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Conditions of Risk:
Assessing Influential Factors**

By

Gary Wyatt

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Decision-Making Under Conditions of Risk: Assessing Influential Factors

by
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INTRODUCTION

An unavoidable part of the human experience is the need to make decisions under conditions of risk where the outcomes can be either rewarding or punishing. Many situations requiring people to make decisions about relationships, careers, goods, services, finances and political issues, involve elements of risk. Risk has been defined as a decision situation in which the alternatives associated with that situation have outcomes with known probabilities (Lopes, 1987:255; Harsanyi, 1977:87). Psychologists, social psychologists and sociologists have explored decision-making and risk-taking processes in great detail (see Abelson and Levi, 1986).

This work, however, has been subject to criticisms. For example, Lopes (1987:255) states, "what is most disconcerting is that there is so much theory for so little substance." Her implication is that there needs to be more research directed at linking theoretical ideas with human behavior in the real world. With criticisms such as those expressed by Lopes in mind, the goal of this research is to add "substance" to the field of knowledge relating to decision-making behavior under conditions of risk.

Gary Wyatt has a Ph.D. in Sociology from Washington State University and is an Assistant Professor of Sociology at Emporia State University.

The focus of this study is on assessing the ability of a decision-making model to correctly predict subjects preferences between two alternatives, one of which is highly valued but less probabilistic, the other less valuable but more probabilistic. The alternative with the more valuable but less probabilistic outcome is considered the risky or risk-taking alternative, while the alternative with the less valued but more probabilistic outcome is considered the risk-avoiding alternative. Thus, the selection of the risky alternative is defined in this study as risk-taking behavior and the alternative selection is considered risk-avoiding behavior. For both risk-taking and risk-avoiding alternatives, the probabilities of obtaining the given outcomes will be explicitly stated so as to conform to the definition of risk presented above.

The decision-making situations to be tested in the study will involve such resources as love, goods, services, status and money. The model establishes an additive set of relationships between certain variables related to the subject's concept of self, parental expectations and sex on the propensity of the subject to take or avoid risks. This model is not intended to represent an alternative to models of decision-making currently in vogue. Rather, the purpose of testing this model is to determine if the information that it provides adds to the ability to correctly predict choice preferences when different resources are involved. In terms of the self concept, the model will include self-efficacy and self-worth (see Gecas, 1986) and in terms of parental expectations it will include instrumental and expressive parental expectations. The specific objectives of this research are two-fold: first to determine if the percentage of predictions of risky decision-making behavior based on the model offer an improvement on the percentage of expected predictions for any choice model that does not include these variables; second, to assess the impact of the individual variables included in this model on the propensity of subjects to take or avoid risk in these different situations.

Achieving these two research objectives is important for several reasons. First, much research has explored the impact of individual oriented personality variables on risk-taking behavior (Wyatt, 1988; Pietromonaca and Rook, 1987; Lind and Connole, 1985; Kourilsky and Campbell, 1984; Van Hecke et al., 1984; Ginsberg and Miller, 1982; Krishna, 1981; Keiahn, 1981; Karabenick and Addy, 1979; Arenson, 1978; Kogan and Dorros, 1978; Covington and Beery, 1976; Roberts, 1975; Jamieson, 1969). The results of many of these studies suggest that various personali-

ty related variables influence the risk-taking and risk-avoiding tendencies of subjects. However, if the information from these variables does not increase the capacity to accurately predict the choice preferences of subjects above the capacity of models that do not include these variables, then the information provided is of little value. Thus, the results of this research will indicate if the designated personality related variables should be included in theoretical explanations of risky decision-making behavior. The results will also indicate if these variables are important in decision-making situations involving certain resources but not in situations involving other kinds of resources. Finally, the results will indicate the impact of the individual variables on the risk-taking and risk-avoiding tendencies of subjects when different resources are involved.

This presentation will proceed in the following manner. In the next section, section two, a review of the literature relating to decision-making behavior will be presented. Prominent models of risky decision-making behavior developed by a variety of social scientists will be presented and discussed. Then, the model considered in this study will be discussed in detail. The emphasis of this discussion will be on the theoretical justifications for including these variables. At the end of section two, hypotheses will be presented indicating the expected contribution the personality variables will make to explain risk-taking and risk avoiding behavior. In section three, methodological issues will be addressed. Included in this section will be a discussion of the questionnaire that was developed for this research, the scale construction procedures and the methods of data analysis. In section four the results of the data analysis will be presented. This will include an examination of the added contribution these individual oriented variables make to explain risky choice beyond that already possible by using current models. Then, the results of the analysis assessing the effects of the individual variables on risky choice preferences will be presented. Finally, in section five, a discussion of the the results will be presented. This discussion will center on the contributions of this research for understanding risky decision-making behavior and the implications of the study for future research.

REVIEW OF LITERATURE

In this section, key literature pertaining to decision-making under conditions of risk will be reviewed. Following that review, a justification for the model of risky decision-making to be tested in

this research will be presented. Finally, hypotheses derived from this model will be set forth.

Risky Decision-Making Explanations

Lopes (1987) suggests that:

...studies of risky choice fall into two groups. At one extreme are the studies run by mathematically inclined experimental psychologists in which subjects make decisions about gambles described in terms of amounts and probabilities. At the other extreme are studies run by personality psychologists who are mostly interested in individual differences in risk-taking. Their tasks tend to be closer to everyday experiences and they often involve elements both of chance and skill (Lopes, 1987:256).

Although this present research reflects the "Personologists' View," a review of both decision-making perspectives will be helpful. As Lopes suggests, these two different traditions are not mutually exclusive. Rather, they are points on opposing ends of a continuum and it is difficult to fully grasp the significance and contribution of one perspective without understanding the other perspective.

The Experimental Perspective

"Experimentologists" tend to focus on cognitive explanations of decision-making behavior. The cognitive focused researchers considered here attempt to explain risky decision-making with mathematical equations depicting the cognitive processes that subjects engage in when making a decision.

Some of these models have been influenced by a principle first proposed by Bernoulli (1738). This principle known as the expected-value principle denotes the likelihood of a subject choosing one alternative over another alternative by determining which alternative has the highest expected-value.

The expected-value of a choice alternative is determined by multiplying the value of the outcome associated with an alternative by the probability of obtaining that outcome. Consider a situation where a decision maker must choose between alternative A with a 70% chance of winning \$1,000.00 and alternative B with a 50% chance of winning \$2,000.00. The expected-value of alternative A is 700 ($0.70 \times 1,000$) and the expected-value of alternative B is 1,000 ($0.50 \times 2,000$). Thus, subjects would be expected to choose alternative B because the expected-value of this alternative is higher than the expected-value value of alternative A. The implication of

this model for risk-taking behavior is that a subject will select a risky alternative as opposed to an alternative that is less risky if the expected-value of the risky alternative exceeds the expected-value of the less risky alternative.

This model, according to Abelson and Levi (1986:244), "has long been recognized as predictively inadequate." Recently, a number of researchers have documented decision-making behavior that does not conform to outcomes predicted by the expected-value model (see Kahneman and Tversky, 1979 and Hershey and Shoemaker, 1980). These scholars have demonstrated that subjects are more concerned with certainty of outcomes in risky decision situations even when the expected-value of the more certain outcome is equal to or less than the expected-value of an outcome associated with a riskier alternative. Thus the relationship between desired outcomes and probabilities suggested in the equation above is misleading (also see Lopes, 1987, Abelson and Levi, 1986 and Kogan and Wallach, 1967).

An alternative model is the 'expected-utility model' which denotes that the likelihood of a subject selecting one alternative over another is determined by multiplying the probability associated with that alternative with the utility of that alternative. The utility of a given alternative is a logarithmic function rather than a value. This implies that as the value of a desired outcome increases, its relative value to the decision maker does not increase proportionately. The expected utility principle has been validated by Hershey and Shoemaker (1982) who report an overwhelming majority of their subjects selected a more certain alternative even though the expected-values of the outcome for each alternative were equal. If the value assigned by the subjects to these two outcomes were equal as the expected-value model would suggest, an equal number of subjects should have selected the risky alternative as well as the certain alternative.

Despite the improvement of the expected-utility model over the expected-value model, the former has its problems. Abelson and Levi state:

It is a problem for the expected-utility principle to explain why gambling should be popular. Bets with small probabilities to win big money (lotteries, roulette wheels, etc.) ought to be especially unattractive, given that a concave utility function drives the worth of a large prize considerably lower than the value warranting the very small probability of obtaining it.

