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Information And Affective Value In Risk-taking Behaviour

Erin Clare Hewitt

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- All the people I worked with at Mount Allison University: Thanks for treating me like one of the department rather than a CL. Being there convinced me that I'm happiest doing what I do best. Thanks Bruce for being a thorn in my intellectual life. It sharpened me and helped me see the world in a different way. Thanks also for being a friend. Thanks Dawn for being there to answer silly questions and for statistical advice . Thanks Marvin for helping me understand the basics. Thanks Steve

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INFORMATION AND AFFECTIVE VALUE
IN RISK-TAKING BEHAVIOUR

by

Erin C. <u>Hewitt</u>

Department of Psychology

Submitted in partial fulfilment
of the requirements of the degree of
Doctor of Philosophy

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Abstract

The purpose of the present investigation was to determine whether individual differences in uncertainty orientation could predict risk-taking in situations where outcomes were based on chance or skill. Drawing on research by Sorrentino, Short and Raynor (1984) and Sorrentino and Hewitt (1984), it was predicted that preferences for intermediate risk (i.e., the most uncertain outcome) would be related to individual differences in uncertainty orientation. More specifically, it was predicted that in both chance and skill situations, uncertainty-oriented persons would choose options of intermediate risk more than risky or cautious ones, and that this difference would be greater than that for certainty-oriented individuals. Three studies were conducted to test the general hypothesis. The first was a chance situation (based on Atkinson & Birch, 1970) where subjects chose between two computer drawings of jars which varied in (a) the number of lucky beads contained therein and (b) the payoff value of each bead (where probability and payoff were inversely related), across a number of trials. The second study was also a chance situation. Again, participants chose between paired events that differed in probability and payoff. For half of these pairs, however, the expected value (the product of probability and payoff) was the same for both choices and for the other half of the pairs, it varied. In

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the third study, involving a skilled task (a version of Atkinson & Litwin's (1960) ring toss task), participants chose the distance from which they would throw a tennis ball into a receptacle across 20 trials. Results from all three studies indicate that risk-taking behaviour is affected by uncertainty orientation and gender. That is, in the first two studies, uncertainty-oriented males and females tended to prefer intermediate risk to risky or cautious alternatives and certainty-oriented females preferred cautious and certainty-oriented males preferred risky alternatives to choices of intermediate risk ($p < .05$ in both studies). In the third study, risk preference for certainty-oriented persons was the same as in the first two studies, however, the preference for intermediate risk for uncertainty-oriented persons was attenuated by preferences for caution or extreme risk for females and males, respectively. Thus, in chance determined situations, results were fairly consistent with predictions. In the skilled situation, however, cultural value appeared to increase in salience for risk-taking behaviour. Results from all three studies do suggest that there is a relationship between gender, uncertainty orientation and risk-taking, although it may be more complex than it was originally thought to be. Implications for research on uncertainty orientation and the theory of achievement motivation are discussed.

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- Joan: You were always there with words of encouragement and a willing ear. Thanks for helping me through the difficult moments and sharing the roller coaster!

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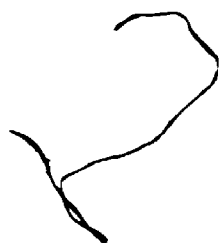
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Chapter I

Introduction

Overview

The purpose of the present investigation is to demonstrate that
risk-taking behaviour can be reliably predicted by individual
differences in uncertainty orientation (Sorrentino & Short, 1986)
more so than by individual differences in achievement motivation
(see Atkinson, 1964; Atkinson & Raynor, 1974). Although research on
achievement motivation has long attempted to account for
risk-taking, such attempts have generally been negative (see
Weinstein, 1969), with few exceptions (e.g., Raynor & Smith, 1966).
Recently, an important distinction between the affective value and
information value of activities or situations has been made by
Raynor and McFarlin (1986) which may shed some light on why
achievement-related motives have not been found to be related to
risk-taking. These authors point out that people engage in
particular activities for two reasons: to feel good about themselves
and/or to find out something about themselves or the environment.
To the extent that an activity will lead to a positive affective
state and/or provide information about the self or environment,
people will be motivated to engage in that activity. Raynor and
McFarlin (1986) argue that a great deal of confusion within many
areas of social psychology could be cleared up if one were to take
account of both factors. Sorrentino and his associates (Sorrentino
& Hewitt, 1984; Sorrentino & Roney, 1986; Sorrentino & Short, 1986;

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Sorrentino et al., 1984) have gone on to demonstrate that individual differences related to information and affective value systematically affect achievement behaviour. Basically, they argue that all those dimensions related to finding out about the self or the environment are subject to individual differences in uncertainty orientation. That is, they find that uncertainty-oriented persons orient toward uncertain situations or situations that will give them additional information about themselves or the environment (e.g., Sorrentino & Hewitt, 1984). Certainty-oriented individuals, in contrast, orient toward certain situations or situations that maintain what is already known about the self or the environment (e.g., Sorrentino & Roney, 1986). Achievement-related motives, however, have to do with affective value, with the success-oriented person motivated to obtain pride in accomplishment and the failure-threatened individual motivated to avoid fear of failure (see Sorrentino & Short, 1986).

Insofar as risk-taking situations vary in the uncertainty of the outcome (i.e., extreme risk and caution having certain outcomes of failure and success, respectively, and intermediate risk being of highest uncertainty) and information value, Sorrentino and his associates argue that this dimension is more related to uncertainty orientation than to achievement-related motives. Although several studies have been conducted with results consistent with the notion that uncertainty orientation is related to information-seeking about the self (e.g., Sorrentino & Hewitt, 1984; Sorrentino & Roney, 1986), no research to date has demonstrated that uncertainty orientation is related to risk-taking.

The purpose of this thesis is to test this notion directly. Studies One and Two utilize tasks in which outcomes are totally due to chance (based on a study reported by Atkinson & Birch, 1970). Study Three employs a skilled situation (based on research by Atkinson & Litwin, 1960; Hamilton, 1974). It is hypothesized that in both situations, the preference for intermediate risk as opposed to extreme risk or caution will be shown by uncertainty-oriented persons and this preference will be stronger than for certainty-oriented individuals. Gender differences are also examined in order to test the generalizability of findings to both genders. Finally, achievement-related motives are also examined for exploratory purposes.

The Theory of Uncertainty Orientation

Working originally in the area of achievement motivation, Sorrentino and his colleagues (Sorrentino & Short, 1986; Sorrentino et al., 1984) have proposed a theory of uncertainty orientation that subsumes the theory of achievement motivation postulated by Atkinson and his colleagues (Atkinson, 1964; Atkinson & Raynor, 1974). The general premise of the theory of uncertainty orientation is that individuals differ reliably in their responses to uncertainty, and that information value (i.e., the potential for finding out about the self or the environment), in conjunction with individual differences in uncertainty orientation, determines the relevance of particular situations to given individuals.

According to Sorrentino and his associates (Sorrentino & Hewitt, 1984; Sorrentino & Short, 1986; Sorrentino et al., 1984),

the "prototype for uncertainty orientation comes from Rokeach's" (1960; Sorrentino & Short, 1986, p. 380) work on belief systems. They note that Rokeach (1960) identified two distinct groups of individuals, those characterized by "open-minded" and those by "closed-minded" belief systems. The open-minded person is one who is willing to consider new information and ideas whereas the closed-minded individual orients to that which is familiar.

They also draw on Kagan's (1972) developmental perspective on uncertainty. Kagan (1972) argues that situations that are uncertain elicit approach or avoidance responses in people as a function of whether or not they have mechanisms that allow them to cope with the situation and whether they are in that situation voluntarily or not. He discusses the mastery or resolution of uncertainty, suggesting that motivational factors, such as affiliation and dependency, will determine the precise manner in which the uncertainty is resolved.

Sorrentino and his associates, influenced by these two conceptions, as well as by current social cognitive perspectives in psychology (e.g., Clark & Fiske, 1982; Higgins & King, 1981; Higgins, King, & Mavin; 1982; Markus, 1977; Nisbett & Ross, 1980), have developed a theory of uncertainty orientation (Sorrentino & Short, 1986). They point out that a crucial aspect of many situations is the uncertainty inherent in the situation. Sorrentino and Short (1986) also discuss two primary types of uncertainty: that about the self and uncertainty about the environment (this parallels Raynor and McFarlin's (1986) distinction between the "self-system" and the "behavioral system"). They suggest that there are two characteristic ways of responding to uncertainty that

describe two groups of individuals, termed uncertainty-oriented and certainty-oriented. Uncertainty-oriented individuals are those who orient toward the uncertainty in the situation, while certainty-oriented persons are described as those who find certainty more relevant. They argue that uncertainty orientation is related to information value. It is the potential for finding out or not finding out that determines the relevance of the situation, or aspects of the situation, for individuals who vary in uncertainty orientation. Thus, uncertainty-oriented persons are described as willing to seek out information about themselves or the situation, likely to engage in causal processing, interested in social comparison and likely to engage in "self-concept discrepancy reduction" (Sorrentino & Short, 1986, p. 399). Certainty-oriented persons, in contrast, are far less likely to display such behavioural patterns; rather, they are hypothesized to prefer the familiar and to be interested in preserving their existing ideas about themselves and the environment.

In addition to describing situations as varying in information value (i.e., the potential for finding out), they can also be seen as differing in uncertainty of the outcome. That is, it is possible that some situations may contain little potential for finding out about some aspect of the self or the environment, but may still differ in the uncertainty of the outcome.

In the discussion above of the characteristics of the certainty-oriented and uncertainty-oriented individual, we described these two types as differing in (1) that to which they orient and (2) the willingness to seek out information, engage in causal

processing, etc.. Both of these aspects of uncertainty orientation stem from the cognitive functioning which is hypothesized to differ in uncertainty- and certainty-oriented persons. That is, these two types of individuals are thought to possess different cognitive schemas (e.g., Markus, 1977). Certainty-oriented individuals are schematic for certainty whereas uncertainty-oriented people are schematic for uncertainty. This uncertainty or certainty may pertain to the self and/or the environment and also includes uncertainty or certainty about the outcome of any particular event. As a function of possessing these schemas, uncertainty- and certainty-oriented persons differ in their assessments of information value, which, it is argued, influences the relevance of the situation. In addition, the uncertainty of the outcome influences relevance. Admittedly, in most situations, these two aspects of uncertainty are probably 'naturally' confounded. That is, in most cases, uncertain outcomes may provide the best opportunity to find out about the self or the environment. Take, for example, a simple motor task. If one were reasonably certain how one would do on the task prior to completing it, it would provide little new information about ability (i.e., information value). It would, however, confirm one's existing conception. Additionally, it may provide information about this particular type of task, as compared to other types of tasks. If, in contrast, one were relatively uncertain of performance, then the task would provide additional information both about ability and about the task.

Thus, it may be difficult, in natural settings, to separate outcome uncertainty from information value. In contrived tasks, however, this may be more readily accomplished. While this may seem to be a trivial distinction, it is important to separate these two in order to demonstrate that uncertainty orientation extends beyond information value. By utilizing an experimental task where the outcome is determined by chance, there is little information value operating. This will allow us to determine the influence of individual differences in uncertainty orientation in situations where there is uncertainty about the outcome. This should indicate that uncertainty orientation extends beyond uncertainty about the self or the environment. As well, this distinction will be used as a basis for describing the literature on uncertainty orientation and for presenting the hypotheses of this thesis.

Uncertainty orientation and affective value

Like Kagan (1972), Sorrentino and his colleagues also maintain that motivation will operate in a secondary fashion to uncertainty orientation. Uncertainty orientation determines the relevance of the situation and then affective value comes into play. Thus, one will feel good or bad in situations that are relevant and relevance is determined by individual differences in responses to uncertainty.

Sorrentino and Short (1986) argue that viewing the interaction of affective and informational concerns in this fashion clarifies much misunderstanding in the literature addressing achievement-related behaviour. In this area, two general approaches exist: a cognitive-attributional one (e.g., Trope, 1975, 1979;

Weiner, 1972) and a motivational one (Atkinson, 1964; Atkinson & Raynor, 1974). These two perspectives have been seen both by the immediate participants (e.g., Trope, 1975; Weiner, 1972) and by others (e.g., McClelland, 1980) as contradictory. Thus, a good portion of the literature has been devoted to testing competing predictions derived from the two approaches (e.g., Trope, 1975). In particular, the debate has focused on explanations for the preference for tasks of intermediate difficulty.

The motivational approach of Atkinson and his colleagues (Atkinson, 1964; Atkinson and Raynor, 1974) suggests that it is the maximization of the relationship between probability of success and the incentive value of success that determines the preference for intermediate tasks among success-oriented persons. According to this theory, probability of success and the incentive value are inversely related. Atkinson & Reitman (1958) define incentive value as "the relative amount of satisfaction ... experienced in any personal accomplishment" (p. 298). When tasks are very difficolt, if one succeeds (which is a highly unlikely outcome) it is very rewarding. If one fails (which is more probable), there is little shame experienced. In contrast, when tasks are very easy, there is considerable shame associated with failure whereas there is little pride in accomplishment associated with success on such tasks (Atkinson & Raynor, 1974). Thus, success-oriented persons are hypothesized to prefer intermediate difficulty tasks because it is here that the relationship between incentive and probability can be maximized. That is, on easy tasks, there is very little incentive (i.e., pride in accomplishment) but the probability of obtaining

success is very high. On difficult tasks there is very high incentive but the probability of actually obtaining the positive outcome is very low. On intermediate tasks, it is moderately likely that the success-oriented person will obtain the moderate level of pride to be experienced on succeeding. Thus, these individuals should be most likely to choose tasks of intermediate difficulty.

In contrast, failure-threatened persons are thought to avoid intermediate difficulty tasks because of this maximization. This type of individual is characterized primarily by negative affective responses. That is, they are afraid of failing and are concerned about experiencing shame over failure. On easy tasks, there is little fear of failure (i.e., low incentive) because the task is very easy and this negative outcome is very unlikely to occur. Conversely, there is little shame over failing a very difficult task. On a task of intermediate difficulty, it is moderately likely that they will fail, and thereby experience a moderate level of shame over failure. According to the theory, failure-threatened persons should avoid intermediate difficulty tasks.

The cognitive-attributional approach maintains that preference for tasks of intermediate difficulty is a function of the desire to find out about or diagnose one's ability level. Trope and Brickman (1975) suggest that tasks of intermediate difficulty are preferred because, in most cases, difficulty is confounded with diagnosticity. This argument rests on the attributional analysis of task performance suggested by Weiner (1972). When faced with the outcome of task performance, it is argued that people engage in an attributional analysis of their performance. It is hypothesized

that a number of potential causes, particularly ability, effort, task characteristics, and luck, are examined and considered in relation to the outcome (e.g., Fiske & Taylor, 1984, pp. 47-53). Weiner (1972) argues that tasks of intermediate difficulty are preferred by individuals because they provide information about an internal stable cause: ability. He suggests that succeeding at an easy task or failing on a difficult task results in the attribution of the outcome to task characteristics. When the task is moderately difficult, however, aspects of the task become less important and the attribution can be made to ability. Thus, Weiner argues that task choice is determined by a desire to find out about or diagnose ability level.

Trope and Brickman (1975) also suggest that it is the potential for diagnosing ability level that determines task choice. They point out, however, that task difficulty and task diagnosticity can be manipulated independently, and present evidence that, when this is done, task choice is made on the basis of diagnosticity rather than difficulty (Trope & Brickman, 1975). This demonstrates more clearly that, when faced with the choice of diagnosing one's ability level versus experiencing pride in accomplishment or avoiding shame over failure, people choose to find out about their ability level. Further, Trope (1975) reports a study in which he found that people who scored high in achievement displayed a stronger preference for diagnostic tasks than did those scoring low in achievement. Thus, he argues that the process underlying achievement-related behaviour is characterized by diagnostic information seeking, which is related to information value rather than affective value .

Uncertainty Orientation and Achievement-Related Behaviour

Since the theory of uncertainty orientation argues that both information and affective value are critical to understanding achievement-related (and other) behaviour, Sorrentino and Short (1986) argue that affective value is strongest (i.e., affect will be most aroused) in situations relevant to one's uncertainty orientation. That is, pride in accomplishment or fear of failure will occur more strongly in situations that are relevant to one's uncertainty orientation. For certainty-oriented persons, this affect is aroused in situations where there is little uncertainty whereas uncertainty-oriented persons experience this affective engagement in situations where there is some opportunity to diagnose their ability level or where there is uncertainty about the outcome.

Sorrentino et al. (1984) conducted a series of studies, one of which tested the relationship of uncertainty orientation and achievement-related motives to performance on a task where difficulty was varied. In this experiment, participants were classified according to their uncertainty orientation and their resultant achievement motivation. There were four types of persons: uncertainty-oriented - success-oriented, uncertainty-oriented - failure-threatened, certainty-oriented - success-oriented, and certainty-oriented - failure-threatened. Individuals were randomly assigned to different levels of subjective probability of success: 20%, 50% or 80% chance of succeeding. These investigators found that for uncertainty-oriented participants, success-oriented people performed best and failure-threatened persons performed worst when the probability of success was 50%. This was expected, as this is

the situation in which there is most uncertainty about the outcome. For certainty-oriented individuals, the difference between success-oriented and failure-threatened individuals was smallest in this condition. Maximum differences were observed in the other two conditions, where there was more certainty about the outcome. Thus, uncertainty-oriented persons behave in accordance with Atkinson's original conceptualization regarding achievement-related motives. Certainty-oriented individuals, in contrast, perform in an opposite fashion. The findings of this study in conjunction with others reported in this paper suggest that the arousal of different types of motivation (e.g., achievement, affiliation) does depend on uncertainty orientation.

Sorrentino and Hewitt (1984) also provide data consistent with the theory of uncertainty orientation. They replicated and extended a study reported by Trope (1979) in which participants were provided with false feedback from a previous test of ability that contained a manipulation of uncertainty. In one condition (the Ascending), they were given information that indicated that, while they definitely did not possess low ability, it was uncertain whether their ability level was intermediate or high. In the second condition (the Descending), it was indicated that the uncertainty about their ability level was between low and intermediate ability levels. Participants were then given an opportunity to take a second test of ability, and were presented with a choice of items for that test. One third of these items discriminated well for high versus intermediate ability (this is a diagnostic test for the Ascending condition, non-diagnostic for the Descending condition). Another

third of the items were described as separating intermediate from
low ability levels (non-diagnostic for Ascending condition,
diagnostic for Descending condition) and the final third did not
discriminate for any level of ability (non-diagnostic for both
conditions). Trope (1979) found that people chose information
diagnostic of their ability level when they were uncertain about
their ability, regardless of whether this information indicated that
they were of low (Descending condition) or high (Ascending
condition) ability.

Sorrentino and Hewitt (1984) argue that this response to
diagnostic information is characteristic only of uncertainty-
oriented individuals. They hypothesized, and demonstrated, that
certainty-oriented persons would respond to the uncertainty by
seeking to confirm what they already knew about their ability. When
examining the choice of diagnostic versus non-diagnostic
information, they found that certainty-oriented persons displayed a
stronger preference for the latter type of information. Only
uncertainty-oriented persons displayed the pattern found by Trope
(1979).

