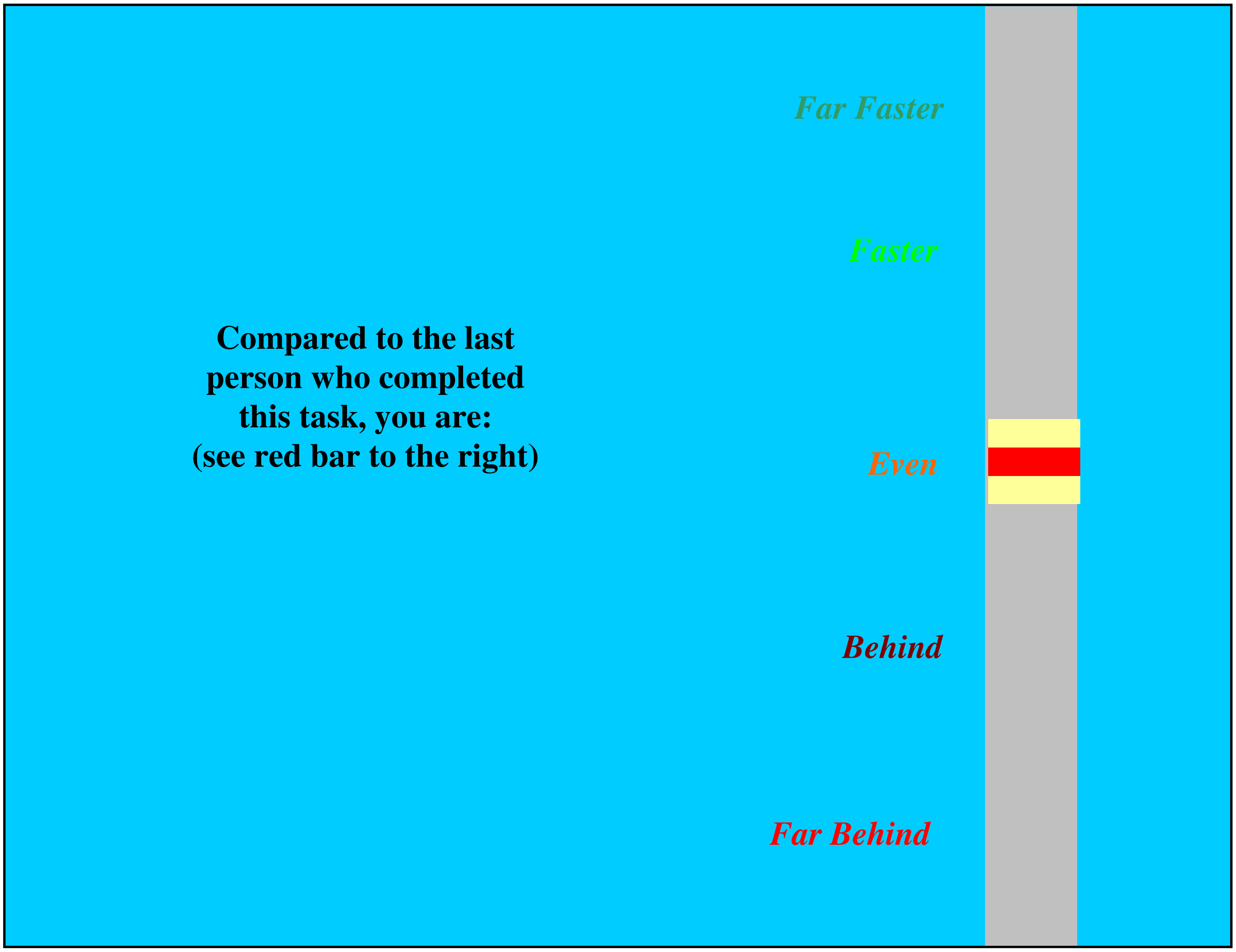

Figure 3

Change in risk-prone proportion by sex and budget