That many people are willing to purchase lottery tickets where in most cases the probability of winning is roughly equal to the probability of being struck by lightning is a perplexing question to expected-utility adherents. In addition to gambling, the decision made by millions of people to purchase insurance is contrary to what people would be expected to do based on expected-utility principles. Attempts have been made to modify the expected-utility model so these aberrations can be explained.

Perhaps the most noteworthy of these attempts is 'Prospect Theory' developed by Kahneman and Tversky (1979). Kahneman and Tversky's model is similar to the expected-utility model with one major difference. That difference is that the probability term is weighted in such a way that small and large probabilities are assigned a heavier weight by decision makers thus accounting for the propensity of people to gamble and buy insurance. "In both cases the rare events—the lottery success or the disastrous property loss—loom larger in the decision maker's mind than the objective probabilities warrant" (Abelson and Levi, 1986: 246). Tversky and Kahneman (1981) also argue that the nature of the value function is such that "the response to losses is more extreme than the response to gains." Thus, they suggest that human decision makers are more concerned with avoiding negative outcomes than acquiring positive outcomes when making risky decisions. This proposition has implications for the present study and will be referred to later.

Tversky and Kahneman (1979: 274) argue that the decision-making process involves two phases: the editing phase and the evaluation phase. In the editing phase the information concerning each "prospect" is simplified and coded, and in the evaluation phase the "prospect" is evaluated and a decision is made.

A final cognitive explanation is reflected in the work of Gray and Tallman (1984) and Tallman and Gray (1987). These researchers have developed a model of decision-making behavior called the satisfaction balance model. The satisfaction balance model can be expressed in its simplest form as follows:

$$a_1/a_2 = (C_2V_1/C_1V_2)^{1/2}$$

where a_1/a_2 is the odds of selecting alternative 1 over alternative 2 in a diadic choice situation, C_1 and C_2 are expected costs associated with each alternative, and V_1 and V_2 are the expected values of these two alternatives, and $1/2$ is a bias term.

One of the important differences between this model and the models discussed previously is the use of the term satisfaction as

opposed to the term utility. This has a couple of important implications. Gray and Tallman (1984:148) define satisfaction as "the ratio of the expected satisfaction resulting from the discrimination made between alternatives and the dissatisfactions from that discrimination." This suggests that a different kind of cognitive process is involved in decision-making than is suggested by the other models. An implication of the utility models is that subjects think in terms of the differences between the expected utilities for each alternative. In other words, an expected-utility is assigned to each alternative by the subject who then compares these alternatives in terms of the difference that exists between them. This difference becomes the basis for the decision that is made. Gray and Tallman's argument that the decision-making process involves considering positive and negative outcomes in ratio terms suggests a less contrived decision-making process. Also, Gray and Tallman's concern with measuring the expected values and expected costs of decision alternatives apart from each other before multiplying them together allows for more theoretical precision and predictive power (see Gray and Tallman, 1984; Stafford, et al., 1986; Gray and Tallman, 1987; Tallman and Gray, 1987).

The implications of this model for risk-taking behavior are that subjects will select a risk-taking alternative (i.e. an alternative with a possible outcome of greater value than an alternative with a less valued but more certain outcome) when the subjects involved believe that satisfaction will be maximized by selecting that alternative. In other words, subjects will select risk-taking alternatives if they believe that satisfaction will exceed dissatisfactions.

The Personality Perspective

Unlike the experimentalists, the personologists do not focus on the cognitive processes involved in making risky decisions. Rather, risk-taking or risk-averse decision preferences are considered to be functions of the decision makers concept of self, motivation and the decision situation (Atkinson, 1957; Atkinson *et al.*, 1960; Covington and Beery, 1976; Janis and Mann, 1977; Seigelman, 1983).

One of the most significant attempts to explain risk-taking behavior from the "personologist view" is the achievement motivation theory developed by Atkinson (1957). Atkinson argues that there are two motives, the first is the motive "to achieve" and the second is the motive to "avoid failure." Atkinson suggests that people who are motivated to achieve, take risks of intermediate difficulty (probability of success), while those who are motivated to

avoid failure select risks with either high or low levels of difficulty. Atkinson states:

...the person in whom the achievement motive is stronger should set his level of aspiration in the intermediate zone where there is moderate risk. To the extent that he has any motive to avoid failure, this means that he will voluntarily choose activities that maximize his own anxiety about failure! On the other hand, the person in whom the motive to avoid failure is stronger should select either the easiest of the alternatives or should be extremely speculative and set his goal where there is virtually no chance for success. These are activities which minimize his anxiety about failure...they are setting their aspiration level either defensively high or defensively low (Atkinson, 1957:364-365).

Those who are more concerned with failure than with achievement would avoid tasks with intermediate levels of difficulty. This is because success is not assured as it is for tasks with high probabilities of success and tasks with high probabilities of failure are not ego threatening. The threat would result from the inability of the subject to assign blame for failure on the level of difficulty or probability of success associated with the task. In situations of intermediate difficulty, the subject would have to blame him or herself for the failure. Thus risk-taking is a function of achievement motivation and risk-aversion is a function of the need to avoid failure (see Atkinson *et al.*, 1960).

Another explanation of decision behavior that focuses on the motivational aspects of decision-making is the conflict model of decision making developed by Janis and Mann (1977). These theorists suggest that risk-taking behavior results from a "functional relationship" that exists between stress and the decision-making process. Janis and Mann (1977:50-51) propose five assumptions that are the foundation of this model.

"Assumption 1: The degree of stress generated by any decisional conflict is a direct function of the goal strivings that the decision maker expects to remain unsatisfied: the more goals expected to be unfulfilled and the more important the needs to which those goals correspond, the greater the stress."

The importance of goals and the expectations that are salient to the decision maker are of central concern. If there are goals that a decision maker needs to attain that may go unfulfilled then the subject will experience high levels of stress. Perhaps the achievement of these goals is necessary to the emotional or biological well-being of the decision maker. Janis and Mann (1977:49) suggest that in situations of high stress such as these the subjects will be motivated to take "protective action." This suggests making decisions in such a way as to minimize perceived threats.

"Assumption 2: When a person encounters new threats or opportunities that motivate him to consider a new course of action, the degree of decisional stress is a function of the degree to which he is committed to adhere to his present course of action."

It should follow that the more emotional the commitment to a given course of action, the greater the stress. Consider, for example, a situation where a researcher has invested a great deal of her life advancing a theory that was created by that researcher. However, an unexpected finding of her most recent research suggests that her theory may offer an inadequate explanation of the phenomena in question. Consequently, this researcher finds herself in a position where she must consider discarding the theory that she has spent much of her professional life advancing in favor of an alternative explanation developed by other researchers. It should be evident that making a decision whether she should discard her theory in favor of an alternative explanation would be associated with high levels of stress. So might the decision to divorce, change careers, or attend a different church. In a situation where a subject must decide whether a new alternative will replace an old one, prior commitments the subject may have developed could lead to high levels of stress when a decision between the two must be considered.

"Assumption 3: When decisional conflict is severe because each alternative poses a threat of serious risks, loss of hope about finding a better solution than the least objectionable one will lead to defensive avoidance of threat cues."

The implications of "defensive avoidance" for decision-making under conditions of risk are discussed by Janis and Mann. When defensive avoidance becomes the dominant tendency:

...the person tries to keep himself from being exposed to communication that might reveal the shortcomings of the course of action he has chosen. A mother and father who had openly disapproved of their daughter's marriage for example, are likely to find that precisely during the period of post-honeymoon disillusionment, when the distraught bride has begun to realize that her parents' dire forecasts about the unscrupulous and exploitative nature of the man she chose to marry are coming true, she has somehow become too busy to visit them or even talk to them over the phone. If unwillingly exposed to an unfavorable comment, the disillusioned person's attention is readily distracted so that the message is not fully absorbed, and its meaning may even be grossly distorted. In any case, the person spends little time thinking about the implications of the unwelcome information (Janis and Mann, 1977:74).

Thus a subject who has yet to make a decision, but, for some reason, perceives that all of the alternatives are threatening will likely select the least objectionable alternative and cope with the negative consequences of this choice by refusing to recognize them.

"Assumption 4: In a severe decisional conflict, when threat cues are salient and the decision maker anticipates having insufficient time to find an adequate means of escaping losses, his level of stress remains extremely high and the likelihood increases that his dominant pattern will be hypervigilant."

When a subject is in a state of hypervigilance, cognitive processes are "disrupted" and the subject has difficulty perceiving, evaluating or acting on choice alternatives. Thus decisions made in situations such as this are often inappropriate and unacceptable. The decision-making processes described here are quite different than the processes which occur when only moderate levels of stress are involved.