In addition to examining these data as a function of
uncertainty orientation, Sorrentino and Hewitt noted that there was
also affective value inherent in the situation. They examined
choices as a function of achievement-related motives and found
differences between success-oriented and failure-threatened persons
only in the Ascending condition. That is, it was only where
subjects could find out whether they did or did not have high
ability (Ascending condition), [that] success-oriented people most

preferred and failure-threatened persons least preferred the most diagnostic task" (Sorrentino & Short, 1986, p. 385). They argued that the Descending condition contains little affective value. That is, pride in accomplishment or fear of failure would not be strongly aroused in a situation in which one can, at best, perform at an average level.

Sorrentino and Roney (1986) extended these findings by examining performance on diagnostic and non-diagnostic tasks as a function of achievement-related motives and uncertainty orientation. These results parallel those of choices of diagnostic versus non-diagnostic tasks; for uncertainty-oriented individuals, those who were success-oriented and failure-threatened differed more in their performance on the diagnostic task. Among certainty-oriented persons, the difference in performance as a function of achievement-related motives was greater on the non-diagnostic task.

Sorrentino and Hewitt's findings, taken together with those of Sorrentino et al. (1984) and Sorrentino and Roney (1986) suggest that both affective value and information value are important in predicting achievement-related behaviour. These results are consistent with the argument that information value determines the relevance of the situation to a person and that individual differences in uncertainty orientation determine information value. It is only in relevant situations that sources of motivation, such as achievement and affiliation, will be engaged and responses will be determined by the affective value inherent in the setting.

In summary, then, uncertainty- and certainty-oriented persons do differ in their responses to uncertainty. Certainty-oriented

people respond to induced uncertainty about the self by attempting to confirm their existing knowledge systems (e.g., choose non-diagnostic information). In contrast, in the face of uncertainty, individuals who are uncertainty-oriented seek out information that will diagnose their ability level by choosing diagnostic information. In addition, the arousal of achievement-related motives depends on the relevance of the situation to one's uncertainty orientation (e.g., Sorrentino et al., 1984). Describing achievement motivation and uncertainty orientation as related to affective value and information value, respectively, provides a conceptualization of these variables that allows for extension into additional areas in which these values are present. This thesis presents such an extension; it examines the relationship of uncertainty orientation, achievement-related motives, and risk-taking behaviour, with risk-taking hypothesized to be described best in terms of information value and uncertainty.

The Theory of Achievement Motivation

Atkinson's theory of achievement motivation (Atkinson, 1964; Atkinson & Raynor, 1974) postulates that both situational and individual difference factors are necessary to account for achievement behaviour. This theory draws upon Lewin's (1935) thesis that behaviour is a function of the person and the environment as well as on Murray's (1938) 'need' theory of personality. According to Atkinson's theory, it is both the achievement cues in the situation and the characteristics of the involved persons that determine achievement-related behaviour.

Atkinson (1964; Atkinson & Raynor, 1974) has proposed a mathematical formulation of achievement motivation that clearly specifies the relationships among the numerous constructs of this theory. First, it is suggested that the tendency to engage in an achievement-oriented activity, T(tot) is an additive function of the resultant tendency to succeed, T(s-f) and other extrinsic sources of motivation, T(ext), such that $T(tot) = T(s-f) + T(ext)$. The resultant tendency to succeed is a multiplicative function of three variables. The first is resultant achievement motivation, which is the approach-avoidance individual difference variable. It is assessed by taking the difference between the motive to achieve success, M(s) and the motive to avoid failure, M(-f). The second variable is the subjective probability of success, P(s) and the third is the incentive value of success, I(s) which is defined as 1 - P(s). This results in the formula: $T(s-f) = [M(s) - M(-f)] \times P(s) \times [1 - P(s)]$.

According to this formulation, the resultant tendency to succeed is greatest when the subjective probability of success is 0.50, when success and failure are equiprobable. That is, it is at this point that individual differences are strongest, as the relationship between P(s) and I(s) is maximized. For a success-oriented person in whom the motivation to succeed is strongest, most positive affect and least negative affect is experienced. In contrast, negative affect (i.e., fear of failure) is strongest for a failure-threatened person, in whom avoidance motivation predominates. Again, this difference rests both on the probability and the incentive value of success.

Achievement Motivation and Risk-Taking in Skill Situations

Prior to discussing the experimental evidence on achievement motivation and risk-taking, it is important to note that risk-taking has been regarded as central to the theory of achievement motivation (e.g., McClelland, 1958). One of the original characteristics that was hypothesized to distinguish success-oriented from failure-threatened persons was risk preference which was assumed to reflect very different affective responses to achievement cues by these two groups of people. In addition, risk-taking was the first area in which hypotheses derived from the theory were tested. It was after these early research efforts that investigators began to ask if achievement-related motives were also related to level of aspiration (e.g., Moulton, 1965) and performance in other achievement settings (e.g., Atkinson & Reitman, 1958). This research is being summarized here because it examines risk-taking behaviour which is of relevance to this thesis and to indicate that individual differences in achievement-related motives do not reliably predict this behaviour.

The original study conducted by McClelland to test his hypotheses regarding the relationship of risk-taking and achievement-related motives was to become the characteristic research design in this area (McClelland, 1958). Two related aspects of the risk-taking situation used in this study must be pointed out. First, it was assumed that the setting used in this study contained affective cues which would engage achievement-related motives. Second, it was a task in which the ability of the participant was related to the task outcome which, in part, determines the affective value.

McClelland (1958) presented children with tasks that had varying risk levels. They were simply asked to perform a number of trials at each task and the level of risk chosen for each trial was recorded. It was then determined if preference varied as a function of achievement motivation. The primary test group consisted of 26 five year old kindergarten students; their level of achievement motivation was inferred from their performance on the "Doodles" Test (see Aronson, 1958 for a complete description of this test). They were classified as high or low in n Achievement on the basis of a median split of these scores.

The children were asked first to attempt a ring toss game, the object of which was to throw a ring over a peg placed on the floor. They had ten tosses which they could throw from any distance from the target, from a minimum of one foot to a maximum of six feet. The distance from the target was recorded for each throw, with the assumption that the farther from the target the greater was the risk of failure. The second test was a tilting board maze, which consisted of a board with a raised maze that had holes through which a ball could drop. The board could be tilted in two planes by the use of wheels. The object of the game was to move the ball through the maze, by changing the tilt of the board, without having the ball drop through one of the holes. The children were asked at the beginning of each of the ten trials where in the maze they hoped to reach. This was the measure of risk, as the closer to the center of the maze, the greater the risk of having the ball drop through one of the holes.

To test the hypotheses (that children high in n Achievement would prefer, and those low would avoid, intermediate risk), the ring toss distances were divided into quartiles (very far from, moderately far from, moderately close to and very close to the target) and comparisons were made between achievement groups using chi-square analysis. It was found that children low in n Achievement were significantly more likely to throw from the extreme quartiles than were those high in n Achievement. Comparisons between the two groups for the middle two quartiles versus the extremes revealed that "again, the "highs" showed significantly more "moderation" and the "lows" more "wild speculation"" (McClelland, 1958, p. 315). High achievement children were also less likely to chose extremely risky distances on the maze task than were low achievement children.

This study provides some support for the hypotheses, although it is somewhat primitive in its conception and execution. There is some indication that high achievement individuals prefer intermediate risk levels and low achievement persons prefer more extreme risk. There is no indication, however, that the latter actually avoid intermediate risk, which was hypothesized to occur.

It should be noted that this study was conducted at a time when the theory of achievement motivation was still in its initial stages of formulation. As such, it did not employ a resultant measure of achievement motivation (assessing the motive to succeed and the motive to avoid failure separately and calculating the difference) which the theory presented above specifies. Only the approach motivation was assessed. Thus, the failure to find avoidance of

intermediate risk could reflect the fact that avoidance motivation was not measured. According to more recent elaborations of the theory of achievement motivation (Atkinson, 1964; Atkinson & Raynor, 1974), measures of both sources of motivation must be taken and a resultant measure formed.

The second study conducted to test hypotheses regarding risk-taking and achievement motivation was conducted by Atkinson and Litwin (1960). They examined risk preference in male college students and used a modification of the ring toss game described above. The level of $\underline{n}$ Achievement was assessed using the French Test of Insight (French, 1958) and avoidance was measured using the Test Anxiety Questionnaire (Mandler & Sarason, 1952). Forty-nine male students were divided into four motive groups on the basis of median splits of both measures. Those high in $\underline{n}$ Achievement and low in anxiety can be labelled success-oriented and those low in $\underline{n}$ Achievement and high in anxiety failure-threatened. The remaining two groups are termed moderates.

Four ring toss games were set up in one room and participants threw the ring at the target ten times from any distance. As was done by McClelland (1958), the distances in this study were divided into three groups which corresponded to the thirds of the distances closest to, farthest from, and moderately distant from the target. In addition, an average deviation score was computed for each participant, which was determined by calculating the mean distance from which each participant took his shots and subtracting from it the median distance of all shots taken by all subjects. Thus, the

magnitude of the deviation score is inversely related to preference for intermediate risk.

For the distance measures, percentages of shots thrown from the three distance groupings were compared for the four motive groups. Although no chi-square analyses were reported by the authors, they are easily calculated. No chi-square attained statistical significance. In contrast, for the average deviation scores, the four motive groups that resulted from median splits on both measures differed significantly ($p < .05$), with success-oriented persons ($Md = 0.48$) showing the strongest preference for intermediate risk, followed by the low-low group ($Md = 0.88$), the failure-threatened group ($Md = 0.93$) and the high-high group ($Md = 1.03$). According to the theory, it would be expected that the success-oriented group would deviate least from the median distance, the failure-threatened group would deviate most, and the two moderate groups would fall in between these two extreme groups. Atkinson and Litwin's (1960) results do not conform totally to this prediction; it appears that a "moderates effect" (Sorrentino & Short, 1977) was obtained in this study.

In this study there is some difference in risk preference as a function of achievement-related motives, as evidenced by the findings for the average deviation measure. There is no indication, however, that failure-threatened persons actually avoid intermediate risk. Rather, it seems that for these persons the preference for intermediate risk is less intense. This is supported by examination of the proportion of shots taken from the different distance intervals. For example, 70% of the shots of the success-oriented

persons were taken from the intermediate range while for
failure-threatened persons 43% were taken from this area and 57%
from the two extremes together. This comparison does not indicate
avoidance. Further, it must be stressed that no significant
difference between motive groups was found for any of the distance
grouping measures, although a significant difference was found on
the average deviation scores. Again, however, the pattern of these
findings does not conform totally to predictions. These two facts
should prompt conservatism in making any conclusions about these
data.

An additional difficulty in this study, pointed out by the
authors, was that participants were not explicitly told about the
probabilities of success. Rather, risk level was assumed to be
related to distance from the target and it was further assumed that
participants would, at some level, recognize this relationship.
Thus, there is a great deal being assumed in this study, which makes
it difficult to state with surety that risk levels were manipulated.

Atkinson, Bastian, Earl and Litwin (1960) used a task similar
to that of Atkinson and Litwin (1960) but included an explicit
statement about probabilities of success. These investigators used
a shuffleboard game similar to the ring toss game. Subjects' level
of n Achievement was assessed using the French Test of Insight and
they were divided into two groups on the basis of a median split.
This measure was taken several weeks prior to participation and no
measure of avoidance was obtained. In addition, although both males
and females participated in the experiment, only the results of

males were reported with the explanation that the measurement of n Achievement in women is unreliable.

Atkinson and his colleagues found that, on the final five test trials where participants were presented with explicit probabilities, there was a significant difference between the two motive groups only on the first trial, with high n Achievement subjects throwing from the intermediate range more frequently than the low subjects. These findings present, at the very best, weak support for the predictions. There is no strong tendency among those high in n Achievement to prefer intermediate risk and there is no indication whatsoever that those low in n Achievement actually avoid such risk. The more conservative interpretation of these findings is that there is little evidence for risk preference varying as a function of achievement-related motives.

A number of additional studies investigating the relationship of achievement-related motives to risk preference in skilled situation have been conducted but, for the sake of brevity, they will be not be reviewed in depth. Litwin (1958, as cited in Atkinson & Litwin, 1960) used the ring toss task and calculated deviations from intermediate risk. He found a statistically significant effect of achievement-related motives. The interpretation of this effect is difficult, however, as he used a deviation measure. Thus, it is not possible to determine if failure-threatened individuals were actually avoiding intermediate risk. DeCharms and Dave (1965) also used the ring toss task, but found a statistically significant effect of motivation only for a non-traditional measure of achievement-related motives, assessed

using the Thematic Apperception Test; the traditional assessment of
the motives did not produce a significant effect of motivation.
Thus, it is difficult to determine the comparability of the
statistically significant results to those of other researchers.
Brody (1963) employed a very different task to examine risk-taking
behaviour and found no significant effect of achievement-related
motives. Raynor and Smith (1966) did find that success-oriented
persons preferred intermediate risk and failure-threatened
individuals preferred extreme risk. They used a very different
measure of risk-taking and it is not clear how it relates to other
measures reported in the literature. Thus, their results provide,
at best, weak support for predictions derived from the theory of
achievement motivation.

Hamilton (1974) is the last study of risk-taking in a skilled
situation reported in the published literature. He administered a
ring toss game to male participants who were classified as success-
oriented, failure-threatened or moderate on the basis of the French
Test of Insight and the Test Anxiety Questionnaire. He had subjects
take ten free throws, followed by 130 practice trials (10 each from
13 distances from the target), followed by 10 free choice test
trials. Individualized probabilities were calculated on the basis
of performance on the practice trials and were displayed for
participants on the test trials. Hamilton also used a deviation
score to assess risk-taking but modified it somewhat by using each
person's 0.50 probability distance as the midpoint of the risk
dimension, rather than the group's median choice. He subtracted
this probability from each of the test trials' probability. Thus,

for one person, the distance associated with the 0.50 probability might be eight feet while for another it might have been 10 feet. The scores were analyzed and there was no difference among the three motive groups in the degree to which they deviated from their 0.50 probability. They did differ significantly ($p<.01$), however, in their deviation from the 0.40 probability distance.

The results of this study are ambiguous for two reasons. First, a deviation measure was used so it is difficult to determine whether there is avoidance among the failure-threatened individuals. Examination of the graphed results (see Figure 1) would seem to indicate a stronger preference among success-oriented participants than those who were failure-threatened, who in turn display little evidence of avoidance. More serious, however, is the possiblity that the statistical significance of the effect for achievement-related motives may be accounted for by a "moderates effect" (Sorrentino & Short, 1977). Hamilton (1974) found a statistically significant effect of motivation only on deviations from the probability 0.40. At this probability level (see Figure 1), however, the moderate group may be accounting for the statistical significance of the effect, as it deviates from the pattern demonstrated by the other two motive groups (It is impossible to determine if this is the case, as Hamilton did not present the results of analysis with only the two extreme groups included). Indeed, through the whole intermediate risk range (p's = 0.40, 0.50, and 0.60) the success-oriented and failure-threatened groups display very similar curves, although the relative levels of preference

Figure 1

Distribution of subjective probabilities on final 10 trials.
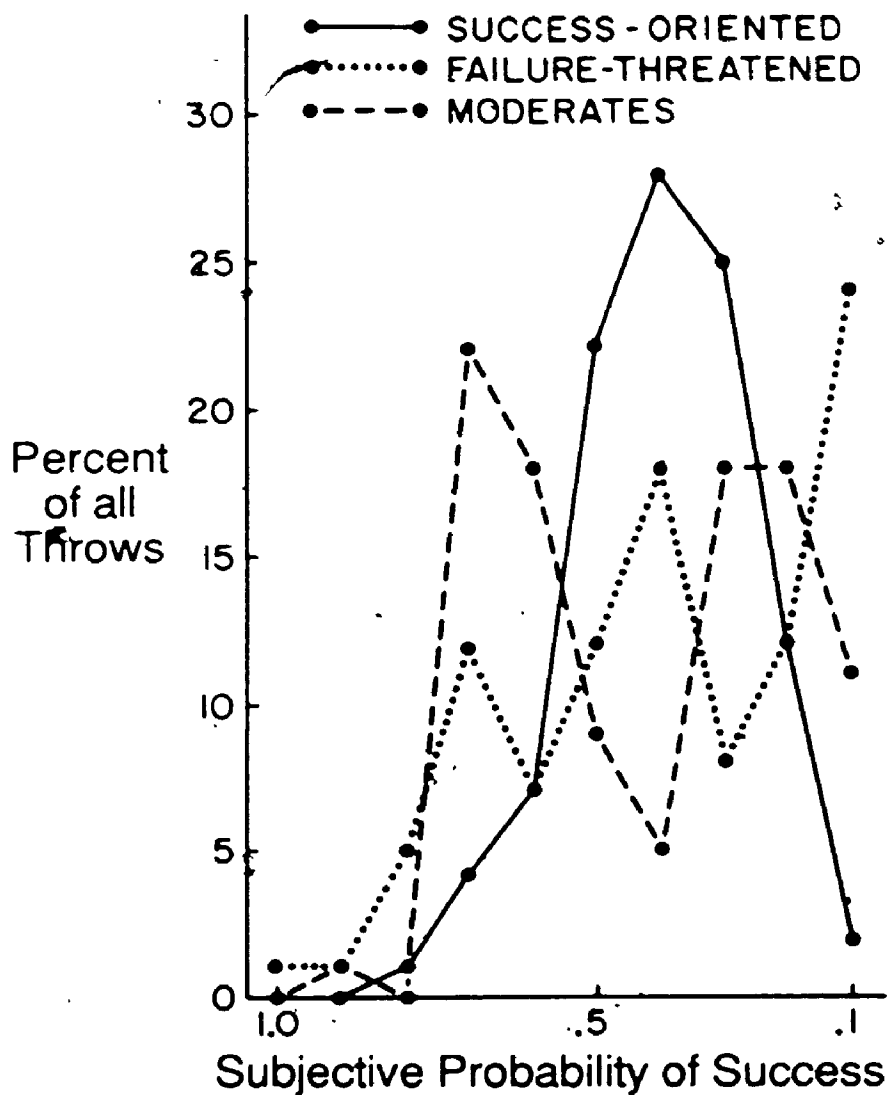
Note. From "Motivation and risk-taking behavior: A test of
Atkinson's theory." by J. O. Hamilton, 1974, Journal of Personality
and Social Psychology, 29, p. 860. Copyright 1974 by the American
Psychological Association.

differ. It is only the moderates that display any avoidance of
intermediate risk.

The results of this research on the influence of achievement-
related motives on risk-taking behaviour in situations that require
skill indicate, at best, weak support for the hypotheses. There is
some support for the preference of success-oriented persons for
intermediate risk (e.g., McClelland, 1958; Raynor & Smith, 1966),
but there is no evidence for avoidance of this type of risk among
failure-threatened persons (e.g., Atkinson & Litwin, 1960; Hamilton,
1974). This, in part, may be a function of the use of discrepancy
or deviation scores which do not allow for a determination of actual
avoidance. It is only when choices from the different risk levels
are presented for the different motive groups that avoidance can be
detected. In the studies in which such information is presented
(e.g., Atkinson et al., 1960; Atkinson & Litwin, 1960; McClelland,
1958), there is no evidence for avoidance among failure-threatened
persons. In fact, evidence claimed to be consistent with the theory
of achievement motivation comes primarily from deviation measures
which do not allow for the assessment of avoidance. It is the
contention of this thesis that the failure to obtain consistent
support for predictions derived from the theory of achievement
motivation reflects the fact that, in risk-taking situations,
information value and uncertainty predominate over affective value.

Achievement Motivation and Risk-Taking in Chance Situations

In addition to testing the relationship of achievement-related
motives and risk-taking on tasks in which skill is involved in

determining the outcome, a number of investigators have also
examined such behaviour in situations where the outcome is
determined by chance (e.g., Atkinson et al., 1960; Hancock & Teevan,
1964). It is not immediately clear why this was done as these
chance situations do not possess any of the charateristics held to
define achievement settings (see Atkinson et al., 1960). As ability
has no effect on the outcome, there is little opportunity for pride
in accomplishment or fear of failure to be experienced. Hence,
achievement-related motives should not be strongly aroused. It may
be relevant to this thesis, however, to examine such research as it
is suggested that uncertainty orientation is not limited to
situations which involve uncertainty about the self or the
environment. Risk-taking in a chance situation is assumed to
involve uncertainty about the outcome and thus should be influenced
by uncertainty orientation.

In each of these studies, research participants were presented
with a series of bets, with the precise characteristics of the bets
varying in different studies. Atkinson et al. (1960) presented
participants with 15 pairs of bets that had a constant expected
value but differed in probability of occurrence and payoff.
Analysis of the betting preferences indicated that only low
n Achievement individuals who received low payoffs made choices that
differed significantly from chance. Atkinson and his colleagues
dismiss these findings by arguing that, for these individuals, any
potentially competitive situation is perceived, subjectively, as
similar to achievement settings, because "the outcome ... often
seems beyond their control even in tasks requiring skill" (p. 35).

Litwin (1958 as cited in Atkinson & Litwin, 1960) had subjects choose bets that (a) had constant expected values and (b) payoffs that had no monetary value. Analysis of the results indicated no effect of achievement-related motives for this task, even though this is not the conclusion reached by the author. A statistical artifact led this author to conclude (erroneously) that there was a significant effect of motivation for the chance task. Scodel, Ratoosh and Minas (1959) had subjects choose one of nine bets that varied both in probability and incentive. These investigators reported a significant difference between low and high n Achievement groups, but this effect should be regarded with some suspicion, as the conclusion was based on analysis of modes which may mask much of the variability in the data (see Kerlinger, 1973, pp. 144-145).

Littig's (1963) research on the "effects of motivation on probability preference" indicates that participants' betting preferences were determined by a straightforward decision rule. In this study, participants were required to place bids on a poker hand after being told the probability of 'beating the hand'. Littig (1963) found that the bids made were a linear function of the probability of beating the hand. No effect of achievement-related motives was found.

Hancock and Teevan (1964) and Raynor and Smith (1966) also investigated the relationship of achievement-related motives and risk-taking in a chance situation. Hancock and Teevan used non-traditional scoring of the Thematic Apperception Test and found a statistically significant difference between their motive groups in risk-taking only for one of 12 trials. Raynor and Smith (1966),

using traditional assessment of achievement-related motives, found no difference between success-oriented and failure-threatened males in betting preferences, using a modification of the task employed by Atkinson et al. (1960).

It can be concluded that there is no support for the hypothesis that success-oriented persons should prefer and, failure-threatened persons avoid, intermediate risk on tasks where the outcome is determined by chance. It is not clear that support should be found, as Atkinson et al. (1960) note that the typical chance setting does not possess the characteristics that the theory states are definitive of an achievement setting. Most particularly, the ability of the individual is irrelevent to the outcome of the task. It is the contention of this thesis that achievement-related motives should not predict risk-taking behaviour in such settings. Rather, this behavioyr should be predicted by individual differences in uncertainty orientation. Studies One and Two of this thesis present tests of this prediction.

Chapter II

Statement of the Problem

The general hypothesis to be tested in this thesis is that individual differences in uncertainty orientation account for risk-taking behaviour. We argue that even in games (both those involving skill and those that are chance determined), individual differences in uncertainty orientation should predict behaviour. The basis for this prediction is a very broad interpretation of uncertainty. That is, previous research in uncertainty orientation has been limited to uncertainty regarding some aspect of the self. This thesis extends the analysis to include outcome uncertainty, in a situation where there is low information value. By extending it in this manner, it may provide support for the contention that uncertainty orientation operates as a predisposition to behave in particular ways when in situations that vary in uncertainty.

Risk-Taking and Information Value

Sorrentino and Short (1986) describe past findings related to uncertainty orientation in terms of information value. This thesis extends this analysis to risk-taking, with the argument that, generally, risk can be conceptualized as incorporating information value (i.e., uncertainty about the self or the environment) as well as outcome uncertainty. Both high risk and high caution constitute certain outcomes (i.e., certain failure and certain success, respectively) whereas intermediate risk entails maximum uncertainty

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about the outcome._ Additionally, the outcomes may allow individuals to diagnose some aspect of themselves. That is, the uncertain outcomes may also provide information about one's ability on a task, whereas relatively more certain outcomes may provide little new information about ability level.

Given that both aspects of uncertainty (information value and outcome) may be operating in risk-taking situations, individual differences in uncertainty orientation should predict risk-taking behaviour. Uncertainty-oriented individuals should be more likely to engage in intermediate risk-taking whereas certainty-oriented persons should be more likely to display cautiousness or high risk where the situation is more certain.

Part of the difficulty in the previous research investigating the relationship of achievement-related motives and risk-taking behaviour may well lie in the confusion of affective value and information value. The measures of achievement-related motives typically used in the area of risk-taking have been projective (e.g., French Test of Insight and the Thematic Apperception Test) and, because of the manner in which they are scored, tap affective value. If our analysis that risk involves information value is correct, then the fact that measures of individual differences in affective value (achievement-related motives) do not predict risk-taking behaviour would not be surprising.

The suggestions of both Heckhausen and his associates (Heckhausen & Halisch, 1986) and McClelland (1980) are consistent with this argument. These investigators have made a distinction between two different types of measures of achievement motivation.

They describe self-report scales of achievement motivation (such as the Mehrabian (1969) scale) as "respondent" (Heckhausen & Halisch, 1986) or "value for achievement" (McClelland, 1980) measures and the Thematic Apperception Test as an "operant" (Heckhausen & Halisch, 1986) or "need for achievement" (McClelland, 1980) measure. They argue that respondent measures of achievement tendencies do not predict behaviour in most achievement settings because they assess the cognitive aspect of valuing rather than affective responses, which are better assessed using operant measures. This fits the present analysis as it could be argued that the self-report measures are tapping information value while the operant measures are assessing affective value.

Some support for the contention that risk-taking involves information value comes from Roney and Sorrentino (1986a). In this study, scores on the Mehrabian scale of achievement (Mehrabian, 1969) were used to predict standard scores of uncertainty orientation and achievement-related motives. This was done by dividing scores on the Mehrabian scale into tertiles and comparing the uncertainty orientation and resultant achievement scores for those who had scored in the top versus the bottom third of the total achievement scale scores. Roney and Sorrentino found that those scoring high on the total Mehrabian scale had significantly higher uncertainty orientation and resultant achievement standard scores. This suggests that both information and affective value are operating in the Mehrabian scale. In addition, items from the Mehrabian scale were divided on the basis of face validity into those reflecting affective value and those reflecting information

value (these latter items were, for the most part, risk-taking
items). Again, scores were divided into tertiles, separately for
the 'affective' and 'Information' items. These investigators found
that those high on the affect items differed from low scorers on
resultant achievement motivation but not on uncertainty orientation.
For the information items, just the reverse occurred. The scores on
the Mehrabian information scale predicted uncertainty orientation
scores but not resultant achievement motivation scores.

These findings suggest two things. First, they are supportive
of the argument that some conceptions of achievement have confounded
affective and information value (e.g., McClelland, 1980). Second,
they suggest that self-report measures, which typically confound the
two sources of value, may not predict well a behaviour that is
influenced primarily by one source of value. That is, these
findings may help explain why self-report inventories of
achievement, which assess both information and affective value, so
poorly predict actual risk-taking behaviour (e.g., Weinstein, 1969),
which, we argue, is influenced primarily by information value.

Risk-Taking in Skill Versus Chance Situations

In the risk-taking literature reviewed in the first chapter,
the distinction between situations in which the outcome was
determined by skill versus chance was made. We noted that it was
not clear why predictions about risk-taking behaviour based on the
theory of achievement motivation were ever tested in a chance
situation. This type of situation does not conform to the theory's
specification of an achievement setting, and thus differences as a

function of achievement-related motives should not be found. We are arguing, in contrast, that risk-taking involves information value and outcome uncertainty. As such, differences in risk behaviour as a function of uncertainty orientation should be found, regardless of what controls the outcome. It is the uncertainty about the self or the environment and the outcome that is important. This thesis presents three studies, two of which investigate risk-taking in a chance setting. We argue that in a setting in which the outcome is determined by chance, while there is little opportunity to find out either about the self or the environment, there is still uncertainty about the outcome. Thus, individual differences in uncertainty orientation should predict differences in behaviour in this setting. The third study tests predictions derived from the theory of uncertainty orientation in a situation which involves skill. In this case, there is both outcome uncertainty and information value and so, again, uncertainty orientation should be predictive of behaviour.

The application of uncertainty orientation to a testing situation in which the outcome is determined by chance allows us to determine whether the theory extends to uncertainty about the outcome as well as to the self or the environment (Sorrentino & Short, 1986). All of the testing of the theory to date has been done in situations where the uncertainty being varied was either totally or primarily about some aspect of the self and always varied in information value. For example, in Sorrentino and Hewitt (1984), participants were presented with information that varied in diagnosticity about their ability level. This is uncertainty about

the self as well as uncertainty about the outcome. Other tests of the theory have also involved situations in which there was a potential for finding out about the self as well as uncertainty about the outcome. In the first study of Sorrentino et al. (1984) the probability of success was varied, which entails uncertainty about the outcome. The manipulation occurred in an ability-relevant setting, however, so, to some extent, the outcome may have been relevant to the self. That is, performance on the task provided information about one's ability on the task.

Thus, no evidence exists supporting the contention that uncertainty orientation also extends to uncertainty about the outcome. If uncertainty- and certainty-oriented persons do indeed differ in their cognitive dynamics, then this should extend beyond finding out about the self or the environment to the processing of information relevant to certainty and uncertainty generally. This should include outcome uncertainty. We predict, therefore, that these two types of individuals should differ in their responses in situations characterized primarily by outcome uncertainty.

Overview of Designs and General Hypotheses

The first study to be reported in this thesis will test predictions in a situation in which the outcome is determined by chance (with the design based on a study reported by Atkinson & Birch, 1970). It is expected that differences in uncertainty orientation will predict choices of intermediate versus extreme risk. Uncertainty-oriented individuals should choose intermediate risk more than other levels of risk, and this effect should be

stronger than for certainty-oriented persons. Further, it is anticipated that a similar pattern of findings will not be found for success-oriented versus failure-threatened individuals. The second study will also allow testing of predictions on a task where the outcome is determined by chance.

The third study should generalize these findings to a situation in which skill at least partially determines the outcome. This study will utilize a variation of a task used in the previous risk-taking literature, and choices across risk level will be examined. It is anticipated that choice of intermediate risk as opposed to caution or extreme risk will characterize uncertainty-oriented persons and this effect will be stronger for this type of person than for certainty-oriented participants. Further, it is expected that effects will appear stronger for uncertainty orientation than for achievement-related motives.

Chapter III

Study One

Rationale

In this study, we will be testing the operation of uncertainty
orientation in a setting in which the uncertainty rests largely in
the outcome of an event. That is, the outcomes will be determined
by chance and will differ in the probability of occurring and the
associated payoff.

As noted, this study is based on Atkinson and Birch's (1970,
pp. 178-181) studies. They conducted several versions of this study
to provide evidence for the relationship between incentive, $I(s)$ and
probability of success, $P(s)$. This study is critically important to
the theory of achievement motivation (Atkinson, 1964; Atkinson &
Raynor, 1974). According to the theory, the tendency to engage in
achievement-related activity is a multiplicative function of
resultant achievement motivation, the subjective probability and the
incentive value of success, defined as $1 - P(s)$. When choosing
between or engaging in achievement-related activities, the theory
proposes that all individuals attempt to maximize the $I(s) - P(s)$
relationship.

Atkinson and Birch's (1970) study is important to the theory
because it demonstrates this maximization principle directly. That
is, both subjective probabilities of success (in this case, assumed
to be identical to the objective probabilities) and incentive
(payoff) are experimentally manipulated. Since the outcome is

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totally beyond the control of participants, no achievement-related motives should be engaged. Thus, behaviour should be a multiplicative function of the two manipulated variables.

Atkinson and Birch (1970) presented participants with jars that contained different proportions of "lucky beads", which would, if drawn, give them the designated payoff. The two jars differed in the probabilities of lucky beads and the payoff (inversely related to probabilities). The participants were instructed to choose one of the two and the chosen probability was recorded. Atkinson and Birch predicted that the function relating the frequency of choice to incentive and probability would be an inverted U-shaped one. That is, they predicted that the low and high probabilities would be chosen much less frequently (proportionally) than the intermediate probabilites. In addition, they expected the peak of this curve to occur at the 0.50 probability (as this is where the product of the probability and incentive is largest). This is, indeed, what they found. They suggest, then, that "the choice of one alternative as a means to a goal of winning some money, to a certain extent, is functionally equivalent to the choice of an alternative as a means to a goal" (Atkinson & Birch, 1970, p. 181). That is, they argue that the probability of 0.30 paired with a payoff of 35 cents is "functionally equivalent to" 0.70 paired with 15 cents. What is important is the maximization of the product of probability and payoff.

We disagree. Rather, we suggest that, because the uncertainty of the outcome of an event varies, individual differences in uncertainty orientation will interact with incentive and probability

of success. We argue that maximization of the product of these two factors will not universally describe the choices of participants. This study is important to the theory of uncertainty orientation because it will demonstrate, first, that there are factors other than I(s) and P(s) operating in this situation. Second, it is considered important as it will indicate that uncertainty orientation operates in situations where there is uncertainty about the outcome (Sorrentino & Short, 1986). That is, it will demonstrate that, in the absence of information value, variation in the uncertainty of the outcome still affects the relevance of the situation for certainty- and uncertainty-oriented individuals.

In addition to testing the effects of uncertainty orientation, gender will also be examined. Previous reseach with achievement-related motives has not reliably predicted risk-taking behaviour for females (see Atkinson, 1964; Atkinson & Raynor, 1974; Horner, 1974). Although Sorrentino and his colleagues have not had similar problems with predicting behaviour of females for uncertainty orientation (e.g., Sorrentino et al., 1984; Sorrentino & Hewitt, 1984), gender differences may be important in risk-taking situations. Hence, this variable is also included for investigation in the present research. Finally, achievement-related motives are assessed for exploratory purposes.

The specific hypothesis of the present study, then, is that uncertainty-oriented persons will choose moderate risk outcomes as opposed to high or low risk outcomes, and this difference will be greater than that for certainty-oriented persons.

Method

Subjects

Twenty male and 20 female undergraduate students at the University of Western Ontario, participating as part of course requirements, served as subjects. They were selected on the basis of their uncertainty orientation, which was assessed during mass testing situations held earlier in the academic year.

Measurement of Individual Differences

Uncertainty orientation.

Uncertainty orientation is hypothesized to consist of two separate components: the relevance of certainty and of uncertainty (Sorrentino et al., 1984). The relevance of uncertainty (abbreviated n Uncertainty) is inferred from responses to the projective measure adapted by Frederick, Sorrentino and Hewitt (1985). This measure consists of eliciting stories from research participants by presenting them with sentence leads. The stories are then scored, using a system similar to that employed for the scoring of n Achievement (see Atkinson, 1958). In order for a story to be scored as containing uncertainty imagery (score = +1), one of four criteria must be met. These criteria are (1) there is a clear statement in the story about some experience or outcome that is desired but is uncertain; the character must be described as actively seeking to engage in the experience or to obtain the outcome; (2) there is some inconsistency between two ideas which the character seeks to resolve; (3) there is some inconsistency between

an experience and an established schema and the character is described as doing something to reduce the inconsistency; and (4) there is inconsistency between a character's behaviour and his or her ideas which the character seeks to resolve. Stories may also be scored as containing doubtful imagery (score = 0) or no uncertainty imagery (score = -1). Those stories scored for uncertainty imagery are also scored for 10 subcategories (score = +1 each), resulting in possible scores ranging from -1 to +11.

The relevance of uncertainty is inferred from Byrne and Lamberth's (1971) measure of authoritarianism. Rokeach's (1960) conception of authoritarianism describes the high authoritarian as one who orients toward the familiar where the low authoritarian is described as willing to engage in new experiences. Thus, conceptually, authoritarianism is related to responses to certainty.

A resultant measure of authoritarianism and need for uncertainty is formed because the relevance of certainty and uncertainty are hypothesized to be distinct aspects of uncertainty orientation. An individual who scores high on the projective measure may or may not score low on the measure of certainty; the two must be assessed independently. Finally, when research participants are selected, a tertile split of the resultant scores is performed. This results in three groups. First, there are uncertainty-oriented persons, who score high on the projective measure of uncertainty and low on authoritarianism. Second, there is the certainty-oriented group, scoring low on n Uncertainty and high on authoritarianism. Finally there is the mixed group, who may score moderate on both measures, low on both or high on both. This

group is typically excluded from analysis as their responses to uncertainty are unpredictable.

Achievement-related motives.

The motive to succeed and the motive to avoid failure are assessed independently. The motive to succeed is also inferred from responses to sentence leads. These are scored for achievement imagery following the procedure recommended by McClelland, Atkinson, Clark & Lowell (1958). The motive to avoid failure is assessed with the first third of the items from Mandler and Sarason's (1952) Test Anxiety Questionnaire (The first third has been found to be highly correlated with the total scores, r's range from 0.84 to 0.90; Smith, 1964). A resultant measure is formed and a tertile split of the scores is performed resulting in success-oriented (high on the motive to succeed, low on the motive to avoid failure), failure-threatened (low on the motive to succeed, high on the motive to avoid failure), and moderate groups.

Assessment of Uncertainty Orientation and Achievement-

Related Motives

The projective measure of n Achievement and n Uncertainty was administered according to standard methods (Frederick et al., 1985; McClelland et al., 1958). Sentence leads were used instead of pictures; this has been found to be a valid procedure (Raynor & Rubin, 1971). Three sentences, the numbers corresponding to the pictures in Atkinson (1958, Appendix 3), were presented in the following order: (2) two people are working in a laboratory on a piece of equipment; (48) a person is sitting with a typewriter and books; and (86) a group of young people are sitting in a lounge

talking. Between sentences two and 48, a specially constructed lead sentence for n Uncertainty was inserted: a person is sitting wondering about what may happen. Stories written to these leads were scored for achievement imagery in accordance with the scoring manual (McClelland et al., 1958) by an expert (CR). Inter-rater reliability was computed for 30 stories (one practice set from materials developed by Smith and Feld, 1958) by correlating the two sets of scores (CR with the practice materials). For the achievement imagery, there was high reliability, $r(30) = 0.92$. Uncertainty imagery was scored for stories in accordance with the scoring manual developed by Frederick et al. (1985). Again, the expert's scores (EH) were highly correlated with the scores from the practice materials, $r(30) = 0.95$.

Following the projective measure, the first third of the Mandler and Sarason (1952) Test Anxiety Questionnaire and Byrne and Lamberth's (1971) measure of authoritarianism were administered.