"Assumption 5: A moderate degree of stress in response to a challenging threat induces a vigilant effort to scrutinize the alternative courses of action carefully and to work out a good solution, provided the decision maker expects to find a satisfactory way to resolve the decision dilemma."

The implications of this assumption are that in situations where the levels of stress are low the subject will be unlikely to carefully consider all of the alternatives because the situation is of little consequence to the subject. Were this not so the stress level would be higher. On the other hand, when the stress level is extremely high, the subject will not consider the alternative carefully either because of reasons suggested in Assumption 4 concerning hypervigilance. A "moderate degree of stress" will motivate the decision maker to carefully consider all alternatives while not inducing apathy or panic.

These assumptions have important implications for the present research. The main implication is that extraneous factors such as stress, commitment, expectations, perceived alternatives, and affect impact the decision-making process. Some of these factors are situational and others relate to the personality of the subject. The focus of the present research will be on some of the most critical personality and situational factors on the decision-making process under conditions of risk. Chief among these factors that will be discussed in the present research are self-worth, instrumental and expressive parental expectations and sex. A discussion of the effect of self-efficacy is presented elsewhere (see Wyatt, 1989).

Justification for Model to be Tested

Self-worth

There is evidence to suggest that two dimensions of the self-concept, namely self-efficacy and self-worth, may have an impact on the propensity of subjects to engage in risk-taking behavior. As this research will focus on the effects of self-worth on risk-taking behavior, that component of the self-concept will be discussed in detail here.

Gecas and Schwable (1986:38) define self-worth as "the moral aspect of self-evaluation and is typically couched in such terms as being good, worthy, virtuous, and living up to standards of moral conduct. Gecas (1985:11) states, "by virtue of having a self-concept the individual is motivated to maintain and enhance it." In this regard, Ball-Rokeach and her colleagues (1984) contend that the motivation to "maintain" as opposed to "enhance" the concept of self is an important distinction that requires further attention. They state:

...there is an important difference between saying that "Jane is trying to maintain her self-esteem" and "Jane is trying to enhance her self-esteem." Self-esteem can be said to be maintained whenever a person is willing to settle for, or to repeat, or to reminisce about past accomplishments and to be enhanced whenever a person receives satisfaction, pleasure, or gratification by modifying whatever he or she normally believes, says, or does. Maintenance implies that a person is motivated to preserve the status quo regarding self-conceptions or self-presentations and not to lose whatever self-esteem is presently enjoyed (Ball-Rokeach *et al.*, 1984: 20).

One of the behaviors that subjects participate in to "enhance" their feelings of self-worth would be to select a risky alternative where the preferred outcome would be pleasing to the subject. On the other hand, one of the behaviors that subjects participate in to "maintain" their level of self-worth would be to select a risk-averse alternative so as to avoid a potential failure that could be damaging to the subject's self-worth.

In this regard, Covington and Beery (1976) argue that subjects with low levels of self-worth will be likely to engage in behaviors that protect them from failure, while subjects with high levels of self-worth will be more spontaneous and adventurous in their choices and behaviors. This results from subjects with little self-worth engaging in "strategies to avoid failure" while subjects with high levels of self-worth will be motivated to engage in "success oriented" endeavors that are by nature, riskier. The validity of this hypothesis will be assessed in the present research.

Parental Expectations

A set of variables thought to be relevant in explaining risky choices are the expectations subjects perceive their parents have for them. There is general agreement in the socialization literature that parental expectations for a child's performance are a source of considerable stress for the child (Tallman *et al.*, 1983). This should be true especially for adolescents who are beginning to test their competencies in competitive situations. In a risky decision-making situation where a subject might feel that he or she has disappointed significant others if a failure resulted, the subject would likely experience higher levels of stress than in situations where the opposite was true. Consequently, he or she would be less likely to take risks.

In the present research, expectations will be measured in terms of their "instrumental" or "expressive" focus. With the terms instrumental and expressive being borrowed from the functionalist tradition (see Turner, 1982). Instrumental expectations are related to achievement type expectations such as completing a degree, earning good grades and having a successful career. Expressive expectations relate to more affective expectations such as expectations to have the right friends, to marry, to have children and to adhere to religious principles.

Sex

Many researchers have explored the effects of sex on risk-taking behavior. Regarding previous research, the results of some studies indicate that there are no decision-making differences based on the sex of the respondent. For example, Jamieson (1969) found no significant risk-taking differences based on gender for ten to twelve year old children. Arenson (1978) found that while playing games of chance, boys and girls between the ages of 5 and 13 did not differ significantly from each other in regard to the levels of risks that they were willing to accept. Kourilsky and Campbell (1984) reported that while participating in a game involving entrepreneurship, elementary school age boys and girls did not differ from each other in terms of risk-taking preferences.

Theoretical justification for these findings is unclear. In regard to the first study Jamieson (1969:7) stated, "Whether this was a chance result or a function of the age group of the subject is a matter for further research." Regarding all of these studies, it is interesting to speculate about the gender differences that might have occurred had the risks involved different resources and if the

studies had defined and operationalized risk in a more rigorous way. In fact these studies are remarkably ambiguous about their conceptualization of risk.

Despite the findings discussed above, the preponderance of the research findings in this area suggest that males are more risk-taking than females. Block (1983) documents a variety of studies that find males when compared to females have higher levels of achievement motivation, less anxiety, and are more impulsive. These findings have implications for risky decision-making behavior. Atkinson (1957) has shown that those who are motivated to achieve are more likely to take risks. Janis and Mann (1977) suggest that higher levels of anxiety are associated with low levels of risk-taking behaviors. Finally, if males are more impulsive than females they are likely to be more risk-taking as well.

Regarding risk-taking specifically, Ginsburg and Miller (1982) reported that young boys were more risk-taking than young girls. They observed children at a zoo and determined that all things being equal, boys were more likely to ride an elephant than were girls. This supports the cultural stereotype of males being more accepting of risks as a result of the socialization process. Kogan and Dorros (1978) report that when completing the "Dilemmas of Choice Questionnaire" males were more likely to take risk than were females. Finally, Roberts (1975) advancing the work of Atkinson discussed earlier, reported that although both males and females who were motivated to achieve preferred intermediate range risks, females were more cautious in their risk preferences than males, again supporting the cultural stereotype of male risk-taking tendencies.

The implications of the research discussed above are that males tend to be greater risk-takers than females. However, as Wyatt (1988) suggests, it is important to analyze gender based risk-taking preferences in the context of situations where different resources are involved.

Risky Decision-Making Behavior

It is likely that the tendency of subjects to select risk-taking alternatives will depend on the resources that are involved and the characteristics of the decision maker. With regard to resources, the present research shall utilize the typology developed by Foa (1971). Foa argues that there are six resources that subjects exchange. These are: 1) love, 2) goods, 3) services, 4) status, 5) money and 6) information. The present research shall use five of these resources,

eliminating only information. Information is eliminated because it is considered to be a service. This investigation attempts to determine whether these resources have a differential effect on risk-taking.

Summary

In summary, the present research proposes that the additive effects of the variables that comprise this model will increase the ability to accurately predict the choice preferences of subjects compared to models that do not include these variables. It further predicts that this will hold for the risky decision situations involving all five resources utilized in this study. However, the argument will be that the improvements in prediction ability will be greater when the decision situations involve resources with emotional components as opposed to resources without emotional components. This is because measures of self-concept and parental expectations relate directly to situations where failure would be most threatening to the subject's concept of self, such as situations involving love and status.

In terms of each variable, this research hypothesizes that risk-taking preferences will increase as the self-worth of the subjects increases. Also risk-taking preferences will decrease as parental expectations increase. Finally, males will have higher risk-taking rates than females.

METHODOLOGY

In this section a discussion of and justification for the methods used in conducting this research are presented. The main focus of this study centers on testing the model represented by the following equation:

$$\text{Log}(P_{d1}/(1-P_{d1})) = \alpha + B_{se}SE + B_{sw}SW + B_{ie}IE + B_{ee}EE + B_sS + U$$

where $P_{d1}/(1-P_{d1})$ are the odds of the subjects selecting d1 (the risk-taking alternative) as opposed to d2 (the risk-avoiding alternative), B_i is the parameter for the i th variable, SE is the subjects' self-efficacy, SW is the subjects' self-worth, IE are the subjects' perceived instrumental parental expectations, EE are the subjects' perceived expressive parental expectations, S is the subjects' reported sex, and U is a residual term. The model specifies that selecting the risk-

taking or risk-avoiding alternative results from an additive relationship between self-efficacy, self-worth, instrumental parental expectations and expressive parental expectations and sex. Presented below is a discussion of how the data were gathered, how each of the variables listed in the equation were created, and how the data were analyzed to test the utility of the model in predicting decision-making behavior under conditions of risk.