A resultant measure of uncertainty orientation was obtained by subtracting the standard score of authoritarianism from the standard score of n Uncertainty. A tertile split was subsequently performed on this measure, yielding uncertainty-oriented, certainty-oriented and mixed groups. Subjects for this experiment were chosen randomly from the two extreme groups and were asked to participate in an experiment looking at choices between paired alternatives. In addition, a resultant measure of achievement motivation was calculated by subtracting the standard score of the Test Anxiety Questionnaire from that of the total n Achievement.

Procedure

Probability pairings: The task used in this experiment was a computerized version of a task described by Atkinson and Birch (1970, p. 179). It involved nine probabilities (0.10 to 0.90) matched with payoffs (45 to 5 cents) which varied inversely with probability. All possible pairs of probabilities (n=36) were formed and presented to participants as choices of one event from a pair. The presentation was computerized on an Apple IIe microcomputer, which presented each choice pair and recorded the choices of each subject. The order in which the pairs were presented was randomized.

The inverse relationship between payoff and probability produces different expected values for the events. That is, the pairing of 0.10 with 45 cents produces an expected value of 4.5, while this value is 12.5 for the pairing of 0.50 and 25 cents. Plotting the expected values against the probabilites produces an inverted U-shaped function which peaks when the probability is 0.50. If subjects operate solely according to a maximization principle, this function will be reproduced in their choices.

This presents a difficulty because it is at this point that the differences between certainty and uncertainty-oriented persons are predicted to be maximal. Thus, a possible alternative explanation for the predicted results could be a difference in intelligence or use of appropriate decision making strategies rather than uncertainty orientation. In order to assess this possibility, a number of control trials were included which had equal expected values but which varied in probability. Three control trials were

included in each set of probabilities, yielding a total of 39 pairs of probabilities presented three times. The logic behind the control trials was to demonstrate that both groups of participants have an equal understanding of the relationship between probability and payoff and understand, at least implicitly, the notion of expected value. The control trials had probabilities of 0.10, 0.30 and 0.90, and were matched with payoffs of 45, 15, and 5 cents, respectively, which produces a constant expected value of 4.5. It was hypothesized that certainty-oriented persons would display a stronger preference for the two extreme probabilities of 0.10 and 0.90 and that uncertainty-oriented individuals would prefer 0.30. This is because 0.30, when paired either with 0.10 or 0.90, is the more intermediate of the pair. If maximization were the governing principle of choices, then no difference in preferences for these three probabilities would be predicted as the expected value is constant.

One might rightly wonder why the probability of 0.50 was not used in the control trials. This is because we did not want the control trials to be radically different from the other trials. If a probability of 0.50 had been included as well as extreme probabilities, the payoff would have been very different from those of the experimental trials. Alternatively, to keep the payoff in the range of the remaining trials, the probabilites paired with 0.50 would not have been sufficiently extreme. Thus, practical concerns governed the choice of the payoffs and probabilities used on the control trials.

<u>Presentation:</u> Participants were tested in groups of up to four individuals. They were informed on arrival that their task was to make "a series of choices between pairs of events" and that, although they were being tested in groups, their responses were totally independent of each other. To emphasize this, barriers were placed between them.

In order to explain the concept of probability to respondents, a visual analogy was used. A graphics display of two containers was shown on the colour monitor and each 'container' was portrayed as containing different colours of 'beads'. They were told to imagine that each container held 100 beads, some proportion of which were designated as 'lucky'. That is, if such a bead was drawn, they would receive a monetary award, the value of which varied across trials. The remaining beads were unlucky and were valueless if drawn.

In explaining the procedure, participants were told that the probability that was displayed on the monitor (e.g., 0.60, 0.30) corresponded to the number of beads out of the 100 (e.g., 60, 30) that were designated as lucky. They were also shown the payoffs associated with the probabilities for each trial. It was pointed out that the probability was different for the two containers and that they would vary across trials. In addition, the probabilities for each of the four participants were different for each trial, and this was mentioned to them. They were told, next, that they were to choose one of the two containers displayed on the monitor and that the computer would record their choice and determine whether the bead that was drawn was lucky or unlucky. They were informed that

they would not be told the outcome of each trial until all choices were made, with the rationale that their choices might be affected by knowlege of the outcomes. Finally, the method of payoff was explained. Out of their total number of chosen outcomes, twenty would be selected randomly by the computer and the payoffs associated with them would be awarded to them.

Following these instructions, participants completed the task, making a total of 117 choices (three times through the 39 pairs). Following calculation of their payoffs, they were fully debriefed as to the purpose of the experiment, were given their payoff, and were thanked for their participation (see Appendix A for instructions).

Treatment of the Data

The predictions made above were stated in terms of low, intermediate and high risk levels. In order to test these predictions, the data were compiled in the following manner. The number of times that the probabilities 0.90, 0.80, and 0.70 were chosen was tallied. This was divided by the total number of times that these probabilities were presented as choices (n = 72). Next, they were expressed as percentages by multiplying the proportions by 100. This defined the percentage of low risk choices. The same calculations were performed for the intermediate risk level (p's =. 0.60, 0.50, 0.40) and the high risk level (p's = 0.30, 0.20, 0.10). Finally, the control trial choices were treated in the same way. The percentage of times that 0.90, 0.30, and 0.10 were chosen was calculated.

The percentages of low, intermediate and high risk choices were analyzed with fixed effects split-plot analysis of variance, with gender and uncertainty orientation as between-subjects factors and risk level as the within-subjects factor. The decision to use a fixed effects analysis was based on the distinction between fixed and random models presented by Keppel (1973, pp. 333-334). He argues that a factor may be considered fixed when a "continuous dimension may be divided coarsely into two, three or more categories" (p. 333). The control trial choices were also analyzed with fixed effects split-plot analysis of variance, with gender and uncertainty orientation as between-subjects factors and probability type (0.90, 0.30, 0.10) as the within-subjects factor.

Results

Test of the Hypothesis

Overall, intermediate risk options were chosen most often (M = 64.79%), followed by low (M = 58.96%) and high risk options (M = 26.25%). Analysis of variance with gender and uncertainty orientation as between-subjects factors and risk level as the within-subjects factor indicates a significant main effect of risk level, $F(2,72)$ = 48.40, $p < .01$, and a significant gender by uncertainty orientation by risk interaction, $F(2,72)$ = 3.18, $p < .05$. No other interactions were statistically significant (see Table 1 for the summary table). The means for this three factor interaction are presented in Table 2. Testing of these means was conducted separately for the certainty- and uncertainty-oriented groups, as

Table 1

Analysis Summary Table - Gender and Uncertainty Orientation as Between-Subjects Factors, Risk Level as the Within-Subjects Factor

Factor	SS	df	Ms	F	p
Between Subjects Effects					
Gender (G)	0.00	1	0.00	0.00	-
Uncertainty Orientation (UO)	0.00	1	0.00	0.00	-
G X UO	0.00	1	0.00	0.00	-
Error	0.00	36	0.00	0.00	-
Within Subjects Effects					
Risk (R)	34524.31	2	17262.15	48.20	.001
R X G	473.52	2	236.76	1.49	n.s.
R X UO	140.19	2	70.10	0.44	n.s.
R X G X UO	1008.20	2	504.10	3.18	.05
Error	25680.56	72	356.67		

Note. The between-groups sums of squares are equal to zero because when collapsing across risk level, the scores sum to a constant.

Table 2

Mean Percentage of Choices Made from Three Risk Levels as a
Function of Gender and Uncertainty Orientation

	Risk Level		
Group	Low	Intermediate	High
Uncertainty-oriented			
Females	57.92a	64.17a	27.92b
Males	55.83a	71.25a	22.93b
Certainty-oriented			
Females	69.17a	62.08ab	18.75c
Males	52.92b	61.67ab	35.42d

Note: Means with common subscripts don't differ at the 0.05 level within uncertainty groups. There are 10 observations per cell.

hypotheses were stated in terms of the two groups. The Student-Newman-Keuls procedures was employed, which controls for error rate (see Keppel, 1973, pp. 136-137). In addition, the overall alpha level was set at 0.05, but the critical value of the statistic was actually that associated with the 0.01 probability. This was done to control for making two sets of comparisons from the same error term from the analysis of variance. Thus, a more conservative approach was adopted to protect against capitalizing on chance.

Examination of the means in Table 2 indicates that uncertainty-oriented males and females both made intermediate risk choices most frequently, which is consistent with predictions. Further, they chose high risk options less frequently than low risk ones. In contrast, certainty-oriented males and females differed in their pattern of choices, which was not predicted. Certainty-oriented females chose low risk options more frequently than intermediate and high risk levels. Further, they chose low risk more frequently than did the certainty-oriented males and chose high risk less frequently than did their male counterparts. This effect of gender for the certainty-oriented participants was not predicted; we had anticipated that both certainty-oriented males and females would prefer intermediate risk less than and extreme risk more than uncertainty-oriented individuals.

Choices across all nine probability levels are presented in Figures 2 and 3. Examination of the curves of the four groups indicates that the uncertainty-oriented groups most strongly prefer the probability 0.60 and the curves are somewhat symmetrical about

Figure 2

Distribution of proportion of choices of probabilities for

uncertainty-oriented individuals.
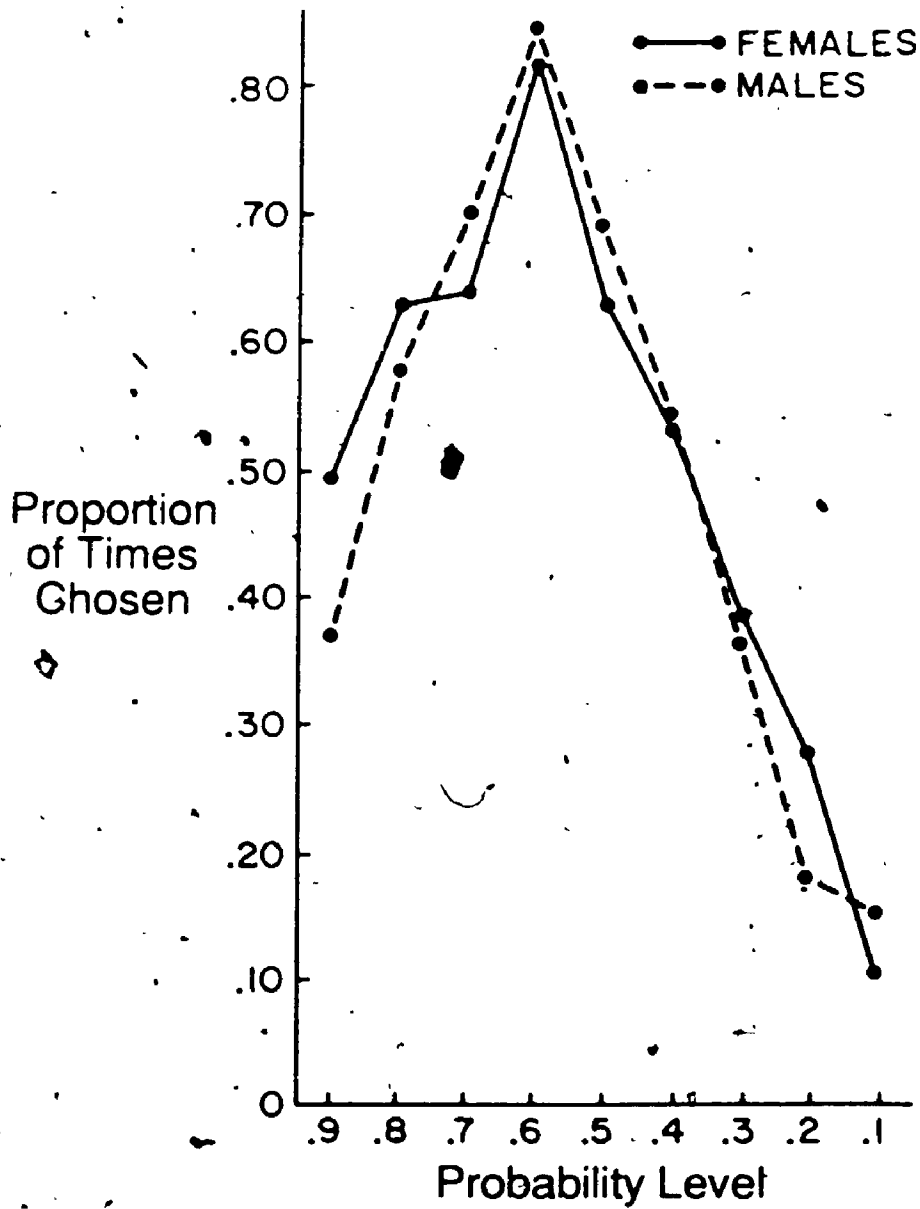
Figure 3

Distribution of proportion of choices of probabilities for

certainty-oriented individuals.
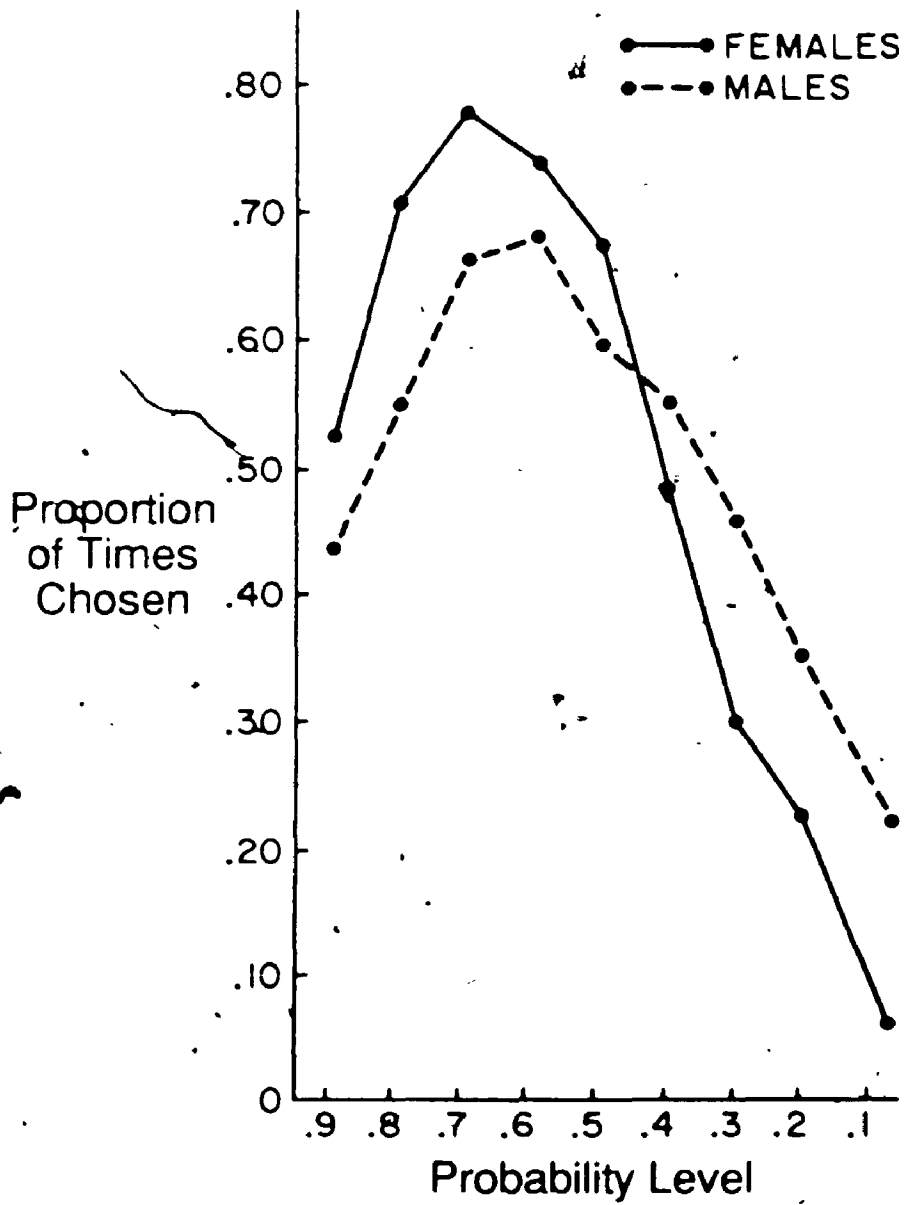
this point. In contrast, certainty-oriented males were more-likely to make 'risky' choices and less likely to make intermediate choices while the females deviated on the 'safe' side of the distribution. Comparison of the curves of the certainty-oriented participants to those of the uncertainty-oriented groups indicates that the curves for the certainty-oriented groups are less peaked and are more elevated at the extreme probability levels.

Analysis with Achievement-Related Motives

Prior to, presenting the results of the analysis of the effects of achievement-related motives, it should be noted that research participants for this study were preselected for their uncertainty orientation. Moderate scorers were excluded. Thus, the 60 participants are not randomly selected for achievement-related motives. Further, the sample size drops for this analysis as moderate scorers for achievement were excluded from the analysis. It should also be noted that this analysis was conducted for exploratory purposes.

Analysis of variance with gender and achievement-related motives as between-subjects factors and risk level as the within-subjects factor indicates only a significant effect of risk level, $F(2,48) = 28.39$, $p < .01$ (see Table 3 for the analysis of variance summary table). Overall, intermediate probabilities were chosen most frequently ($M = 65.18\%$), followed by low ($M = 58.48\%$) and high risk ($M = 26.34$). This pattern is highly similar to that found when all participants were included, in the analysis with gender and uncertainty orientation as the between-subjects factors.

Table 3

Analysis Summary Table - Gender and Achievement-Related Motives

as Between-Subjects Factors, Risk Level as the

Within-Subjects Factor

Factor	SS	df	Ms	F	p
Between Subjects Effects					
Gender (G)	0.00	1	0.00	0.00	-
Achievement-Related Motives (ARM)	0.00	1	0.00	0.00	-
G X ARM	0.00	1	0.00	0.00	-
Error	0.00	24	0.00	0.00	-
Within Subjects Effects					
Risk (R)	24448.34	2	12224.17	28.39	.01
R X G	757.08	2	378.54	0.88	n.s.
R X ARM	1207.30	2	603.65	1.40	n.s.
R X G X ARM	294.55	2	147.28	0.34	n.s.
Error	20670.42	48	430.63		

Note. The between-groups sums of squares are equal to zero because when collapsing across risk level, the scores sum to a constant.

Analysis of Control Trials

Nine control trials were inserted randomly among the 108 experimental trials. These control trials paired the probabilities 0.10, 0.30, and 0.90, with the expected value held constant. As was done for the other trials, percentage measures were calculated for the three and analyzed with gender and uncertainty orientation as between-subjects factors and probability type as the within-subjects factor. Analysis of variance indicates a significant probability type main effect, $F(2,72) = 15.04$, $p<.01$, and a significant gender by probability type interaction, $F(2,72) = 4.88$, $p<.01$, neither of which was predicted to occur (see Table 4 for the summary table). Overall, 0.90 was chosen most frequently ($M = 73.34\%$) followed by 0.10 ($M = 41.67\%$) and 0.30 ($M = 35.00\%$). This main effect is qualified by the interaction of gender and probability type. Examination of these means indicates that females showed a stronger preference for 0.90 ($M = 85.00\%$) than do males ($M = 61.67\%$). Further, they prefer 0.10 less ($M = 30.00\%$) than the males ($M = 53.33\%$). The two groups don't differ in the percentage of times that 0.30 was chosen ($M = 35.00\%$ for both males and females). Thus, when the expected value is held constant, females tend to have a stronger preference than males for the low risk option while the reverse is true for high risk. There was no effect of uncertainty orientation on these choices, as had been predicted. We had expected that uncertainty-oriented individuals would prefer the probability of 0.30 more than and 0.90 and 0.10 less than certainty-oriented persons. This prediction was not confirmed by

Table 4

Analysis of Variance Summary Table for Control Trials -
Gender and Uncertainty Orientation and Probability as Between-
Subjects Factors and Probability as the Within-Subject Factor

Factor	SS	df	Ms	F	p
Between Subjects Effects					
Gender (G)	0.00	1	0.00	0.00	-
Uncertainty Orientation (UO)	0.00	1	0.00	0.00	-
G X UO	0.00	1	0.00	0.00	-
Error	0.00	36	0.00	0.00	-
Within Subjects Effects					
Probability (P)	33555.56	2	16777.78	15.04	.001
R X G	10888.89	2	5444.45	4.08	.01
R X UO	55.56	2	27.78	0.03	n.s.
R X G X UO	722.22	2	361.11	0.32	n.s.
Error	80333.33	72	1115.74		

Note. The between-groups sums of squares are equal to zero
because when collapsing across risk level, the scores sum to
a constant.

these results. Rather, the pattern of results on these control trials resembles than on the experimental trials.

Discussion

The results of Study One are consistent with predictions, although gender interacted significantly with uncertainty orientation ($p < .05$), unexpectedly. The nature of this interaction does not contradict the hypotheses. We anticipated that uncertainty-oriented persons would show a preference for intermediate risk and that this preference would be stronger than that of certainty-oriented persons. Results for uncertainty-oriented males and females are somewhat consistent with this hypothesis. We also expected that certainty-oriented persons would show a stronger preference for extreme risk levels than uncertainty-oriented participants. On a very general level, we found this to be the case, although, here, gender determined the specific form of the extreme risk preference. Male and female certainty-oriented participants differed in the pattern of choices across the three levels of risk. Males shifted more toward the high risk end of the continuum whereas the females shifted toward the cautious end. Both of these, however, are relatively more certain outcomes than the intermediate probabilities.

In hindsight, such an interaction with gender might have been expected. For example, Clayton (1981) did find, using the Bem Sex-Role Inventory (Bem, 1974), that whereas uncertainty-oriented males and females tended to be androgynous, certainty-oriented males

and females tended to be sex-role typed. Thus, when it comes to risk-taking behaviour, we might have expected certainty-oriented persons to show more gender appropriate behaviour, reflecting cultural values. It must be made clear, however, that the interaction with gender was not predicted. Hence, any discussion of the significance of the finding would necessarily be post hoc. Rather than make much ado about what could be nothing, this interaction will be tested in the second study to determine its replicability. It is possible that risk-taking may have the additional propensity to elicit stereotypic behaviour on the part of certainty-oriented persons, so gender will be examined in conjunction with uncertainty orientation in Studies Two and Three.

Besides the unpredicted interaction of gender and uncertainty orientation, this study has a second weakness that prompts caution in the interpretation of the results. This weakness lies in the control trials which were inserted to attempt to demonstrate that, when expected value was held constant, certainty- and uncertainty-oriented persons would make their choices on the basis of the uncertainty of the outcome (i.e., the probabilitx). This prediction received no support.

The difficulty with these trials is that all three outcomes (i.e., p's = 0.10, 0.30, 0.90) were relatively more certain outcomes. That is, there was not true intermediate probability included in these trials. Choosing 0.10 or 0.30 results in a relatively low likelihood of obtaining the payoff, whereas choosing 0.90 represents a relatively sure likelihood of obtaining a payoff. In both cases, the outcome is reasonably certain. Thus, analysis of

the control trials does not allow us to determine if uncertainty-
and certainty-oriented persons differ in their preference 'for
uncertain versus certain outcomes. This limitation of the control
trials, then, does not allow us to rule out the alternative
explanation for the results of this study. It is still possible
that what accounts for the differences in choices between certainty-
and uncertainty-oriented individuals is a difference in intelligence
or in use of an appropriate decision strategy. This alternative
explanation will be addressed in the second study of this thesis.

In sum, then, the results of the present study do provide some
support for the argument that uncertainty orientation applies in
situations that are low in information value but which vary in
outcome uncertainty. In the third study, we will test whether
uncertainty orientation predicts risk-taking in skill situations,
which include both information value and outcome uncertainty.

Study Two

Rationale

The purpose of this second study is to pursue further the plausibility of the alternative hypothesis from the first study. That is, can both certainty- and uncertainty-oriented persons make decisions in ways that maximize the expected value? In the first study, nine pairs of control trials were inserted in which the expected value was constant. These trials were added in the hope of ruling out an alternative hypothesis for the predicted pattern of results. We predicted that uncertainty-oriented persons would most strongly prefer the probability of 0.50 and that certainty-oriented individuals would prefer more certain probabilities, such as 0.20 or 0.80. As noted in Chapter III, probability and payoff were inversely related, producing an inverted U-shaped function for the expected values with the greatest expected value at the 0.50 probability. Thus, an alternative explanation for the predicted findings could be that certainty-oriented and uncertainty-oriented persons differ in their ability to use the best decision strategy, which is to maximize the product of probability and payoff. According to the maximization principle, people should choose an option that has the greatest "subjective expected utility" (Edwards, 1954). The purpose of this second study is to demonstrate that

uncertainty- and certainty-oriented persons do indeed use these strategies appropriately.

In the first study, where payoff and probability were inversely related, either the uncertainty of the outcome or the expected value of the outcome could have determined choices. In this second study, these two factors will be separated, thus causing the expected values to differ on some trials. For other trials, the expected value will be held constant; both options in the paired choices will have the same expected value but will differ in probability. If uncertainty orientation does not influence the use of decision strategies, then both groups should prefer that outcome which maximizes utility, when they have the choice. When the expected value is constant, irrespective of which choice is made, uncertainty-oriented persons should show a preference for intermediate probabilities while certainty-oriented individuals should show a preference for the more certain probabilities. In addition, gender should interact significantly with uncertainty orientation.

Method

Subjects

Thirty certainty- and thirty uncertainty-oriented males and females served as subjects, in partial fulfillment of course requirements for an introductory psychology course at Mount Allison University. They were recruited for participation on the basis of

their uncertainty orientation which had been assessed in massed
testing sessions held several weeks prior to this study.

Measurement of Individual Differences

The manner in which the uncertainty orientation of the
participants was assessed is identical to the procedure outlined in
Study One, except that, in this study, their level of achievement
motivation was not assessed. Participants completed the Thematic
Apperception Test followed by the authoritarianism scale, and the
stories written to the Thematic Apperception Test were scored by an
expert scorer only for uncertainty imagery. Again, the correlation
of the scores of the expert scorer with those of the scoring manual
materials (Frederick et al., 1985) was high, $r(30) = 0.92$.

Procedure

Probability pairings: Thirty-six pairs of probabilities were
presented to participants. There were six pairs that differed in
expected value and these were repeated three times. There were also
six pairs that had constant expected values and they were repeated
three times as well (see Appendix B for the questionnaire). For
both types of pairs, high (p's = 0.10 and 0.20), intermediate (p =
0.50) and low risk (p's = 0.80 and 0.90) probabilities were used.
Hypothetical payoffs ranged from $1.00 to $8.00.

Presentation: Participants were presented with a "Choice Task"
which consisted of instructions and the probability pairs. The
instructions explained the concepts of probability and payoff and
participants were told to "choose one of the paired hypothetical
events". The written instructions were reviewed with participants

and, prior to beginning the task, they were asked if they had any
questions. Following this, participants worked through the pairs,
indicating their choice by circling the option they preferred. When
they had completed the task, they were fully debriefed and thanked
for their participation.

Data Treatment

For the different expected value trials, the number of times
that the option with the higher expected value was selected was
tallied, divided by 18 (the total number of trials) and converted to
a percentage. This variable is labelled the percentage of higher
expected value choices. For the constant expected value trials, the
percentage of times that low, moderate, and high risk options were
chosen was computed. These were calculated separately for each risk
level. That is, the percentage of times that an intermediate risk
choice was made was calculated by dividing the number of such
choices by the number of times that this option was presented to
participants, then multiplying by 100.

Results

Different Expected Values Trials

Fixed effects analysis of variance, with gender and uncertainty
orientation as between-subjects factors, was conducted on the
percentage of higher expected value choices made on trials with
differing expected values. This revealed no significant main
effects or interactions (see Table 5 for the analysis of variance
summary table). Both uncertainty- ($M = 64.07$) and certainty-

Table 5

Analysis of Variance Summary Table - Percentage of Higher Expected

Value Choices - Gender and Uncertainty Orientation as

Between-Subjects Factors

Source	SS	df	MS	F	p
Gender	100.81	1	100.81	< 1	n.s.
Uncertainty Orientation	51.45	1	51.45	< 1	n.s.
Gender by Uncertainty Orientation	2.06	1	2.06	< 1	n.s.
Error	6078.15	14	108.54		
Total	6232.47	59			

oriented persons ($\underline{M}$ = 62.22) more frequently chose the outcome with the higher expected value, which was predicted on the basis of subjestive expected utility theory.

Constant Expected Value Trials

Fixed effects analysis of variance with gender and uncertainty orientation as between-subjects factors, and risk level as the within-subjects factor was conducted on choices from trials with constant expected values. Analysis of the percentage of times each risk level was chosen revealed a significant risk level by gender, $\underline{F}(2,112)$ = 22.15, $\underline{p}<.001$ interaction. Overall, females preferred low ($\underline{M}$ = 59.17) and intermediate risk ($\underline{M}$ = 53.33) more than high risk options ($\underline{M}$ = 37.60). This pattern is reversed for males who preferred intermediate ($\underline{M}$ = 54.72) and high risk ($\underline{M}$ = 57.50) over low risk ($\underline{M}$ = 37.78). There was also a significant risk level by uncertainty orientation interaction, $\underline{F}(2,112)$ = 23.08, $\underline{p}<.001$. Overall, uncertainty-oriented individuals preferred intermediate risk most ($\underline{M}$ = 66.39), and chose low ($\underline{M}$ = 40.59) and high ($\underline{M}$ = 43.06) risk options equally often. In contrast, certainty-oriented persons chose the extreme risks ($\underline{M}$'s = 56.39 and 51.95, for low and high risk, respectively) more frequently than intermediate risk ($\underline{M}$ = 41.67). These interactions are qualified by the statistically significant interaction of risk level, gender, and uncertainty orientation, $\underline{F}(2,112)$ = 3.08, $\underline{p}<.05$ (see Table 6 for the summary table). Examination of the means (see Table 7) indicates that this interaction is similar to that obtained in Study One (Post hoc testing of means was conducted in the same manner as in Study One, including the dual control for error rate). For both

Table 6

Analysis of Variance Summary Table - Choices with Constant

Expected Values - Gender and Uncertainty Orientation

as Between-Subjects Factors, Risk Level as the

Within-Subjects Factor

Source	SS	df	MS	F	p
Between Subjects Effects					
Gender (G)	3.47	1	3.47	< 1	n.s.
Uncertainty Orientation (UO)	9.65	1	9.65	1.47	n.s.
G x UO	9.65	1	9.65	1.47	n.s.
Error	367.28	56	6.56		
Within Subjects Effects					
Risk Level (R)	1398.15	2	699.07	2.37	n.s.
R x G	13083.33	2	6541.67	22.15	.001
R x UO	13632.72	2	6816.36	23.08	.001
R x G x UO	1817.90	2	908.95	3.08	.05
Error	33077.16	112	295.33		

Table 7

Mean Percentage of Choices Made from Three Risk Levels as a

Function of Gender and Uncertainty Orientation

| | | Risk Level | |
Group	Low	Intermediate	High
Uncertainty-oriented			
Females	47.22b	66.11a	36.67b
Males	33.89b	66.67a	49.44b
Certainty-oriented			
Females	71.11a	40.56b	38.33b
Males	41.67b	42.78b	65.56a

Note. Means with common subscripts don't differ at the 0.05

level, within uncertainty groups. There are 15 observations per

cell.

uncertainty-oriented males and females, there was a stronger preference for intermediate risk than for high or low risk. In contrast, certainty-oriented males and females did not differ in their intermediate risk choices. Rather, they differed in their choices of low and high risk. Certainty-oriented males preferred high risk more than low risk and more than did certianty-oriented females. This pattern reverses for low risk choices. Females chose this risk level most frequently and chose it more frequently than did the certainty-oriented males.   —

This pattern of results replicates that found in the first study and demonstrates the divergence in choices of certainty-oriented males and females more clearly. This suggests that the effect of gender found in the first study was not a chance finding.

Discussion

The findings of this second study indicate that uncertainty- and certainty-oriented persons can both utilize an appropriate decision strategy. On trials where the expected value of the outcomes differed, these two types of individuals did not differ in their choices. It was the expected value of the outcome that determined which option was chosen. This finding suggests that, in the first study, the pattern observed in the choices of these two groups may not have been solely a function of differences in the use of decision rules.

The findings of this study also replicate those of the first study, where uncertainty-oriented males and females did not differ, but chose intermediate probabilities most often. Certainty-oriented

males chose high risk options and their female counterparts chose lower risk options, both of which are relatively more certain outcomes. For the constant expected value trials in this study, gender and uncertainty orientation also interacted. Again, uncertainty-oriented males and females chose intermediate risk most often. Certainty-oriented males chose high risks and females chose low risk options. This replicates the pattern of the first study.

There is one discrepancy in the results of the first two studies that merits a brief discussion at this point. In the first study, most of the choices (96 out of 108) were made on trials where the expected values differed. In this second study, both constant and different expected values pairs were presented to participants. In Study One, a significant gender by uncertainty orientation interaction was found, whereas for the different expected value trials in this second study, no such differences were observed. In order to investigate this further, analysis of choices made on the trials with constant expected values from Study One was conducted. There were four such pairs presented to participants in the first study, because of the relationship between probability and payoff. When 0.90 (payoff = 5 cents) is paired with 0.10 (payoff = 45 cents), the expected value is the same for both choices. Similarly, when 0.80 (10 cents) is paired with 0.20 (40 cents), 0.70 (15 cents) with 0.30 (35 cents) and 0.60 (20 cents) with 0.40 (30 cents), pairs with constant expected values are obtained. These four pairs (part of the 36 possible unique pairs of the probabilities 0.90 to 0.10) were repeated three times, resulting in 12 choices between pairs with equal expected values. The percentage of times that the higher

probability of the pair was chosen was calculated. Thus, this is an index of low risk preference. Fixed effects analysis of variance with gender and uncertainty orientation as between-subjects factors revealed a marginally significant main effect of gender, $F(1,36) = 3.34$, $p=0.07$ and a significant interaction of gender and uncertainty orientation, $F(1,36) = 5.52$, $p<.05$ (see Table 8 for the summary table). Examination of the means for this interaction indicates that uncertainty-oriented males ($M = 75\%$) and females ($M = 70\%$) did not differ. Certainty-oriented females chose the low risk option more frequently ($M = 95\%$) and certainty-oriented males chose this less frequently ($M = 55\%$) than their uncertainty-oriented counterparts. This parallels the findings of this second study. Nonetheless, on the overall analysis of the first study, uncertainty orientation interacted significantly with gender on choices between risk levels, and most of the pairs presented for choice had differing expected values. In this second study, on trials where the expected value differed, individual differences did not significantly affect risk-taking.

One difference in the procedures of the two studies may explain why there is a difference in the findings. In the first study, participants were presented with the paired probabilities one at a time whereas in the second, they received a booklet containing all of the pairs. Thus, in the second study, it may have been more apparent to the participants that there were different types of pairs (constant and differing expected values). As well, in the first study, there were relatively few constant expected value trials (12 out of a total of 96). In the second study, there were

Table 8

Analysis of Variance Summary Table - Percentage of Constant
Expected Value Choices From Study One - Gender and Uncertainty
Orientation as Between-Subjects Factors

Source	SS	df	MS	F	p
Gender	3062.50	1	3062.50	3.34	.07
Uncertainty Orientation	62.50	1	62.50	0.07	n.s.
Gender by Uncertainty Orientation	5062.50	1	5062.50	5.52	.05
Error	33000.00	36	916.67		

equal numbers of each type ($\underline{n}$ = 18). It is possible, therefore, that participants in the first study may not have been as aware of the difference and may have been using a different strategy in making choices than participants in the second study. This is, admittedly, post hoc speculation about the cognitive processes of research participants, for which there is no direct evidence.

In summary, the pattern of findings of this second study is consistent with that of the first study. The findings also suggest that the alternative explanation for the data of the first study may not be a viable one. That is, this study demonstrates that both uncertainty- and certainty-oriented persons can use the maximization principle. When this strategy is not applicable (as in the constant expected value trials) uncertainty orientation predicts preference for options that vary in the uncertainty of the outcome. The findings are also consistent with the argument that uncertainty orientation affects responses to uncertainty about the outcome when the outcome is due to chance. The next study reported in this thesis will examine the effect of this individual difference variable in a setting in which the skill of the participants has some effect on the outcome as well.

Study Three

Rationale

The purpose of this third study, to reiterate, is to extend the
application of uncertainty orientation to risk-taking in a situation
in which there is both information value and uncertainty about the
outcome. In this third study, the task will involve the skill of
the participants. Thus, the task can provide information to the
participants that would allow them to diagnose their ability level.
As' in the first study, the central hypothesis of this experiment is
that risk-taking is related to uncertainty orientation.

As argued previously, the risk-taking literature has confused
information and affective value and has attempted (and, for the most
part, failed) to demonstrate that risk-taking behaviour is related
to differences in achievement-related motives. We argue that such
attempts have generally failed because the critical factor in
risk-taking situations is information value or uncertainty rather
than affective value. We contend that differences which have been
found as a function of such motives most likely reflect the fact
that there is some affective value in risk-taking situations that
entail pride in accomplishment and fear of failure. The weakness of
the findings, though, is a function of the relatively stronger
influence of information value. Thus, it would be more profitable

to examine individual differences in terms of information value (i.e., uncertainty orientation) alone or in conjunction with affective value (i.e., achievement motivation) in order to understand the nature of risk-taking behaviour.

Further, this study will examine the interaction of gender and uncertainty orientation in light of the findings of the first two studies reported in this thesis. Gender is an important factor to consider in determining the relevance of some situations and we argue that uncertainty orientation and gender will interact in determining risk-taking behaviour. Specifically, we predict that uncertainty-oriented individuals ought not to differ in their risk-taking behaviour as a function of gender: both males and females should prefer intermediate risk. Certainty-oriented persons should show a gender difference. Certainty-oriented males should show a stronger preference for high risk whereas such females should prefer low risk outcomes. Certainty-oriented individuals should be more responsive to cultural values in determining gender appropriate behaviour as they are more likely to be gender stereotyped than uncertainty-oriented persons (Clayton, 1981).

Differences due to achievement-related motives are also examined to determine if there is a preference for intermediate risk on the part of success-oriented persons as opposed to those who are failure-threatened. It is expected, however, based on previous research and current arguments, that preference for intermediate

risk as a function of achievement-related motives will not be reliable or will be weak at most.

The specific hypothesis of the present study, then, is that: uncertainty-oriented males and females will test their skill where they perceive their chances of succeeding to be intermediate; certainty-oriented males and females will be more likely to test their skill at high and low risk levels, respectively.