Data Collection

The data for this study were collected by administering a questionnaire to 682 undergraduate students at Washington State University during the Fall of 1987. The students were enrolled in 100 level geology and sociology courses. These courses were selected because they fill General University Requirements (GUR's) necessary for graduation and thus attract a large and diverse segment of the university population. The questionnaire was completed by the subjects in the classroom during class time. The students were informed that participation in the study was voluntary and that the information they provided would be confidential. They were also informed that they could skip any questions that they would rather not answer.

Prior to collecting the data, approval was obtained from the Chair of the Department of Sociology of Washington State University. This was done in compliance with University procedures regarding human subjects in social research. The questionnaire was also pretested to insure that the subjects would correctly understand the questions and be able to complete the questionnaire in a timely manner. The questionnaire can be found in the Appendix.

Variable Measurement and Construction

Dependent Variables

The questionnaire consisted of seven questions that required the subjects to make decisions where there were two alternatives with outcomes having known probabilities. One of these alternatives was risk-taking and the other a risk-avoiding alternative. Additionally, the questions reflected the different resources that are generally thought to be of value to decision makers. These are love, goods, services, status and money. Each of these resources were included in at least one of the questions. The responses to these questions comprise the dependent variables of this study.

The first decision-making situation in the questionnaire related to love. It is as follows:

1) You feel the need for an intimate relationship with a member of the opposite sex. You decide to consider the people who you know that you feel you could fall in love with. The first person is very attractive, but, you estimate that there is a 40% chance that this person will back out on you if you get involved in a serious relationship. The second person is also attractive, though not as attractive as the first, but there is only a 20% chance of backing out if you get involved in a serious relationship. After thinking about which of these two people to cultivate a relationship with, you decide:

A) to seek to develop a relationship with the first person, who is very attractive but also has a 40% chance of backing out.

B) to seek to develop a relationship with the second person, who is also attractive, though not as attractive as the first, but has only a 20% chance of backing out.

In this situation, both potential partners are attractive, however, one is clearly more attractive than the other. The degree of attractiveness, holding other qualities equal, establishes the "very attractive" person as being more valued. That is to say, if the known probabilities of having a successful relationship with either of these people were equal and their other personal qualities were the same, the subjects would probably all select the more attractive person. However, there is a 40% chance that the "very attractive" person will back-out, while there is only a 20% chance that the less attractive person will back out. Thus, Alternative A is the risk-taking alternative and Alternative B is the risk-avoiding alternative.

Question 2 required the subjects to make a risky decision where a "good" was involved. This question is as follows:

Because you are sick of washing dishes you decide to buy a dishwasher. After shopping around you have narrowed your choice to two dishwashers. The first dish-washer costs \$360.00 and has a one year warranty. The second dishwasher costs \$310.00 and has a 6 month warranty. As near as you can determine these dishwashers are the same. You determine that there is a 20% chance of having trouble with either of these dishwashers 6 months to 1 year after you have made the purchase. However, if by chance problems did arise during that time period the first dishwasher would be covered by the warranty. You give the matter some thought and decide to buy:

A) the first dishwasher that costs \$360.00 and has a 1 year warranty.

B) the second dishwasher that costs \$310.00 and has a 6 month warranty.

Here the element of risk concerns a good, namely a dishwasher, that may or may not need fixing between 6 months and 1 year after it is purchased. Regardless of the dishwasher purchased, there is a 20% chance that it will need maintenance during that time period. Thus purchasing the less expensive dishwasher does not increase the probability of having problems - it merely

saves money. Similarly, purchasing the more expensive dishwasher does not decrease the probability of having problems with the dishwasher - it means that if problems occur they will be covered. The risk-taking alternative was to purchase the less expensive dishwasher and save money while hoping that maintenance problems don't arise after the warranty expires.

The third question required the subjects to make a decision involving a service.

You are interested in buying health insurance to protect yourself in case of accident or illness. The premium for the first policy that you consider is \$75.00 per month and will provide coverage for injuries resulting from accidents and a variety of common illnesses. The premium for the second policy that you consider is \$90.00 per month and will provide coverage for everything provided by the first policy. However, this second policy also provides coverage for a few additional illnesses that are rare but quite serious. You determine that the odds of contracting one of those illnesses is 1 in 200. Which will you buy?

A) You decide to buy the first policy with a \$75.00 per month premium.

B) You decide to buy the second policy with a \$90.00 per month premium which covers a few additional rare but serious illnesses.

This question focuses on a service that will protect the subject in case of illness or injury with the more expensive policy covering illnesses that are rare but serious. Will the subject risk purchasing the lower quality policy or pay the higher premium for the policy with better coverage, particularly when the chance of contacting one of these rare illnesses is known? Because of the value associated with \$15.00 that will be saved, combined with the likelihood of contracting one of these rare illnesses, a decision to purchase the first policy represents risk-taking behavior.

The fourth question required the subjects to make a risky decision involving status. The question is as follows:

Having been a member of the student body of a major university for quite some time you are aware of the high esteem that the leaders of the student body acquire as a result of their positions. For example, you can see that many of these student leaders receive a lot of respect from a variety of people because of the positions that they hold and consequently, are often offered important jobs after graduation. However, losing an election would be very embarrassing to you and if you lost you would have a great deal of difficulty facing your friends. Election time is approaching and you contemplate running for office. You estimate that you have a 40% chance of becoming student body president. After giving the matter serious thought you decide:

A) to run for student body president with a 40% chance of winning.

B) not to run for student body president so as to avoid the substantial chance of losing and suffering the embarrassment that would result.

Based on the information presented in the question, subjects would choose to risk running for office because they hope to win the election and thus increase their status. On the other hand, those who decided not to risk running for office would do so out of a desire not to lose status should they be defeated.

The remaining three questions (5, 6 and 7) focus on risk involving money as the central concern. A variety of studies have explored risky decision-making where money is the focus of the question (see Kogan and Wallach, 1967, Kahneman and Tversky, 1979, and Tversky and Kahneman, 1981). Consequently, in the present study the subjects are confronted with a variety of questions where the probabilities associated with the possible outcomes varied so as to attempt to establish a threshold where identical amounts of money illicit risk-taking or risk-avoiding responses. Question 5 presents the subject with significant chances of winning significant amounts of money and small chances of losing small amounts of money. This question is as follows:

You are required to make a decision in a situation of risk where you must choose between one of the two following options. Option A provides you with a 50% chance of winning \$1,000.00 and a 50% chance of losing \$50.00, while Option B provides you with a 65% chance of winning \$500.00 and a 35% chance of losing \$50.00. Will you choose

- A) Option A
- B) Option B

Will the subject risk a 50% chance of winning \$1,000.00 with a 50% chance of losing \$50.00 instead, or will the subject choose the less risky option that provides them with the 65% chance of winning only \$500.00 and a 35% chance of losing \$50.00.

Question 6 is similar to question 5 except for a slight change in the probabilities and the absence of punishment. The risk involves going for the higher amount of money with the lower probability of success.

You are required to make another choice in a situation where you must choose between one of the two following options. Option C provides you with a 65% chance of winning \$1,000.00 and a 35% chance of winning nothing, while Option D provides you with an 80% chance of winning \$500.00 and a 20% chance of winning nothing. Will you choose:

- A) Option C
- B) Option D

As with question 6, question 7 does not present the subject with the possibility of losing money. However, the probabilities of win-

ning are much lower, particularly for the option associated with the greatest amount of money.

You are required to make a choice between one of the following options. Option E provides you with a 30% chance of winning \$1,000.00 and a 70% chance of winning nothing, while Option F provides you with a 40% chance of winning \$500.00 and a 60% chance of winning nothing.

Will you choose:

- A) Option E
- B) Option F

Will the subjects be more, or less, likely to take risks if the probabilities of winning are much lower?

Discussion

The questions described above reflect hypothetical situations. The respondents were asked to reflect on how they believed they would choose if they were actually in the situations presented by the questions (see Table 1). The variations in the responses suggested that, despite the hypothetical nature, the conditions of risk presented in the questions had meaning for the respondents.

Some have argued that social scientists concerned with risky decision-making behaviors must put subjects in conditions of real as opposed to hypothetical risk in order to have valid findings. However, when this has been attempted the results have not differed noticeably from studies in which subjects made hypothetical choices (see Kogan and Wallach, 1967: 139-143).

Table 1
Distribution of the Marginals for each Questions

Question	Risk-taking	Risk-avoiding
1. Love	246(37%)	417(63%)
2. Good	246(38%)	408(62%)
3. Service	474(70%)	199(30%)
4. Status	540(81%)	130(19%)
5. Money/Punish	480(70%)	202(30%)
6. Money/High	325(48%)	350(52%)
7. Money/Low	383(57%)	291(43%)

Independent Variables

Self-Worth

Self-worth was measured using an instrument developed by Gecas (1971) and Gecas and Schwalbe (1986). When completing this portion of the questionnaire the subjects were required to in-

dicating how they rate themselves on a continuum in terms of a variety of qualities. Six of these qualities were measures of self-worth. They are described by the terms, honest, good, kind, dependable, tolerant, and generous. The responses for each item were coded from 1 to 7 as the scale for each item had 7 categories. For example, if a subject indicated that he or she was very honest that response would have been coded as a 7. If this subject indicated that he or she was average that response would have been coded as a 4. If the subject indicated that he or she was very dishonest that response would have been coded as a 1. The means and standard deviations for each of these qualities are presented in Table 2. After the responses were coded for all subjects, confirmatory factor analysis was performed to insure that the items in the instrument measured the two dimensions of self-concept that will be used in this study. The results confirmed that the instrument measured the two dimensions of self-concept with the self-efficacy qualities loading onto one factor and the self-worth qualities loading onto the other factor (see Table 3). The self-worth variable was the summed total of the 6 items that measured self-worth. The mean for this variable was 33.31 and the standard deviation was 4.23. The means for these variables did not differ significantly based on the sex of the respondent.

Table 2
Means and Standard Deviations for Measures of
Self-efficacy and Self-worth

<i>Quality</i>	<i>Mean</i>	<i>Standard Deviation</i>
Powerful/powerless	4.827	0.964
Conf/lacks conf	5.212	1.243
Strong/weak	5.801	1.178
Attract/unattract	5.801	1.178
Wise/foolish	5.025	0.978
Brave/cow	5.115	1.068
Honest/Dis	5.728	1.007
Good/bad	5.622	0.963
Kind/cruel	5.723	1.031
Depend/undep	5.862	1.046
Toler/untoler	4.997	1.391
Generous/Selfish	5.378	1.131

Instrumental and Expressive Parental Expectations

These variables were measured by asking the subjects to indicate how strong the expectations that each of their parents had

Table 3
Factor Analysis Results-Self-efficacy
and Self-worth: Varimax Rotation

<i>Quality</i>	<i>Self-efficacy</i>	<i>Self-worth</i>
Powerful/powerless	0.789	-0.064
Conf/lacks conf	0.698	0.174
Strong/weak	0.803	0.045
Attract/unattract	0.581	0.124
Wise/foolish	0.492	0.412
Brave/cow	0.630	0.183
Honest/Dis	0.123	0.661
Good/bad	0.196	0.694
Kind/cruel	0.062	0.729
Depend/undep	0.207	0.580
Toler/untoler	-0.95	0.542
Generous/Selfish	0.150	0.551

for them in eight different areas. Four of the eight areas reflected perceived instrumental expectations. These were expectations "to get good grades," "to develop my talents to the fullest," "to complete my degree," and "to have a successful career." The remaining four areas reflect perceived expressive expectations. These areas were "to have the right kinds of friends," "to get married to the right person," "to have children after marriage," and "to adhere to religious principles."

In each of these eight areas the subjects were to indicate how high their fathers' (or step-fathers') and then their mothers' (or step-mothers') expectations were for them. These variables were measured in a manner similar to the way the self-concept variables were measured. A continuum was created and the subjects indicated where they would put the expectations that their parents had for them. The responses were coded from 1 to 7 with 7 being "very high" and 1 being "very low." The means and the standard deviations for each of these 8 items are reported in Table 4. Confirmatory factor analysis was performed and the results confirmed that the eight perceived parental expectations for each parent, do in fact, load onto 2 factors with the 4 items that reflected instrumental expectations loading onto 1 factor and the 4 items that reflected expressive expectations loading onto the other factor (see Table 5).

Because the variable that I desired to create is perceived parental expectations each of the 8 items for each parent were added together.

Table 4
Means and Standard Deviations for Expectations

<i>Expect</i>	<i>Mean</i>	<i>Standard Deviation</i>
Father		
Grades	5.535	1.190
Talents	5.841	1.163
Degree	6.117	1.166
Career	5.801	1.178
Friends	5.047	1.399
Married	5.224	1.436
Children	4.417	1.437
Religion	3.845	2.011
Mother		
Grades	5.728	0.994
Talents	6.012	0.974
Degree	6.106	1.040
Career	5.975	1.038
Friends	5.556	1.258
Married	5.844	1.210
Children	5.118	1.442
Religion	4.541	1.990

Confirmatory factor analysis was again performed and again all the items for the combined parental expectations variable loaded on two factors. The instrumental items comprised 1 factor and the

Table 5
Factor Analysis-Instrumental and Expectations: Varimax Rotation

<i>Expect</i>	<i>Instructional</i>	<i>Expressive</i>
Father		
Grades	0.847	0.045
Talents	0.767	0.120
Degree	0.802	0.185
Career	0.707	0.277
Friends	0.466	0.637
Married	0.325	0.760
Children	0.087	0.789
Religion	0.009	0.707
Mother		
Grades	0.817	0.120
Talents	0.742	0.165
Degree	0.790	0.107
Career	0.764	0.168
Friends	0.328	0.722
Married	0.290	0.762
Children	0.020	0.735
Religion	0.039	0.621

Table 6
Factor Analysis Results-combined: Varimax Rotation

<i>Combined Parent</i>	<i>Instructional</i>	<i>Expressive</i>
Grades	0.845	0.070
Talents	0.766	0.160
Degree	0.787	0.144
Career	0.747	0.224
Friends	0.416	0.685
Married	0.373	0.741
Children	0.056	0.772
Religion	0.010	0.710

expressive items comprised the other factor (see Table 6). The instrumental parental expectations variable was the summed total of the 4 items that measured instrumental expectations. The mean for this variable was 47.10 with a standard deviation of 5.88. The expressive parental expectations variable was the summed total of the 4 items that measured expressive parental expectations. The mean for this variable was 39.59 with a standard deviation of 7.92. There were no significant differences between the means of these variables based on the sex of the subjects. There was a positive correlation between instrumental parental expectations and the subjects' family income level ($r = 0.12$, $p \leq 0.001$). Nass and McDonald (1982:346) report that low income families have low expectations for their children. This finding, coupled with the small but significant positive correlation between income and instrumental expectations reported above, offers weak support for the validity of the instrumental expectations variable.

Sex

The sex of the subjects was included in this study. Of the 682 subjects who participated in the study 324 (47.5%) indicated they were male and 352 (51.6%) indicated they were female.

Analysis Techniques

The data were analyzed in two phases. The purpose of each phase was to assess the utility of the model presented in this study in predicting how subjects will make decisions under conditions of risk.

The purpose of the first phase was to assess whether or not the model presented in this study offers an improvement in the ability to predict how subjects will make risky decisions over a prediction based on the distribution of the marginals. Predictions based on the

distribution of the marginals represent the best rate of prediction that could be expected from any model that does not include personality or other such variables. This rate of prediction establishes a baseline that will be used to assess whether the model being tested can add to the ability of cognitive models to predict choice behavior. If prediction rates based on the model do not exceed this baseline, then one must conclude that this model offers little in terms of explaining decision-making behavior under conditions of risk. This would suggest that a model that does not include these variables is as good, if not better, than the model presented here. The probability of correctly predicting how subjects will make risky decisions based on the distribution of the marginals is determined using the following formula:

$$\left(\frac{N_1^2 + N_2^2}{N_1 + N_2} \right) \times 100$$

where N_1 was the number of times alternative 1 was selected and N_2 was the number of times alternative 2 was selected. After determining how often correct choices can be predicted based on the distribution of the marginals, these predictions will be compared with predictions based on the model presented in this research. Predictions based on this model will be obtained by running discriminant analysis on the model for all seven questions. Part of the output given when this program is run is the number of times the computer correctly predicts how subjects will make decisions based on the model presented. The percentage of correct predictions acquired here will be compared with those based on the distribution of the marginals. The significance of the differences in prediction between the model and the distribution of the marginals will be determined by conducting a difference in proportions test described by Blalock (1979).