Method

Subjects

One hundred and forty undergraduate students at the University of Western Ontario participated in this experiment in partial fulfillment of a course requirement. They were selected on the basis of their uncertainty orientation and achievement motivation, which had been assessed earlier in the academic year during mass testing sessions. Roughly equivalent proportions of males and females across the three levels of uncertainty orientation were included, although there were more female (n = 88) than male (n = 52) participants.

Individual Differences

The manner in which uncertainty orientation and achievement motivation were assessed for this study is identical to that of the first and second studies. Again, the standard scores of resultant achievement motivation and uncertainty orientation were found to be uncorrelated, $r(138)$ = 0.16, n.s. (The number of participants

dropped to 138 because two participants did not complete the measures of individual differences.). As well, the inter-rater reliability for the scoring of achievement imagery, $r(30) = 0.90$, and uncertainty imagery, $r(30) = 0.92$, was high.

Procedure

On the basis of their pretesting scores, participants were recruited for participation in this study by telephone and were tested in single gender groups ranging from two to eight people by two different female experimenters. Upon arrival, they were informed that they would be performing a ball throwing task and were shown the apparatus. There was a basket into which they were to throw tennis balls, and distance markers were placed on the floor at one foot intervals, ranging from one foot to 25 feet. Participants first took seven practice throws, one from each of seven fixed distances (1, 4, 8, 12, 16, 20 and 25 feet) in order to familiarize them with the task. The experimenter recorded the accuracy of these throws.

Following this, all participants were seated and were asked to fill in several questionnaires. First, their subjective probabilities of success were assessed. This was accomplished by having them assign distances ranging from one to 25 feet, to each of 11 probabilities, ranging from 1.0 to 0.0. To give an indication of this, they were told to indicate first "where, if you were to take 10 throws, you know you would get 10 hits". They assigned the remaining probabilities in the same fashion. Upon completion, each participant was given a sheet that indicated the point structure for the task. The points awarded for a hit varied from 5 to 45 and

varied inversely with the probabilities of success. They were given several minutes to examine the point sheet, after which they filled in four seven-point Likert-type scales: (a) How important is it that you do well on this task?; (b) How important is it to your self-concept that you do well on this task?; (c) How important is finding out about your ability on this task?; and (d) How important to your self-concept is finding out about your ability on this task?. Finally, they were given a mood questionnaire which assessed, independently, the degree of positive and negative performance affect being experienced by participants at that particular time. They rated these affect states on seven-point Likert-type scales. The positive affect items were eager, enthusiastic, and interested, and the negative items were fearful, nervous, and jittery. These latter two measures (importance ratings and mood questionnaire) are taken from Raynor (1985).

Once these measures were completed, participants were told that they would now take 20 throws, for which they could stand at any distance from the target and could move from throw to throw. They were reminded of the subjective probabilities of success that they had assigned and the point structure, and were informed that the experimenter would be recording the distance from which they threw and their accuracy. Following the 20 free throws, participants were given their performance record and tallied their own points. They then reassigned the probabilities of success and indicated the distance at which they would stand from the target if they wanted to find out most about their ability level. This is an indication of the most diagnostic distance. They were then thoroughly debriefed

about the nature of the experiment and its relation to the mass
testing session held earlier in the year and were thanked for their
participation (see Appendix C for the materials).

Results

Assessment of Risk Levels

The measure of risk is dependent on the subjective
probabilities of success that were assigned after the seven practice
trials and prior to the 20 test trials. The risk measure consisted
of the proportion of the 20 test shots that were taken from the
distances associated with the subjective probabilities of success.
This was then reduced to the number of shots taken from the low risk
(p's = 0.90, 0.80, 0.70), moderate risk (p's = 0.60, 0.50, 0.40) and
high risk (p's = 0.30, 0.20, 0.10) areas. This reduction to three
levels was necessary because of low frequencies in some of the nine
probability levels. That is, there were nine probability levels and
when the 20 shots were distributed across the nine levels, many of
the proportions were very low or zero. This dependent measure was
analyzed utilizing split-plot factorial analysis of variance with
gender and uncertainty orientation as between-subjects factors and
level of risk as the within-subjects factor and with gender and
achievement-related motives as between-subjects factors and risk

2

1.0
1.1
1.25

2.8
3.2
3.6
4.0

2.5
2.2
2.0
1.8

1.4
1.6

level as the within-subjects factor. The results of these analyses
follow in two separate subsections.

Before presenting the results of these analyses, a brief
discussion of the assumptions regarding the nature of independent
variables is warranted. The conception of risk level in this study
as fixed is somewhat less clear than in the first two studies. In
these first two studies, research participants were presented with
the probabilities ranging from 0.90 to 0.10. These referred to the
probability of obtaining a payoff. They represent a full range of
the risk dimension, ranging from extreme risk to caution. Thus,
this was a true manipulated variable, defined objectively. In this
third study, low, intermediate, and high risk levels are defined by
subjective probabilities of success. Respondents assigned distances
to the probabilities ranging from 0.00 to 1.00, so there is

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[1] Split-plot analysis of variance, with gender, uncertainty
orientation and achievement-related motives as between-subjects
factors and the three levels of risk as the within-subjects factor
was also performed. This indicated only a marginally significant
four factor interaction, $F(2,114) = 2.92$, $p=.054$ (see Appendix E
for the summary table and the table of means for this four factor
interaction). This interaction is uninterpretable, which could be a
function of the small and unevenly distributed cell sizes.

variability across participants in the distances assigned to particular probabilities. Nonetheless, we are concerned with risk as a psychological dimension, not distance, which is a physical dimension. Despite the fact that, across individuals, the distances vary, we are assuming that the psychological dimension does not vary in the same way across individuals. It is then treated as a fixed factor, assuming the same logic as in the first two studies.

Analysis with Uncertainty Orientation

Split-plot analysis of variance with gender and uncertainty orientation as between-subjects factors and risk level as the within-subjects factor indicated a significant main effect for risk level, $F(2,180) = 4.11$, $p<.05$, a significant interaction of risk level and gender, $F(2,180) = 79.69$, $p<.001$, and a significant gender by uncertainty orientation by risk level interaction, $F(2,180) = 3.37$, $p<.05$ (see Table 9 for the summary table). Overall, low ($M = 39.77$) and intermediate risk ($M = 34.77$) are preferred over high risk ($M = 25.46$). This is subsumed by the two factor interaction of gender and risk level, where females prefer low risk ($M = 49.31$) over intermediate ($M = 29.17$) and high risk ($M = 21.53$) and males most prefer intermediate risk ($M = 41.72$) followed by high ($M = 30.34$) and low risk ($M = 27.94$). Again, however, this is subsumed by the higher order interaction of uncertainty orientation, gender and risk level.

The means for this interaction are presented in Table 10. As in the first two studies, separate Student-Newman-Keuls procedures were conducted for the uncertainty- and certainty-oriented groups.

Table 9

Analysis of Variance Summary Table – Percentage of Shots Taken From Three Levels of Risk – Gender and Uncertainty Orientation as Between-Subjects Factors and Risk Level as the Within-Subjects Factor

Factor	SS	df	MS	F	p
Between Subjects Effects					
Gender (G)	0.00	1	0.00	–	
Uncertainty Orientation (UO)	0.00	1	0.00	–	
G x UO	0.00	1	0.00	–	
Error	0.00	90	0.00		
Within Subjects Effects					
Risk Level (R)	9090.74	2	4545.37	4.11	.05
R x G	21432.92	2	10716.46	9.69	.001
R x UO	752.04	2	376.02	0.34	n.s.
R x G x UO	7453.96	2	3726.98	3.37	.05
Error	199067.40	180	1105.93		

Note. The between-groups sums of squares are equal to zero because when collapsing across risk level, the scores sum to a constant.

Table 10

Mean Percentage of Shots Taken from Three Risk Levels as a Function of Gender and Uncertainty Orientation

Group	Risk Level		
	Low	Intermediate	High
Uncertainty-oriented			
Females (27)	45.32a	33.18ab	21.50b
Males (17)	31.53ab	42.94a	25.53b
Certainty-oriented			
Females (29)	50.00b	37.90b,	12.10a
Males (21)	20.24a	39.90b	39.86b

Note: Means with common subscripts don't differ at the 0.05 level within gender groups. The number of observations per cell are in parentheses.

Examination of these means indicates that results are somewhat consistent with the specific hypothesis. Uncertainty-oriented males showed a stronger preference for intermediate and low risk than high risk. Further, they do not differ from the uncertainty-oriented females in their preference for intermediate risk. Uncertainty-oriented females, in contrast to predictions, did not most strongly prefer intermediate risk. Rather, they chose to take low risks most frequently.

The certainty-oriented participants showed the same pattern of risk preference in this study as they did in the first two studies. They did not differ in intermediate risk preference but males more frequently opted for high risk whereas females were more likely to prefer caution. This was the predicted pattern of results.

An additional a priori weighted contrast of these means reveals that certainty-oriented males and females do show greater extreme risk choices (greater preference of high risk and caution, respectively) than do uncertainty-oriented males and females, $t(180) = 2.32$, $p < .05$.

Analysis with Achievement-Related Motives

Split plot analysis of variance with gender and achievement-related motives as between-subjects factors and risk level as the within-subjects factor indicated a significant main effect of risk, $F(2,182) = 3.70$, $p < .05$, and a significant gender by risk level interaction, $F(2,182) = 6.28$, $p < .01$, as in the analysis with uncertainty orientation reported above (see Table 11 for the summary table). Note, however, that, unlike the analysis reported above,

Table 11

Analysis of Variance Summary Table - Percentage of Shots Taken From

Three Levels of Risk - Gender and Achievement-Related

Motives as Between-Subjects Factors and Risk Level as

the Within-Subjects Factor

Factor	SS	df	Ms	F	p
Between Subjects Effects					
Gender (G)	0.00	1	0.00	-	
Achievement-Related Motives (ARM)	0.00	1	0.00	-	
G x ARM	0.00	1	0.00	-	
Error	0.00	91	0.00		
Within Subjects Effects					
Risk Level (R)	9053.52	2	4526.76	3.70	.05
R x G	15359.42	2	7679.73	6.28	.001
R x ARM	1.63	2	0.82	0.00	n.s.
R x G x ARM	770.58	2	385.29	0.31	n.s.
Error	222652.28	182	1223.36		

Note. The between-groups sums of squares are equal to zero
because when collapsing across risk level, the scores sum to
a constant.

this two factor interaction was not subsumed by the higher order
interaction. As was the case for the analysis reported above, a
greater percentage of shots were taken from the low (M = 36.81) and
the intermediate, (M = 36.27) range than from the high risk area
(M = 26.92). This was qualified by the two factor interaction.
Females took a greater percentage of shots from the low risk
(M = 44.65) and the intermediate risk area (M = 31.53) than from the
high risk area (M = 23.82) whereas males took a greater percentage
from the high (M = 30.03) and the intermediate risk areas
(M = 41.00) than from the low risk area (M = 28.97).

Analysis of Other Dependent Measures

Importance of information and affect.

Research participants, prior to engaging in the task, were
asked to rate the importance of doing well and the importance of
finding out about their ability. These two measures were analyzed
separately, with gender and uncertainty orientation as
between-subjects factors. No significant effects were found in
either analysis. (see Appendix D - Tables 1 and 2 for the summary
tables). Analyses, with gender and achievement-related motives as
between-subjects factors, indicated no significant main effects or
interactions (see Appendix D - Tables 3 and 4 for the summary
tables).

Raynor affect measure.

This measure consists of the difference between positive and negative affect related to performance. It was calculated by summing ratings to the positive and negative items separately and then subtracting the sum of the ratings of negative affect from the sum of positive affect. Thus, if positive and negative affect were rated identically, this difference score would be zero. A positive score indicates more-positive than negative affect and a negative score indicates relatively more negative than positive affect.

These difference scores were analyzed with analysis of variance, with uncertainty orientation and gender as between-subjects factors. This analysis indicated no significant main effects or interactions (see Appendix D - Table 5 for summary table). Analysis with gender and achievement-related motives as between-subjects factors indicated a significant interaction of gender and achievement-related motives, $F(1,91) = 4.39$, $p < .05$ (see Appendix D - Table 6 for summary table). Success-oriented females ($M = 1.88$) had smaller mean difference scores than did failure-threatened females ($M = 3.97$), indicating that, relatively, the failure-threatened females were experiencing more positive or less negative affect than success-oriented females. For males the pattern is reversed; success-oriented males ($M = 3.96$) rated themselves as experiencing more positive affect or less negative affect than did their failure-threatened counterparts ($M = 2.29$).

<u>Diagnostic distance</u>.

Participants, after completing the risk-taking task, were asked to indicate the distance from the target (in feet) at which they would stand to find out most about their ability level. Analysis of variance with uncertainty orientation and gender as between-subjects factors indicated no significant main effects or interactions (see Appendix D - Table 7 for the summary table). Analysis with achievement-related motives and gender as factors similarly revealed no significant effects (see Appendix D - Table 8 for the summary table).

Discussion

The results of this third study indicate that gender and uncertainty orientation interact significantly ($p < .05$) in predicting risk-taking in a skilled situation. The hypothesis that uncertainty-oriented males and females would show a greater preference for intermediate risk whereas certainty-oriented males and females would demonstrate a stronger preference for extreme risk and caution, respectively, received only partial support. It is clear from examination of the means in Table 10 that only uncertainty-oriented males demonstrated intermediate risk preference. Their female counterparts demonstrated a stronger preference for low than intermediate risk. Comparison of choices, across risk levels, of uncertainty-oriented and certainty-oriented

females indicates that the latter group displayed a stronger preference for low risk and a weaker preference for high risk.

Among males, hypotheses received support. Uncertainty-oriented males most strongly preferred intermediate risk, followed by low and then high risk. In contrast, certainty-oriented males preferred intermediate and high risk about equally and preferred low risk least. It would appear that the uncertainty-oriented males were gravitating toward the moderate to low end of the risk dimension whereas those who are certainty-oriented were gravitating towards the high risk end.

In comparing these results to those of Study One and Two, it can be seen that the nature of the gender by uncertainty orientation interaction differs. In the first and second studies, gender was more influential among certainty-oriented persons. In this third study, it seems to have played a role for both certainty- and uncertainty-oriented persons.

There are, at least, two possible explanations for the difference between the findings of the first and second studies and those of this study. First, it may be that, when called upon to perform a skilled task, cultural value plays an even stronger role than for an activity where the outcome is determined by chance. Second, in Study Three, subjects are actually observed by their peers, which may make gender appropriate behaviour even more salient than in Study One and Two, where subjects could not see each other's responses. Testing in groups, as in this study, may exaggerate the gender differences. It may also add variability to the data which,

for the purposes of the present investigation, is considered to be error variance.

As in Study One, the present study also reveals that, when preference for risk level is examined as a function of achievement-related motives and gender, neither achievement-related motives alone nor in conjunction with gender reliably predict risk preference.

Examination of the results of analyses of self-report measures indicates very little systematic effect on the risk-taking behaviour of participants. For the affect measures, no significant effects of gender or uncertainty orientation were found. There was a significant interaction of gender and achievement-related motives, with males showing a pattern that is most consistent with the theory of achievement motivation. That is, the success-oriented males indicated stronger positive affect than did failure-threatened males. Thus, there is some evidence that they differ in their affective state prior to task performance. The pattern among females is not consistent with the expectations of the theory. Here, there is a reversal of the expected pattern. It is of interest, however, that reversals like the one found here for ratings of affect are sometimes found in behaviour. They occur when testing is done under "relaxed" conditions (e.g., Short, 1980). That is, when achievement cues in the situation are minimized, failure-threatened individuals have been found to perform better than those who are success-oriented on tasks of intermediate difficulty.

Females may be demonstrating this reversal in this study because of the gender cues in the situation. That is, they may see this task as masculine and, therefore, as an inappropriate situation in which to succeed. Thus, this situation may be equivalent to "relaxed" testing conditions. It is important to point out, however, that previous reversals have occurred for performance, not for ratings of affect. As well, there is no parallel reversal in risk-taking behaviour in this study. No differences in risk-taking were found as a function of achievement-related motives, gender, or the interaction of these two characteristics.

For these affect measures, it should not be surprising that no differences were found as a function of uncertainty orientation, as it was hypothesized that this risk-taking situation is characterized more strongly by information value rather than affective value. Thus, ratings of negative versus positive anticipation for certainty- and uncertainty-oriented individuals were not expected to differ. There were differences as a function of gender and achievement-related motives, with males displaying the expected effect and females showing a contradictory pattern. It should be noted, however, that these affective differences did not translate into differences in risk-taking behaviour.

The pattern (or lack thereof) in the self-report measures of affective and information value does not parallel the pattern in risk-taking behaviour. There was no significant variability, as a function of individual differences, in ratings of the importance of doing well and finding out. Examination of these data reveals that many of the participants simply circled the midpoint (four) of the

seven point Likert-type scale. The data suggest one possible explanation for the failure to find effects: restriction of range in the scores. Examining the ratings more carefully indicated that this was a plausible explanation. For the four rating scales together (the importance of finding out and doing well and the importance of finding out and doing well to the self-concept), 78% of participants made ratings between one (not at all important) and four (moderately important). Thus, it is possible that the restriction in range may have contributed to the nonsignificant, F-tests. An alternative suggestion, however, may be that they are unable to report on the processes of interest. Nisbett and Wilson (1977), in their seminal paper on self-reporting, suggest that, in some circumstances at least, people are not capable of giving accurate reports of the internal events or external stimuli that affect their behaviour. This may be occurring in this situation. It may well be that participants may be unaware of the relative influence of affective and information value on their degree of risk-taking. This is, however, a questionable and contentious post hoc explanation for a failure to find effects on the self-report measures of affective and information value.

Finally, analysis of the ratings of the most diagnostic distance also indicated no significant effects. For this measure, participants were asked at what distance from the target they would stand to find out most about their ability. Examination of the data suggest one explanation for the failure to find effects. The mean diagnostic distance provided by all participants ($M = 12.00$) was very near the mid-point of the distances from which participants

could throw (there were 25 distance markers at one foot intervals
and the midpoint of these distances is 12.5). Thus, their ratings
may simply be reflecting the use of a 'split-the-difference'
heuristic. That is, they may have decided that neither standing
very close to or very far from the target would tell them anything
about their ability. As a consequence, somewhere in the middle may
have seemed like a reasonable decision. It should also be noted
that participants made this rating after they had done the task.
Thus, it might well simply be a summary of, rather than predictive
of, their performance.

Summary

Significant differences in risk-taking behaviour were found as
a function of gender and uncertainty orientation. The pattern of
means, however, did not conform completely with predictions. The
findings for males were, for the most part, as predicted, but both
certainty-oriented and uncertainty-oriented females demonstrated a
stronger preference for low risk than any other level of risk. This
conforms to predictions for the certainty-oriented participants, but
does not for the uncertainty-oriented group. In addition, results
of analyses of self-report measures were largely non-significant.
The failure to find effects for the ratings of the importance of
finding out and doing well is particularly problematic. Possible
explanations for this failure have been presented. Despite these
departures from predictions, analysis of the risk-taking behaviour
does suggest that individual differences in uncertainty orientation,

in conjunction with gender, are related to behaviour where there is uncertainty about the outcome as well as the self.

Chapter VI

General Discussion

The findings of the three studies reported in this thesis suggest that, in risk-taking situations which involve a component of uncertainty, individual differences in uncertainty orientation and gender may be important determinants of the risk-taking behaviour of participants. In the first two studies, uncertainty-oriented individuals preferred intermediate risk over caution and extreme risk and this tendency was stronger than for certainty-oriented persons. Certainty-oriented males tended to opt for more risky options whereas the females opted for more cautious options. In the third study, uncertainty-oriented males most preferred intermediate risk and certainty-oriented males tended to prefer more extreme risk. For females the pattern differed. Overall, uncertainty-oriented females preferred low to intermediate risk, but preferred it less than certainty-oriented females. In addition, this latter group preferred high risk less strongly than did uncertainty-oriented females. Finally, no such pattern was observed as a function of achievement-related motives, in the two studies in which they were assessed.

Importance of the Findings to the Theory of Uncertainty Orientation

First, the findings of the first two studies suggest that the domain encompassed by uncertainty orientation may be extended to behaviour in chance determined situations. The theory of uncertainty

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orientation (Sorrentino & Short, 1986) assumes that it is both uncertainty about the self and the environment (information value) and uncertainty about the outcome that are important and this thesis represents the first direct test of predictions derived from this theory in a situation where the primary source of uncertainty is the outcome itself. That is, the first two studies of this thesis were conducted using a task in which there was little opportunity to engage in self-assessment and found that risk-taking behaviour was related to individual differences in uncertainty orientation.

The findings of this thesis, in addition to being supportive of the role of information value and individual differences in uncertainty orientation in determining the relevance of the situation, suggest that gender may also play an important role in this process. In the first study, gender interacted significantly with uncertainty orientation in predicting risk-taking behaviour. This was not predicted to occur, but in hindsight, was not surprising and interacted in such a way as to be consistent with the general hypothesis. The second and third studies, in light of these findings, predicted and found that gender interacted with uncertainty orientation in determining risk-taking behaviour. The interaction of gender and uncertainty orientation in the third study, however, suggests that cultural value related to gender may be more complex than originally anticipated. That is, in the third study, uncertainty orientation seems to have been less influential for female risk-taking behaviour than for males'. It was argued that, in this third study, the gender cues may have been more salient, resulting in cultural

value having as strong an influence on female behaviour as information value.

In addition, the findings are also important to the theory of uncertainty orientation suggested by Sorrentino and his associates (Sorrentino & Short, 1986; Sorrentino et al., 1984). It is important to note that, in previous research conducted in the area of uncertainty orientation, gender has not interacted with uncertainty orientation or achievement-related motives (e.g., Sorrentino & Hewitt, 1984; Sorrentino et al., 1984). Sorrentino et al. (1984), using a standard achievement task, found no interaction between gender and uncertainty orientation, or achievement-related motives. It should be pointed out, however, that in this research, the effects of achievement-related motives were completely contingent on the relevance of the situation, which was determined by individual differences in uncertainty orientation.

Why, then, does gender interact with uncertainty orientation in risk-taking situations and not interact in achievement-related performance settings? A likely explanation of this difference is in the salience of the 'gender cues' in the situation. In Sorrentino et al.'s (1984) Study One, the task consisted of arithmetic problems using basic skills of addition and memory. Participants may simply not construe this situation as gender-linked. In this thesis, we used what can be construed as a betting task (Studies One and Two) and a task which required participants to throw a ball into a target receptacle (Study Three). Both of these may be perceived by participants as more stereotypically gender-linked. The gender cues may be more salient in risk-taking situations than in the arithmetic

task used by Sorrentino et al. (1984), thus the cultural value the two settings may differ. An additional explanation for the differences between the findings of this thesis and Sorrentino et al.'s (1984) findings is that in the latter study, participants were told their subjective probability of success and were told that it was based on previous tests of their ability. This may make a self-standard rather than a cultural standard of performance more salient. That is, they may form specific expectations about their performance, based on the probabilities of success provided to them. In this thesis, particularly in the third study, participants may be forming very general expectations about their behaviour, based on cultural standards.

Bem (1981, 1984) discusses gender as an attribute that may elicit different cognitive processing in people. She suggests that some people process information about themselves and the world around them with gender as an organizing feature; these individuals are referred to as gender-schematic. Other people do not process and organize information around the notion of gender and are termed aschematic. Thus, she is describing gender stereotyping as a cognitive process or structure that people bring to bear in different situations.

This notion, in conjunction with the findings reported above, suggests that more than one cognitive aspect may operate to determine the relevance of a situation. Sorrentino and Short (1986) describe the "cognitive dynamics of uncertainty orientation" in terms of category accessibility. They state that "certainty is a readily accessible construct within the cognitive domain of certainty-oriented people, whereas uncertainty is a readily accessible construct for

uncertainty-oriented people" (p. 391). Both individual differences in construct accessibility and schematic processing may determine the relevance of situations which vary in uncertainty. To the extent that different situations contain gender cues as well as uncertainty, both gender and uncertainty orientation will predict behaviour.

An alternative view of the effect of gender on risk-taking rests on the suggestion of Raynor and McFarlin (1986) that, in addition to describing affective and information value, different "substantive types of value" can be distinguished, one of which is cultural value. They define this type of value as "the extent to which a person (1) sees an outcome as good or bad, right or wrong, proper or improper in the person's culture or (2) believes that possession of an attribute or self-image makes him or her a good or bad, right or wrong, proper or improper person in his or her culture" (p. 319). This notion, applied to previous research, suggests why initial achievement results with females were negative and why eventually only males were utilized to test predictions based on the theory of achievement motivation. It may have been that risk-taking either had or was thought to have different cultural value for males and females. Two findings of this thesis suggest that this may still be, the case, at least for certainty-oriented individuals and/or in situations where information value is low but cultural value is high. First, we found that, in all three studies, cultural value related to gender played more of a role for certainty-oriented than uncertainty-oriented participants. Second, the results of the affect ratings, as a function of achievement-related motives, in the third study suggest that males and females may differ in their affective responses to a

situation that contains achievement cues. That is, success-oriented
males were in a more positive affective state just before engaging in
the task than were failure-threatened males. This is consistent with
the theory of achievement motivation. In contrast, success-oriented
females were in a less positive state than were failure-threatened
females, which is the reverse of predictions derived from the theory.
These findings are consistent with the argument that risk may have
different cultural value for males and females.

An integration of the suggestions of Bem (1981, 1984) and Raynor
and McFarlin (1986) may lie in viewing individual differences in
cultural value as a difference in cognitive processing. That is, we
may learn to attach value to possessing certain attributes that are
gender-linked (e.g., Major, Carnevale & Deaux, 1981). Bem (1981,
1984) suggests that there are individual differences in the tendency
to process and evaluate information according to gender. These
differences rest on the possession (or lack) of a cognitive schema for
gender. Thus, individual differences in cultural value related to
gender may be mediated by differences in cognitive processing. This
argument is similar to that advanced by Sorrentino and his associates
(Sorrentino & Short, 1986) for the cognitive basis of uncertainty
orientation. They suggest that individual differences in information
value rest on differences in the cognitive processing of certainty-
and uncertainty-oriented persons (Sorrentino & Short, 1986).

The advantage to the inclusion of cultural value in the theory
of uncertainty orientation is that it allows for more accurate
prediction of behaviour; when cultural value operates in a situation,
it will interact with information value. Other findings consistent

with this suggestion have been reported. Roney (1986) conducted a study investigating the relationship of uncertainty orientation to social comparison. He found that cultural value played a role, in that there was an effect of gender, with females more concerned with the social (as opposed to the informational) aspect of social comparison than were males. This suggests that cultural value is not restricted to typical achievement situations. It also suggests that when cultural value enters into a situation, the theory of uncertainty orientation has to make adjustments for its effects.

Thus, in terms of implications of these findings for uncertainty orientation, it seems that cultural value, which may be reflected in cognitive processes such as gender schematic processing (Bem, 1984), is important when describing the relevance of various situations. Given that gender cues seem to be very pervasive in our culture (e.g., O'Leary & Hansen, 1984), cultural value may well be a factor that should be considered in future research on the theory of uncertainty orientation.

Implications for the Theory of Achievement Motivation

The major implications of the findings of this thesis for the theory of achievement motivation concern the behaviours that should be used when testing predictions derived from this theory. Generally, we argue that risk-taking, because it has more to do with information value than affective value, is not an appropriate behaviour in which to test predictions of this theory.

First, the findings of this thesis suggest that situations in which the outcome is determined by chance are of little value for

testing predictions derived from the theory of achievement motivation. Indeed, Atkinson and his colleagues (Atkinson et al., 1960) note that they do not possess the characteristics that the theory defines as necessary for the arousal of achievement-related motives. Most notably, there is little pride in accomplishment or fear of failure to be experienced on a task where the participant has no control over the outcome. We argue and report evidence to suggest that behaviour in such settings is predictable utilizing individual differences in uncertainty orientation.

Attempts in the past to predict risk-taking as a function of achievement-related motives in situations where the outcome of the task is influenced by skill have met with, at best, very limited success. Success-oriented and failure-threatened persons have not been found to differ consistently in their preference for intermediate as opposed to extreme risk or caution (e.g., Atkinson & Litwin, 1960); generally, participants (almost all male) have demonstrated a mild preference for intermediate risk and this preference is marginally stronger among those who are success-oriented than those who are failure-threatened (e.g., Atkinson et al., 1960). This tendency to find an overall weak bias toward intermediate risk does not support the prediction that it is the potential for experiencing pride in accomplishment and fear of failure that produces different types of risk-taking behaviour among success-oriented and failure-threatened persons.

This overall preference for intermediate risk has perplexed achievement theorists (e.g., Heckhausen, 1968; Revelle & Michaels, 1976) and provided fuel for critics (e.g., Trope & Brickman, 1975;

Weiner, 1972; Weinstein, 1969). The theory of achievement motivation predicts that the peak in preferences for success-oriented individuals should occur at the probability 0.50, for it is at this point that the relationship between incentives and probability of obtaining the outcome is maximized (Atkinson, 1964; Atkinson & Raynor, 1974). A number of investigators, however, have found stronger preference for riskier outcomes among success-oriented males (e.g., Hamilton, 1974; Heckhausen, 1968). Both Revelle and Michaels (1976) and Heckhausen (1968) have argued, on the basis of such findings, for modifications to the theory of achievement motivation.

The findings of this thesis suggest, however, that an alternative conceptualization is available for the deviations from the theoretically expected results in risk preference. Specifically, it may be that different samples of research participants differ in their overall degree of uncertainty orientation. If one sample contained relatively more certainty-oriented males than another, then the overall preferences might differ. We found in this thesis that certainty-oriented males are the extreme risk takers. Thus, the shifting of preferences toward risker outcomes found in some samples might indicate that, relative to other samples, they contained a greater proportion of certainty-oriented males. This is purely speculative, but the data in this thesis suggest that uncertainty orientation is important in the prediction of risk-taking behaviour. Given this finding, it is possible that the shifting in risk preferences (and as argued above, the failure to find avoidance of intermediate risk among failure-threatened participants) reflects the operation of information value as well as affective value. Thus,

future research in the area of risk-taking behaviour should consider individual differences in uncertainty orientation as well as achievement-related motives.

We also found, however, that gender interacts with uncertainty orientation to influence behaviour in risk-taking situations, both chance and skill determined. While this issue has been addressed in some detail in the preceding section, it bears noting again, as testing of the theory of achievement motivation has been conducted almost exclusively with males. Atkinson and his colleagues (Atkinson et al., 1960) argue that this is a result of the unreliability of the measurement of achievement-related motives in women. It is clear, however, that this is no longer a valid reason for excluding females as Sorrentino and his associates (e.g., Sorrentino & Hewitt, 1984; Sorrentino & Short, 1977; Sorrentino et al., 1984) have not had any difficulty measuring the achievement tendencies of women and predicting their achievement-related behaviour, particularly when the interaction of achievement-related motives and uncertainty orientation has been taken into consideration.

We argue that the effect of gender in one situation and not in another reflects cultural value, relevant to gender. That is, Sorrentino and his colleagues have not found that gender interacts with uncertainty orientation and achievement-related motives (e.g., Sorrentino et al., 1984; Study One). In the preceding section it was suggested that this may be due to the fact that the testing situation did not contain strong gender cues. This thesis, however, found that gender and uncertainty orientation interacted in all three studies. In risk-taking situations, where gender cues are salient, cultural

value as well as information value must be considered in determining the relevance of, and hence the behaviour in, that situation.

Limitations

A major limitation of the research presented in this thesis is that the roles of affective and information value are assumed rather than tested directly. That is, the manipulations used in this thesis were not constructed as a systematic variation of information and affective value. Rather, this distinction is used as a heuristic in describing the process that may be occurring. In the third study, participants were asked about the importance of finding out versus doing well but on these self-reports they did not distinguish between the two types of value. It has already been argued that this may reflect statistical limitations of these measures or that it may represent an inability to report on the variables that are influencing behaviour, as has been suggested by Nisbett and Wilson (1977). Given the findings for the behavioural measure, however, it is possible that information and affective value may be influencing behaviour even though participants are not able to report these effects. It should be noted at this point that discussion of information and affective value in relation to the theory of uncertainty orientation is relatively recent. When this thesis was designed and conducted, this discussion was in its very early stages (Raynor and McFarlin's paper was still in its draft stages) and, while these concepts were considered, they were not sufficiently developed to guide the research design. This does not mean, however, that these ideas cannot be used in the interpretation of the findings.

A second limitation of this research rests in the third study. This study contained three individual difference factors, uncertainty orientation, achievement-related motives and gender. Exploratory analysis indicated that the interaction of these factors with risk level was statistically significant. Unfortunately, there were low and uneven cell sizes which prevented interpretation of this interaction. Nonetheless, predictions were made in terms of gender, uncertainty orientation, and risk level, and the three factor analysis tests these appropriately. Further, Sorrentino and Hewitt (1984) also reported analyses separately for gender and uncertainty orientation and gender and achievement motivation. Sorrentino and Roney (1986) had sufficient power to test the four factor and replicated the pattern of results reported by Sorrentino and Hewitt (1984). Nonetheless, the nature of the four factor interaction of gender, uncertainty orientation, achievement motivation and risk level in the risk-taking domain remains a question to be settled in future research.

One criticism that can be made of the research reported here is that there are inconsistencies in the particular findings of the first two studies. In the first study, where most trials presented participants with events that differed in expected value, gender and uncertainty orientation interacted. In the second study, there were equal numbers of trials where the pairs differed and where they were equal in expected value. In this second study, differences were found on trials with different expected values. It was suggested above that this may reflect differences in procedures, but it could also reflect variability in the effect itself. In addition, in the first two

studies, uncertainty-oriented males and females tended to behave reasonably similarly. Stronger gender effects were observed for certainty-oriented people. In the third study, however, there were substantial gender differences both for uncertainty- and certainty-oriented participants, although the differences were somewhat larger for the latter group. Again, this may point to variability in the effect.

Despite the limitations of this research, there is consistency in the findings of the three studies which indicates that the interaction of gender and uncertainty orientation in risk-taking behaviour is a reasonably stable one (although the particular form of the interaction may depend on the cultural value present in the situation).

Implications for Future Research

As noted above, the finding that gender interacts with uncertainty orientation in the prediction of risk-taking behaviour suggests that more than one factor may act to determine the relevance of a situation. That is, both gender and uncertainty orientation may be required to predict what situation will be relevant to different types of individuals. Because gender had not previously been found to interact with uncertainty orientation, Sorrentino and his colleagues, in developing the theory of uncertainty orientation, have argued for a more simplistic determination of relevance. More recent data suggest that gender may be important in determining relevance. Roney (1986), in investigating the relationship of uncertainty orientation and social comparison processes, found that females were more concerned about engaging in comparison with others for social information

whereas males were less interested in this type of comparison. The findings of this thesis also indicate that gender is important. It has been argued that this may reflect the operation of cultural value. To the extent that there is cultural value operating in a particular situation, the theory of uncertainty orientation must take account of it when making predictions. Thus, if the degree to which one is gender stereotyped or gender schematic causes different value to be placed on different activities, this must be considered by the theory. In the past, Sorrentino and his associates have argued that uncertainty orientation determines the relevance of the situation and that sources of motivation, such as achievement and affiliation, are maximally engaged only in relevant situations. That is, the sources of motivation have been described as being in the "service" of uncertainty orientation. What we are suggesting here is that cultural value may operate along with uncertainty orientation rather than as a secondary source. An integration of this concept into the theory of uncertainty orientation will require more complete knowledge of the nature of cultural value. When does it operate? Are there particular types of cultural value that are more pervasive than others and thus should be considered on a regular basis in future research? Is gender a pervasive cultural value? All of these are questions that remain to be answered.

More generally, the theory of uncertainty orientation must clarify the processes thought to describe uncertainty- and certainty-oriented persons. Only two studies have been conducted that attempt to assess the 'cognitive dynamics' of uncertainty orientation (King, 1980; Roney & Sorrentino, 1986b). Additional research must

clarify the relationship between uncertainty orientation and cognitive processes. This will entail stepping beyond what is, fundamentally, an empirical basis for making predictions into a truly theoretical one. Uncertainty orientation was initially postulated to account for inconsistencies in achievement-related behaviour and has developed from this empirical basis. If the theory is going to continue to be of use, there must be more conceptual clarification of the nature of uncertainty orientation. This should include a more complete understanding of the developmental basis of uncertainty orientation, its relationship to other individual differences that are conceptually similar, and a detailing of the conditions under which uncertainty orientation should influence behaviour. Thus, much research remains to be done before it can be said with confidence that we understand the nature of uncertainty orientation.

References

Aronson, E. (1958). The need for achievement as measured by graphic expression. In J. W. Atkinson (Ed.). Motives in fantasy, action, and society (pp. 249-265). Princeton: Von Nostrand.

Atkinson, J. W. (Ed.) (1958). Motives in fantasy, action, and society. Princeton: Von Nostrand.

Atkinson, J. W. (1964). An introduction to motivation. Princeton: Von Nostrand.

Atkinson, J. W., Bastian, J. R., Earl, R. W., & Litwin, G. H. (1960). The achievement motive, goal-setting, and probability preferences. Journal of Abnormal and Social Psychology, 60, 27-36.

Atkinson, J. W., & Birch, D. (1970). Dynamics of action. New York: Wiley.

Atkinson, J. W., & Litwin, G. H. (1960). Achievement motive and test anxiety conceived as motive to approach success and motive to avoid failure. Journal of Abnormal and Social Psychology, 60, 52-63.

Atkinson, J. W., & Raynor, J. O. (1974). Motivation and achievement. Washington, DC: Winston and Sons.

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Atkinson, J. W., & Reitman, W. R. (1958). Performance as a function
of motive strength and expectancy of goal attainment. In J. W.
Atkinson (Ed.), Motives in fantasy, action, and society
(pp. 278 - 287). Princeton: Von Nostrand.

Bem, S. L. (1974). The measurement of psychological androgyny.
Journal of Consulting and Clinical Psychology, 42 155-162.

Bem, S. L. (1981). Gender schema theory: A cognitive account of
sex typing. Psychological Review, 88, 354-364.

Bem, S. L. (1984). Androgyny and gender schema theory: A conceptual
and empirical integration. In T. B. Sonderegger (Ed.),
Nebraska symposium on motivation, 1984 (Vol. 32, pp.
179 - 226) Lincoln, NE: University of Nebraska Press.

Brody, N. (1963). N Achievement, test anxiety, and subjective
probability of success in risk taking behavior. Journal of
Abnormal and Social Psychology, 66, 413-418.