If the model offers improvement in the ability to predict choice alternatives selected by the subjects, it will be necessary to determine the strength, direction and significance of the individual variables included in the model on decision-making under conditions of risk. This phase of the work will require the use of logit analysis. Logit analysis is appropriate because the assumptions of this technique are consistent with the model being tested in this study (see Aldrich and Nelson, 1984). An analysis of the Pearson's correlation coefficients for the independent variables suggests that although some of the independent variables are related to each other the collinearity problem is minimal (see Table 7).

The logit model will be run for each of the seven questions. The coefficients produced by this model are in the form of a log of an

Table 7
Pearson's Correlation Coefficients for Independent Variables

	SE	SW	IE	EE
SE	1.0000			
Sign.	0.0000			
SW	0.3622	1.0000		
Sign.	0.0001	0.0000		
IE	0.2195	0.1742	1.0000	
Sign.	0.0001	0.0000	0.0000	
EE	0.1332	0.1872	0.4175	1.0000
Sign.	0.0005	0.0001	0.0001	0.0000
Mean	30.03	33.31	47.10	39.59
STD	4.31	4.23	5.88	7.92
N	682	682	682	682

odds ratio. Therefore, these coefficients will be transformed by taking the exponential of the coefficient which is a simple odds ratio. The odds ratio by its composition, indicates the direction and strength of the effects of the given independent variable on the dependent variable. If the odds ratio is greater than 1, that indicates that there is a positive relationship between that independent variable and the dependent variable. If the odds ratio is less than 1, that indicates a negative relationship between the independent variable and the dependent variable. The chi-squared given in the output will be used to determine statistical significance. The .05 level is specified as the critical level.

FINDINGS

The first phase of the analysis will compare predictions based on the distribution of the marginals with predictions based on the model. Then, the results of the logit analysis for specific questions will be presented.

Prediction Comparisons

The results of the prediction comparisons are summarized in Table 8. The first risky decision-making situation required the subjects to choose between a "very attractive" person who has a 40% chance of backing out of the relationship and a person who was described as being "not as attractive" but has a 20% chance of backing out of the relationship. Of the 663 subjects who answered this question, 417 selected the less attractive but less risky person

while only 246 of the subjects chose to risk a relationship with the "very attractive" but riskier person. Based on this information accurate predictions could be expected 53.3 percent of the time. This represents the best possible rate of prediction that could be expected based solely on the distribution of the marginals of the dependent variable. However, predictions obtained from discriminant analysis based on the model presented in this study were correct 61.5% of the time.

Table 8
Prediction Comparisons

Questions	base line	Model	Difference	Z Score	Probabilities
1. Love	53.3	61.5	8.2	4.32	0.0001
2. Good	53.1	57.7	4.6	2.44	0.0208
3. Service	58.3	52.4	-5.9	-3.10	0.0033
4. Status	68.7	63.1	-5.6	-3.11	0.0032
5. Mon/pun	58.0	56.8	-1.2	-0.63	0.3292
6. Mon/high	50.7	53.0	2.3	1.21	0.1919
7. Mon/low	50.9	56.8	5.9	3.12	0.0031

Thus, predictions produced by the model provided an 8.2% improvement ($61.5\% - 53.3\% = 8.2\%$) over predictions based on the distribution of the marginals in the ability to correctly predict which decision alternative the subjects selected. This difference was statistically significant.

Predictions based on the distribution of the marginals could be expected for question 2, which focused on purchasing one of two dishwashers, 53.1% of the time. Predictions based on the model were correct 57.7 percent of the time for a significant 4.6% improvement.

Accurate predictions based on the distribution of the marginals could be expected for question 3 which focused on a service (the decision involving the purchase of one of two insurance policies) 53.3% of the time. Predictions based on the model did not significantly differ from predictions based on the distribution of the marginals. Thus, the explanatory ability of the model was insignificant for this question.

The results for question 4, though statistically significant, ran contrary to the hypothesis. Predictions based on the distribution of the marginals could be expected 68.7% of the time. This high level of prediction is because a large percentage of the subjects chose to run for student body president and risk the substantive chance of being defeated as opposed to choosing not to run. Predictions based

on the model produced accurate predictions 63.1% of the time. This represented a 5.6% decrease in prediction ability. Thus, predictions based on the model are significantly less accurate than predictions based on the distribution of the marginals. The implications of this finding will be discussed later.

For question 5, where the subjects were required to choose between an alternative with a 50% chance of winning \$1,000.00 and a 50% chance of losing \$50.00, and an alternative with a 65% chance of winning \$500.00 and a 35% chance of losing \$50.00, predictions based on the distribution of the marginals could be expected 57.9% of the time. Predictions of choice behavior based on the model were not significantly different from this rate of prediction.

For question 6, where the subjects were required to choose between an alternative with a 65% chance of winning \$1,000.00 and a 35% chance of winning nothing, and an alternative with an 80% chance of winning \$500.00 and a 20% chance of winning nothing, predictions based on the distribution of the marginals could be expected 50.1% of the time. Predictions based on the model did not differ significantly from this rate of prediction.

Finally, for question 7, where the alternatives of winning either \$1,000.00 or \$500.00 were 30% and 70% respectively, predictions based on the distribution of the marginals were 50.9%. However, predictions based on the model were produced 56.8% of the time. Thus, predictions based on the model represent a 5.9% improvement on what could be expected if decision predictions were based on the distribution of the marginals.

Summary of Prediction Comparisons

For three of the seven questions, the predictions based on the model produced rates of prediction that surpassed expected rates of prediction based on the marginal distribution. These three questions focused on risks involving love, goods, and a gamble for money with a low probability of winning. For two of the seven questions, expected predictions based on the marginal distribution exceeded predictions based on information provided by the model. These questions focused on services and status. The results for these two questions suggest that cognitive models of choice behavior based on no other information except the distribution of the marginals for the dependent variable surpass the model for prediction accuracy for these two questions. The rate of prediction for the remaining two questions, focusing on gambles for money with probabilities of being punished and gambles for money in-

volving high probabilities of winning, did not differ for either marginal or model based predictions. Thus, the information provided by the model was of little value for these two questions.

Logit Analysis Results

In this section the logit analysis results will be presented and interpreted. The presentation will focus on the results for questions where predictions based on the model surpassed predictions based on the distribution of the marginals (see Table 8). However, other results will be discussed that warrant attention. Attention will center on the effects of self-worth, instrumental and expressive parental expectations, and sex.

Question 1 - Love

For this question, predictions of decision-making behavior surpassed predictions based on the distribution of the marginals by a significant 8.2%. This suggests that a knowledge of the specific effects of the independent variables in the model adds to the ability to correctly predict the alternative subjects select for this question (see Table 9). The self-worth coefficient had a significant effect on risk-taking. This coefficient was 0.94, which suggests that a single unit increase in self-worth, while controlling for the other variables, changes the odds of selecting the more attractive but risky partner by a factor of 0.94.

Table 9
Logit results - Question 1

Variable	Odds Ratio	Chi-square	Significance
Self-worth	0.94	9.08	0.0026
Instrumental	1.01	0.66	0.4171
Expressive	1.01	0.86	0.3550
Sex	0.44	22.81	0.0001

The inverse value of 0.94 is 1.06 and is easier to interpret. This value is interpreted by saying that a unit increase in self-worth increases the odds of selecting the risk-avoiding alternative for this question by a factor of 1.06. This knowledge of self-worth assists in the ability to correctly predict which alternative the subjects will select when making this decision. However, the inverse relationship between self-worth was contrary to the hypothesis stated earlier. Finally, the sex of the decision-maker appears to be important. This coefficient was 0.44 which is interpreted to mean that be-

ing female as opposed to male changes the odds of selecting the more attractive but risky partner by a factor of 0.44. The inverse of 0.44 is 2.27 which suggests that being male as opposed to female increases the odds of selecting the "very attractive" but risky person by a factor of 2.27. Neither instrumental or expressive parental expectations produced coefficients with significant effects.

Question 2 - Goods

Although the percentage of predictions for this question based on the model surpassed the expected percentage of accurate predictions based on the distribution of the marginals by a statistically significant 5.5%; none of the coefficients were significant (see Table 10).

Table 10
Logit results - Question 2

Variable	Odds Ratio	Chi-square	Significance
Self-worth	0.99	0.09	0.7691
Instrumental	0.98	2.61	0.1065
Expressive	0.99	1.33	0.2490
Sex	0.76	2.89	0.0907

It is of interest, however, that this question which posed a choice between an expensive dishwasher with a one year warranty and a less expensive dishwasher with a six month warranty indicated that sex yielded the strongest, albeit not statistically significant, influence. Being male as opposed to female appeared to increase the odds of purchasing the less expensive but riskier dishwasher by a factor of 1.32.

Question 3 - Services

The results for this question indicated the predictive ability is increased if predictions are based on the distribution of the marginals. Furthermore, none of the variables had a significant impact on risk-taking or risk-avoiding behavior (see Table 11).

Table 11
Logit results - Question 3

Variable	Odds Ratio	Chi-square	Significance
Self-worth	0.97	1.34	0.2475
Instrumental	0.99	0.79	0.3734
Expressive	0.99	0.06	0.8054
Sex	1.28	1.98	0.1647

Question 4 - Status

The probability of accurately predicting how subjects would make this decision was increased by 5.6%, if the predictions were based on a knowledge of the distribution of the marginals as opposed to a knowledge of the variables that comprise the model. Furthermore, none of the specific variables that are the focus of this study were significant (see Table 12). Nevertheless, the largest of the coefficients and the only one that approached statistical significance was sex. This finding suggests that males are more risk-taking than females when status is involved.

Table 12
Logit results - Question 4

Variable	Odds Ratio	Chi-square	Significance
Self-worth	1.01	0.08	0.7708
Instrumental	1.01	0.30	0.5849
Expressive	1.00	0.12	0.7332
Sex	0.76	1.71	0.1912

Question 5 - Money/punishment

Predictions based on the model did not differ significantly from predictions based on the distribution of the marginals. Once again none of the variables that are the focus of this study had a significant effect (see Table 13).

Table 13
Logit results - Question 5

Variable	Odds Ratio	Chi-square	Significance
Self-worth	0.99	0.97	0.3259
Instrumental	1.00	0.01	0.9170
Expressive	0.99	0.38	0.5360
Sex	1.12	0.39	0.5334

Question 6 - Money with high probability of success

Predictions based on the model did not differ significantly from predictions based on the distribution of the marginals. Furthermore, none of the independent variables had significant effects on the propensity to take or avoid risks (see Table 14).

Question 7 - Money with a low probability of success

This question, where the subjects were required to decide between an alternative with a 30% chance of winning \$1,000.00 and

Table 14
Logit results - Question 6

Variable	Odds Ratio	Chi-square	Significance
Self-worth	0.98	0.88	0.3470
Instrumental	1.01	0.10	0.7542
Expressive	1.01	0.04	0.8448
Sex	1.03	0.04	0.8462

an alternative with a 40% chance of winning \$500.00, produced results indicating that accurate predictions based on the model being tested could be expected 5.9% more often than predictions based on the distribution of the marginals. Furthermore, two of the variables produced significant coefficients. A one unit increase in self-worth changed the odds of selecting the risky alternative by a factor of 0.95. The inverse of 0.95 is 1.05. This indicates that each unit increase in self-worth increases the odds of the subjects selecting the risk-avoiding alternative (a 40% chance of winning \$500.00) by a factor of 1.05. Finally, being male as opposed to female increased the odds of selecting the risky alternative with a 30% chance of winning \$1,000.00 by a factor of 1.43 - the inverse of 0.70. The logit results for the equation are reported in Table 15 below.

Table 15
Logit results - Question 7

Variable	Odds Ratio	Chi-square	Significance
Self-worth	0.95	5.77	0.0163
Instrumental	1.01	0.19	0.6639
Expressive	1.00	0.13	0.7190
Sex	0.70	4.72	0.0298

Summary of Logit Analysis Results

Predictions produced by the model differed significantly from predictions based on the distribution of the marginals for five of the seven questions. In three of those five cases the model improved on the percentage of accurate predictions. This suggests that for these three questions (1-involving the selection of a mate, 2-purchasing a dishwasher and 7-gambling for money with a low probability of winning) the model will produce more accurate predictions than can be expected from a model based solely on the distributions of the marginals. For two of these five questions (5 and 6 both invol-

ing gambles for money) the model did not offer improvement of prediction accuracy over predictions based on the distribution of the marginals. This suggests that for these two questions, the possibility exists that extraneous variables may be less salient and therefore, less likely to contribute to explaining decisions behavior. Finally, for the remaining questions (3-involving the purchase of insurance and 4-running for student body president) the predictions produced by the model tested here, produced less accurate predictions than what a decision model that does not include variables such as these could be expected to produce. These issues will be considered in more detail.

Increases in self-worth were negatively associated with the propensity of subjects to take risks for two of the seven questions (1 and 7). The direction of this association was opposite that hypothesized. Instrumental and expressive parental expectations had no effect on the propensity of the subjects to take or avoid risks. Thus, the hypotheses concerning these two variables were not confirmed. Finally, there was solid evidence suggesting that the sex of the respondent affects decision-making with males being more inclined to take risks than females on questions 1 and 7.

DISCUSSION

In the previous section, the utility of a model based on self-concept, parental expectations and sex for predicting risk-taking, as opposed to risk-avoiding behavior was assessed. In this section the findings will be examined in more detail and their implications for future research will be considered. The general conclusions that can be drawn from this research about the choice preferences that the subjects made will be explored. Then, how well the model functioned overall will be discussed, as well as for each question. Finally, the implications of these findings for further studies of risk-taking behavior will be discussed.

Risk-taking and Risk-avoiding Preferences

The subjects exhibited preferences for the risk-avoiding alternatives on three questions and preferences for risk-taking alternatives on the remaining four questions (see Table 1). Some comparisons of these data are noteworthy. For question 1, 417 (63%) of the subjects selected the less risky and less attractive person to develop a relationship with while only 130 (19%) selected the less risky alternative of not running for student body president posed in question 4. This finding is interesting given that the probability of

success with the risk-taking alternative was 20% greater for question 1 than for question 4. Two possible explanations for this outcome are discussed below.

The first explanation pertains to the differing ways that the questions were structured, Kahneman and Tversky (1984) suggest that the decision preferences of subjects are influenced by the way the questions were "framed" by the subjects. They state, "the possible outcomes of a gamble can be framed as either gains of losses." When a question refers to the probability of winning, the subject thinks about winning and assigns a higher weight to the probability of winning. When a question refers to the probability of losing the subject thinks about losing and assigns a higher weight to the probability of losing. While answering question 1 the subjects learned that there was a 40% chance that the "very attractive" partner would "back out" while with question 4 the subjects learned that there was a 40% chance that they would "win." Thus, the way that success and failure are embedded in a question has implications for the manner in which the decision maker evaluates the alternatives. The second explanation for this finding is that rejection by a handsome or beautiful person with whom one is intimately involved could have been more threatening to the subject than rejection in a less personal election. This latter explanation speaks to the important issue of assessing the different magnitudes of value attached to these choices. Unfortunately, as yet there is no adequate basis for assessing the relative magnitudes of value afforded to various resources.

Another interesting comparison involves the distribution of the responses for questions 6 and 7. For both of these questions the subjects were presented with alternatives with probabilities of winning \$1,000.00 or nothing. These probabilities are lower than the probabilities of winning \$500.00 or nothing. For question 6, where the probabilities of winning either amount are high (80% for \$500.00 and 65% for \$1,000.00) the subjects were more risk-avoiding than risk-taking. However, for question 7 where the probabilities of winning either amount were much lower (30% for \$1,000.00 and 40% for \$500.00), the subjects were more risk-taking than risk-avoiding. Why was this the case? A possible explanation is that when the probabilities of winning either amount were high, the subjects were motivated to be more risk-avoiding because of the substantial chance of at least winning the \$500.00. On the other hand, when the probabilities of winning either amount were low, the subjects exhibited more risk-taking tendencies because they

were doubtful of winning anything and thus had little to lose by gambling on the more rewarding but risky alternative. This reasoning is similar to the argument made by Tversky and Kahneman (1981:454). They suggest, "low probabilities are overweighted and high probabilities are underweighted, and the latter effect is more pronounced than the former." They argue that this tendency accounts for the decision made by many to gamble and buy insurance.

Discussion of the Results

The purpose of this study was to test a logit model comprised of personality related variables for predicting risk-taking and risk-avoiding decision-making behaviors. The focus of the study centered on testing whether the additive knowledge of self-efficacy, self-worth, instrumental and expressive parental expectations and sex would increase predictive ability over models that do not include variables such as these. The results indicate that the model, in general, did not work. However, a number of the variables had effects in specific instances that are worthy of discussion. Self-efficacy had a significant effect on decision making for four of the seven questions, however, as stated earlier the significance of this variable is reported and discussed elsewhere (Wyatt, 1989). Self-worth had a significant effect on decision making for question 1 and question 7. Ironically, the impact of this variable was contrary to the stated hypothesis. Thus, an unexpected finding was that increased levels of reported self-worth were associated with decreased probabilities of risk-taking. These findings suggest that the proposed theoretical explanation of the relationship between self-worth and risk-taking was misleading. Thus, a post-datum re-analysis seems in order.

It was suggested earlier that subjects with high levels of reported self-worth would be more risk-taking than those with lower levels of self-worth. This was because both groups of subjects would desire the more valued but more risky outcome, while the subjects with higher levels of self-worth would be less threatened by failure than those with lower levels of self-worth. These results suggest that this is not so. An alternative explanation relies on a more careful assessment of self-worth. Gecas (1986) suggests that persons with high levels of self-worth would be motivated to engage in risk-avoiding behaviors while subjects with lower levels of self-worth would be more risk-taking either to validate themselves or because they have less to lose. Consequently, sub-

themselves to greater levels of risk to acquire these outcomes. This reasoning is consistent with the scarcity principle of social exchange theory proposed by Homans (1972). Homans suggests that rewards are more valuable to subjects who need rewards the most (see Turner, 1982:222-226). Finally, it is important to note that while self-efficacy and self-worth are positively related to each other (see Table 2) they have different effects for decision-making behavior (Wyatt, 1989). This offers some support for Gecas' (1971) argument that these variables are "related" but "conceptually distinct."

In terms of sex, these findings offer support for the argument that males are more inclined to be risk-takers than are females. This particular finding is consistent with research done by Walster *et. al.*, (1973). The implications of this research are that males desire relationships with attractive women. Also, males can afford to be more risk-taking in situations involving love because if failure results, males are free to approach another partner—an option generally not available to females. Thus, females are more cautious in situations involving love. Being male as opposed to female also increased the odds of selecting the alternative with a 30% chance of winning \$1,000.00 as opposed to the alternative of a 40% chance of winning \$500.00 posed in question 7.

Conclusions

The results suggest that although the model did offer significant improvement in predictive ability over predictions based on the distribution of the marginals for some questions, the most important determinant of risk-taking behavior seems to be the probabilities associated with each alternative. That is to say, the model improved on predictive ability for those questions where the probabilities were such that the marginals were evenly distributed (see Table 8). Thus, for questions where the marginals are evenly distributed, the predictive ability of decision models will likely be improved if personality-related variables are included.

The results also suggest that the variables that comprise the model tested in this study are only significant when certain resources are involved and even then the effect of these variables seems to be influenced by the probabilities associated with these resources. This again supports an argument contrary to the stated hypothesis of this study, that situational factors are of greater importance than individual personality factors.

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APPENDIX

Research on Decision Making Behavior

This research is being conducted to find out more about how people such as yourself make decision when risk is involved. Many times we have to make choices in which the outcomes are not certain. In this questionnaire you are asked to make a number of decisions in a number of different situations. Please try to make each decision as you think you really would if you were in the situation presented by the question.

Please do not put your name on this paper. The information that you give will be aggregated with information provided by many other people. Your responses are anonymous. Nevertheless, if you come to a question that you would rather not answer you may skip over it.

Please circle the letter (A or B) corresponding to the response that you choose.

1. You feel the need for an intimate relationship with & member of the opposite sex. You decide to consider the people that you know who might be suitable partners. There are two people that you know that you feel you could fall in love with. The first person is very attractive, but, you estimate that there is a 40% chance that this person will back out on you if you get involved in a serious relationship. The second person is also attractive, though not as attractive as the first, but, there is only a 20% chance of backing out if you get involved in a serious relationship. After thinking about which of these two people to cultivate a relationship with you decide:

A) to seek to develop a relationship with the first person, who is very attractive but also has a 40% chance of backing out.

B) to seek to develop a relationship with the second person, who is also attractive, though not as attractive as the first person, but has only a 20% chance of backing out.

2. Because you are sick of washing dishes you decide to buy a dishwasher. After shopping around you have narrowed your choice to two dishwashers. The first dishwasher costs \$360.00 and has a 1 year warranty. The second dishwasher costs \$310.00 and has a 6 month warranty. As near as you can determine these dishwashers are the same. You determine that there is a 20% chance of having trouble with either of these dishwashers 6 months to one year after you have made the purchase. However, if by chance problems did arise during that time period the first dishwasher would be covered

by the warranty. You give the matter some thought and decide to buy:

A) the first dishwasher that costs \$360.00 and has a one year warranty.

B) the second dishwasher that costs \$310.00 and has a 6 month warranty.

3. You are interested in buying health insurance to protect yourself in case of accident or illness. The premium for the first policy that you consider is \$75.00 per month and will provide coverage for injuries resulting from accidents and a variety of common illnesses. The premium for the second policy that you consider is \$90.00 per month and will provide coverage for everything provided by the first policy. However, this second policy also provides coverage for a few additional illnesses that are rare but quite serious. You determine that the odds of contracting one of those illnesses is 1 in 200. Which of these policies will you buy?

A) You decide buy the first policy with a \$75.00 per month premium?

B) You decide to buy the second policy with a \$90.00 per month premium which covers a few additional rare but serious illnesses.

4. Having been a member of the student body of a major university for quite some time you are aware of the high esteem that the leaders of the student body acquire as a result of their positions. For example, you can see that many of these student leaders receive a lot of respect from a variety of people because of the positions that they hold and consequently, are often offered important jobs after graduation. However, losing an election would be very embarrassing to you and if you lost you would have a great deal of difficulty facing your friends. Election time is approaching and you contemplate running for office. You estimate that you have a 40% chance of becoming the student body president. After giving the matter serious thought you decide:

A) to run for student body president with a 40% chance of winning.

B) not to run for student body president so as to avoid the substantial chance of losing and suffering the embarrassment that would result.

5. You are required to make a decision in a situation of risk where you must choose between one of the two following options. Option A provides you with a 50% chance of winning \$1,000.00 and a 50% chance of losing \$50.00, while Option B provides you with a 65% chance of winning \$500.00 and a 35% chance of losing

\$50.00. Will you choose:

A) Option A

B) Option B

6. You are **require** to make another choice in a situation of risk where you **must** choose between one of the two following options. Option C provides you with a 65% chance of winning \$1,000.00 and a 35% chance of winning nothing, while option D provides you with an 80% chance of winning \$500.00 and a 20% chance of winning nothing. Will you choose:

A) Option C

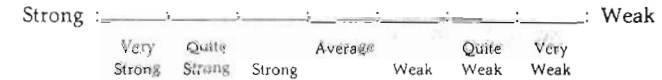
B) Option D

7. You are **required** to make a choice between one of the following options. Option E provides you with a 30% chance of winning \$1,000.00 and a 70% chance of winning nothing, while option F provides you with a 40% chance of winning \$500.00 and a 60% chance of winning nothing. Will you choose:

A) Option E

B) Option F

8. Please show how you ordinarily think of yourself by placing an X somewhere between the two opposite words. For example, suppose you have the pair or words: strong—Weak:



If you think of of yourself as average, mark an X on the space above "average." For each of these pairs of words, place an X on the point of the scale which best represents the way you think about yourself.

MYSELF

- Powerful : _____ : Powerless
- Honest : _____ : Dishonest
- Good : _____ : Bad
- Confident : _____ : Lacks Confidence
- Kind : _____ : Cruel
- Strong : _____ : Weak
- Attractive : _____ : Unattractive
- Dependable : _____ : Undependable

14. Your present marital status. (circle letter)
- A. NEVER MARRIED
 - B. MARRIED
 - C. DIVORCED
 - D. SEPARATED
 - E. WIDOWED
15. Your present age: _____ YEARS
16. What is your parents approximate annual income?
- A. UNDER \$15,000.00
 - B. \$15,001.00 TO \$30,000.00
 - C. \$30,001.00 TO \$45,000.00
 - D. \$45,001.00 TO \$60,000.00
 - E. \$60,001.00 TO \$75,000.00
 - F. \$75,001.00 TO \$90,000.00
 - G. ABOVE \$90,000.00
17. Are your natural parents:
- A. still married to each other
 - B. divorced
 - C. separated
 - D. remarried
 - E. Other, please specify _____
18. How many siblings (brothers and sisters) do you have?
Brothers _____ Sisters _____
19. How many of your siblings are younger than you? _____
20. What is your religious preference (check appropriate category)
- A. CATHOLIC
 - B. PROTESTANT
 - C. JEWISH
 - D. NO PREFERENCE
 - E. Other, please specify _____

Thank you very much for your time and effort in completing this questionnaire. Your response is greatly appreciated.