Byrne, D., & Lamberth, J. (1971). The effect of erotic stimuli on
sex arousal, evaluative responses, and subsequent behavior.
Technical reports of the Commission on Obscenity and
Pornography (Vol. 8, pp. 41-67). Washington, D.C.: U.S.
Government Printing Office.

Clark, M. S., & Fiske, S. T. (Eds.) (1982). Affect and cognition:
The 17th annual Carnegie symposium on cognition. Hillsdale,
NJ: Erlbaum.

Clayton, J. P. (1981). Uncertainty orientation, sex role identity
and performance in achievement situations. Unpublished
master's thesis. University of Western Ontario, London,
Ontario, Canada.

DeCharms, R., & Dave, P. N. (1965). Hope of success, fear of
failure, subjective probability, and risk taking behavior.
Journal of Personality and Social Psychology, 1, 558-568.

Edwards, W. (1954). The theory of decision making. Psychological
Bulletin, 51, 380-417.

Fiske, S. T., & Taylor, S. E. (1984). Social cognition. Reading,
MA: Addison-Wesley.

Frederick, J. E., Sorrentino, R. M., & Hewitt, E. C. (1985).
A scoring manual for need for uncertainty. (Research Bulletin
No. 618). London, Ont.: University of Western Ontario.

French, E. G. (1958). Development of a measure of complex.
motivation. In J. W. Atkinson (Ed.), Motives in fantasy,
action, and society (pp. 242-248). Princeton: Von Nostrand.

Hamilton, J. O. (1974). Motivation and risk taking: A test of
Atkinson's theory. Journal of Personality and Social
Psychology, 29, 856-864.

Hancock, J. G., & Teevan, R. C. (1964). Fear of failure and risk
taking behavior. Journal of Personality, 32, 200-209.

Heckhausen, H. (1968). Achievement motive research: Current problems and some contributions toward a general theory of motivation. In W. J. Arnold (Ed.), Nebraska symposium on motivation (Vol. 16, pp. 103-174). Lincoln, NE: University of Nebraska Press.

Heckhausen, H., & Halisch, F. (1986, July). "Operant" versus "respondent" motive measures: A problem of validity or of construct?. Paper presented at the 21st International Congress of Applied Psychology, Jerusalem, Israel.

Higgins, E. T., & King, G. A. (1981). Accessibility of social constructs: Information processing consequences of individual and contextual variability. In N. Cantor & J. F. Kihlstrom (Eds.), Personality, cognition, and social interaction (pp. 69-121). Hillsdale, NJ: Erlbaum.

Higgins, E. T., King, G. A., & Mavin, G. H. (1982). Individual construct accessibility and subjective impressions and recall. Journal of Personality and Social Psychology, 43, 35-47.

Horner, M. S. (1974). The measurement and behavioral implications of fear of success in women. In J. W. Atkinson & J. O. Raynor (Eds.), Motivation, and achievement (pp. 41 - 70). Washington, DC: Winston and Sons.

Kagan, J. (1972). Motives and development. Journal of Personality and Social Psychology, 22, 51-66.

Keppel, G. (1973). Design and analysis: A researcher's handbook.
    Englewood Cliffs, NJ: Prentice-Hall.

Kerlinger, F. N. (1973). Foundations of behavioral research
    (2nd ed). New York: Holt, Rinehart and Winston.

King, G. A. (1980). Individual differences in construct
    accessibility: A cognitive structural approach to uncertainty
    orientation. Unpublished doctoral thesis. University of
    Western Ontario. London, Ontario, Canada.

Lewin, K. (1935). Dynamic theory of personality. New York:
    McGraw-Hill.

Littig, L. W. (1963). Effects of motivation on probability
    preferences. Journal of Personality, 31, 417-427.

Major, B., Carnevel, P. J. D., & Deaux, K. (1981). A different
    perspective on androgyny: Evaluations of masculine and
    feminine personality characteristics. Journal of Personality
    and Social Psychology, 41, 988-1001.

Mandler, G., & Sarason, S. B. (1952). A study of anxiety and
    learning. Journal of Abnormal and Social Psychology,
    47, 166-173.

Markus, H. (1977). Self-schemata and processing information about
the self. Journal of Personality and Social Psychology,
35, 63-78.

McClelland, D. C. (1958). Risk taking in children with high and low
need for achievement. In J. W. Atkinson (Ed.), Motives in
fantasy, action, and society (pp. 306-321). Princeton:
Von Nostrand.

McClelland, D. C. (1980). Motive dispositions. In L. Wheeler
(Ed.), Review of personality and social psychology
(Vol. 1, pp. 10-41). Beverly Hills: Sage.

McClelland, D. C., Atkinson, J. W., Clark, R. A., & Lowell,
E. L. (1958). A scoring manual for the achievement motive. In
J. W. Atkinson (Ed.), Motives in fantasy, action, and society
(pp. 179-204). Princeton: Von Nostrand.

Mehrabian, A. (1969). Measures of achieving tendency.
Educational and Psychological Measurement, 29, 445-451.

Moulton, R. (1965). Effects of success and failure on level of
aspiration as related to achievement motives. Journal of
Personality and Social Psychology, 1, 399-406.

Murray, H. A. (1938). Explorations in personality. New York:
Oxford University Press.

Nisbett, R. E., & Ross, L. (1980). Human inference: Strategies and shortcomings of social judgment. Englewood Cliffs, NJ: Prentice-Hall.

Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. Psychological Review, 84, 231-259.

O'Leary, V. E., & Hansen, R. D. (1984). Sex as an attributional fact. In In T. B. Sonderegger (Ed.), Nebraska symposium on motivation, 1984 (Vol. 32, pp. 133-1178). Lincoln, NE: University of Nebraska Press.

Raynor, J. O. (1985). [Materials for risk taking study].

Raynor, J. O., & McFarlin, D. B. (1986). Motivation and the self-system. In R. M. Sorrentino & E. T. Higgins (Eds.), Handbook of motivation and cognition: Foundations of social behavior (pp. 315-349). New York: Guilford.

Raynor, J. O., & Rubin, I. S. (1971). Effects of achievement motivation and future orientation on level of performance. Journal of Personality and Social Psychology, 17, 36-41.

Raynor, J. O., & Smith, C. P. (1966). Achievement-related motives and risk taking in games of skill and chance. Journal of Personality, 34, 394-404.

Revelle, W., & Michaels, E. J. (1976). The theory of achievement motivation revisited: The implications of inertial tendencies. Psychological Review, 83, 394-404.

Rokeach, M. (1960). The open and closed mind: Investigations into the nature of belief systems and personality systems. New York: Basic Books.

Roney, C. (1986). Uncertainty orientation and social comparison. Unpublished manuscript.

Roney, C., & Sorrentino, R. M. (1986a). Affective and information value and the Mehrabian scale of achievement. Unpublished manuscript.

Roney, C., & Sorrentino, R. M. (1986b). Uncertainty orientation and person perception: Individual differences in categorization. Manuscript submitted for publication.

Scodel, A., Ratoosh, P., & Minas, J. S. (1959). Some behavioral correlates of decision making under conditions of risk. Behavioral Science, 4, 19-28.

Short, J. C. (1980). The effects of affiliation on achievement-related performance. Unpublished doctoral dissertation. University of Western Ontario, London, Ontario, Canada.

Smith, C. P. (1964). Relationships between achievement-related
motives and intelligence, performance level, and persistence.
Journal of Abnormal and Social Psychology, 68, 523-532.

Smith, C. P., & Feld, S. C. (1958). How to learn the method of
content analysis of nAchievement, nAffiliation, and
nPower. In J. W. Atkinson (Ed.), Motives in fantasy,
action, and society (pp. 685-818). Princeton: Von Nostrand.

Sorrentino, R. M., & Hewitt, E. C. (1984). Uncertainty-reducing
properties of achievement tasks as a function of uncertainty
orientation and achievement-related motives. Journal of
Personality and Social Psychology, 47, 884-899.

Sorrentino, R. M., & Roney, C. (1986). Uncertainty orientation,
achievement-related motivation, and task diagnosticity as
determinants of task performance. Social Cognition, 4,
420-436.

Sorrentino, R. M., & Short, J. C. (1977). 'The case of the
mysterious moderates: Why motives sometimes fail to predict
behavior. Journal of Personality and Social Psychology
35, 478 - 484.

Sorrentino, R. M., & Short, J. C. (1986). Uncertainty orientation, motivation, and cognition. In R. M. Sorrentino & E. T. Higgins (Eds.), Handbook of motivation and cognition: Foundations of social behavior (pp. 379-403). New York: Guilford.

Sorrentino, R. M., Short, J. C., & Raynor, J. O. (1984). Uncertainty orientation: Implications for affective and cognitive views of achievement behavior. Journal of Personality and Social Psychology, 46, 189-206.

Trope, Y. (1975). Seeking information about one's own ability as a determinant of choice among tasks. Journal of Personality and Social Psychology, 32, 1004-1013.

Trope, Y. (1979). Uncertainty-reducing properties of achievement tasks. Journal of Personality and Social Psychology, 37, 1505-1518.

Trope, Y., & Brickman, P. (1975). Difficulty and diagnosticity as determinants of choice among tasks, Journal of Personality and Social Psychology, 31, 918-925.

Weiner, B. (1972). Theories of achievement: From mechanism to cognition. Chicago: Markham.

Weinstein, M. S. (1969). Achievement motivation and risk preference. Journal of Personality and Social Psychology, 13, 153-172.

Appendix A

Instructions and Data

Study One

Instructions to Participants

You can see in front of you [point to it] a computer screen that has a display of two jars. Notice that there are beads filling up the jars, and that some of those beads are one color and some of them are another. In this experiment, I will be asking you to choose one of the two jars. The two jars will differ from each other for each choice that you are asked to make.

Now, you can see that on the screen the two jars contain different colored beads [point to the beads]. Some of the beads in each jar are called lucky beads and others are not lucky. They are lucky beads because, if they are picked, they are worth money. The two jars will differ on each trial in two ways. First, they will have different proportions of lucky beads. Second, the payoff, or amount of money that the lucky beads are worth, will differ.

The display provides you with this information. Look at the numbers on the bottom of the screen. The number on the top [point this out] tells you what proportion of lucky beads that are in the container. Imagine that there are 100 beads in the jar. The proportion at the bottom tells you how many out of 100 are lucky. Here [point] , there are 90 lucky beads and here there are 40. Below each proportion, there is the payoff. Here you can see it is five cents [point] and here it is 30 cents [point]. What I will have you do is choose one of these pairs of proportions and payoffs, either the one on the left or the one on the right. You will indicate which choice you want by pushing the joystick in front of you to the left or the right.

You will also notice that there are four displays at the bottom, numbered one through four. You can see a number on the table in front of you. That tells you what information to look at on the screen. So you [point] are participant number one, you [point] are number two, you [point] are number three and you [point] are number four. Each of you will have different information presented to you on each choice. I am interested in your individual choices; I am testing you in groups because it is convenient for me. When you make your choices, look at the information at the bottom of the screen that corresponds to your participant number.

Once you have each made your choices, the computer will then randomly choose one of the 100 beads and will record whether or not it is a lucky bead, and the payoff associated with this. If a lucky bead is randomly chosen by the computer, it will record the payoff. If it doesn't choose a lucky bead, it records a payoff of zero cents. You will not be told what happens after each draw because this might influence your responses. I will show you the printout of your choices at the end of the study. Further, to determine the amount of money that you get paid for participating in this study, the computer will randomly draw 20 of all the choices you make and calculate your payment on the basis of the payoffs that you received on those twenty trials. It does this separately for each of you. You will also see this on the printout at the end of the study.

So, remember, decide from which of the two jars you want the computer to pick, given the proportion of lucky beads and the payoff information. Indicate your choice by pressing left or right on the joystick in front of you. Do you have any questions?

Debriefing Information

The purpose of this study has been to examine the relationship of certain personal characteristics and behaviour in a situation where there is some uncertainty about outcomes. Each of the choices you made in this experiment involved choosing between two events that differed in the likelihood that you would receive a payoff. So, for example, you were asked to choose between a jar that had 50 lucky beads out of 100 beads and a jar that had 90 lucky beads out of 100. What we are interested in here is the uncertainty involved in choices like this. If you chose the jar that had 90 beads, it was very likely that you would receive a payoff, but that payoff was small. In contrast, if you chose the jar that had 50 lucky beads, it was equally likely that the computer would choose a lucky bead or choose an unlucky bead. The outcome of this jar is very uncertain. Finally, on some choices, you could have chosen a jar that contained only 10 lucky beads. Again, this is a relatively more certain situation; it is very unlikely that the computer would choose a lucky bead. So, what we will be looking at is the probability or proportions that you chose and looking at them as choices of relatively certain situations versus relatively uncertain situations.

Earlier in the year, you came in for a large group testing session. One of the characteristics we assess with the questionnaires that you fill in is what we call uncertainty orientation. Some people seem to have a preference for situations that are relatively more certain; we call these people certainty-oriented. Other people refer situations where the outcome

is relatively uncertain; they are labelled uncertainty-oriented.
There is no particular value to being one way or the other. Either
tendency taken to the extreme would not be good. If people chose
only situations that were uncertain, they would live in a very
unstable world. So there is some adaptive function to seeking out
situations where the outcome is more certain as they provide some
constancy in life. If people chose to be in situations where there
was no uncertainty at all, nothing would ever be different. So there
is some value to having some uncertainty as well.

What we expect will happen in this experiment is that there will
be a difference between people who are certainty- versus
uncertainty-oriented in the choices made. We are suggesting that
certainty-oriented persons will be more likely when presented with
choices to choose the more certain outcome. In contrast,
uncertainty-oriented people should choose the more uncertain of the
pair. As well, we are testing both males and females to determine if
that makes any difference.

Obviously, if people know what is being tested before they come
in for the study, their responses may be very different than they
would be if they did not know what I am testing. Because of this, I
would ask you not to discuss the purpose of this study with other
students who might be participating for a period of two weeks. I
will be finished testing by then.

[Allow time for questions.]

Line	Column	Variable
1	1 - 5	Participant Code Number
1	6	·Gender (1 = Female 2 = Male)
1	7	Uncertainty Orientation (1 = Uncertainty-oriented 2 = Certainty-oriented)
1	8 - 9	Experimental Session Number
1	10	Member Number
1	11	Achievement Motivation (1 = Success-oriented 2 = Failure-threatened 3 = Moderate)
1	15 - 68	Proportion Chosen on Trials 1 - 54
2	15 - 68	Proportion Chosen on Trials 55 - 108,
3	15 - 23	Proportions Chosen on Control Trials 1 - 9
3	25	Rating of Self-Perception as Risky Person (1 = very risky 7 = not at all risky)
3	26	Rating of Others' Perception as Risky Person (1 = very risky 7 = not at all risky
3	27	Rating of Extent of Use of a System to Make Choices (1 = not at all systematic 7 = very systematic)
3	28	Rating of Frequency of Lottery Ticket Purchase (1 = very frequently 7 = never)
3	29	Rating of Betting Frequency (1 = never 7 = very frequently)

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00069120123   4764896597849689528758679753878269764764896597849684S3
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              919939939 44372
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              113913139 46561
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              913919939 42463
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              919919919 56661
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              919919119 34564
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               939939919 66672
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               919919919 43452
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               87386797538782687947648965978496895389586797538782687
               939939939 66761
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               67526693534782637945645965348496745367586613534782587
               139933933 55671
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Appendix B

Instructions and Data

Study Two

Choice Task

Below, you will see a whole series of paired choices. What I would like you to do for this task is to choose ONE of the paired choices. Each choice includes two pieces of information. Look at the example below. You see two options, labelled A and B. Both of these options present you with two pieces of information: a probability on the left and a payoff on the right. For example, option A has a probability of 0.70, which means that there is a 70% chance of winning. It also has a payoff of $2.00, which means that if you were to win, you would get $2.00. This is very much like a lottery. Look at option B in the example. It has a 40% chance of winning and if you were to win, you would get $3.00.

Your task is to choose one of the paired hypothetical events listed below. Indicate your choice by circling A or B. Please do all 36 of the pairs.

IF YOU HAVE ANY QUESTIONS, PLEASE ASK BEFORE COMPLETING THIS TASK.

EXAMPLE

A. 0.70 $2.00

B. 0.40 $3.00

1.	A.	0.90	$4.00	2.	A.	0.10	$5.00
	B.	0.50	$2.50		B.	0.50	$1.00
3.	A.	0.50	$4.00	4.	A.	0.50	$4.50
	B.	0.80	$2.50		B.	0.90	$2.50
5.	A.	0.20	$1.50	6.	A.	0.80	$1.00
	B.	0.50	$5.00		B.	0.20	$8.00
7.	A.	0.10	$1.00	8.	A.	0.50	$1.00
	B.	0.90	$4.00		B.	0.20	$2.50
9.	A.	0.80	$1.50	10.	A.	0.90	$0.50
	B.	0.50	$5.00		B.	0.10	$4.50
11.	A.	0.50	$5.00	12.	A.	0.20	$4.00
	B.	0.10	$1.00		B.	0.80	$1.00

13.	A.	0.90	$2.50		14.	A.	0.50	$5.00
	B.	0.50	$4.50			B.	0.80	$1.50
15.	A.	0.20	$2.50		16.	A.	0.10	$4.50
	B.	0.50	$1.00			B.	0.90	$0.50
17.	A.	0.80	$2.50		18.	A.	0.50	$1.00
	B.	0.50	$4.00			B.	0.10	$5.00
19.	A.	0.10	$1.00		20.	A.	0.50	$2.50
	B.	0.50	$5.00			B.	0.90	$4.00
21.	A.	0.80	$1.00		22.	A.	0.50	$5.00
	B.	0.20	$4.00			B.	0.20	$1.50
23.	A.	0.90	$4.00		24.	A.	0.20	$8.00
	B.	0.10	$1.00			B.	0.80	$1.00
25.	A.	0.50	$2.50		26.	A.	0.20	$2.50
	B.	0.90	$4.00			B.	0.50	$1.00
27.	A.	0.50	$1.00		28.	A.	0.50	$5.00
	B.	0.10	$5.00			B.	0.80	$1.50
29.	A.	0.80	$2.50		30.	A.	0.10	$4.50
	B.	0.50	$4.00			B.	0.90	$0.50
31.	A.	0.90	$2.50		32.	A.	0.10	$1.00
	B.	0.50	$4.50			B.	0.50	$5.00
33.	A.	0.50	$5.00		34.	A.	0.80	$1.00
	B.	0.20	$1.50			B.	0.20	$4.00
35.	A.	0.20	$8.00		36.	A.	0.90	$4.00
	B.	0.80	$1.00			B.	0.10	$1.00

Data

Col. 1 - 3   subject identification number

Col. 5   gender code 1 = female   2 = male

Col. 6   uncertainty orientation code
                1 = uncertainty oriented
                2 = certainty oriented

Col. 8 - 9   number of intermediate risk choices made
                on constant expected outcome trials
                (out of 12)

Col. 10 - 11   number of intermediate risk choices made on
                constant expected outcome trials when
                paired with a high risk option

Col. 12 - 13   number of intermediate risk choices made on
                constant expected outcome trials when
                paired with a low risk option

Col. 14 - 15   number of low risk choices made on
                constant expected outcome trials when
                paired with a high risk option

Col. 16 - 17   number of high risk choices made on
                constant expected outcome trials when
                paired with a low risk option

Col. 18 - 19   number of high risk choices made on
                constant expected outcome trials when
                paired with an intermediate risk option

Col. 20 - 21   number of low risk choices made on
                constant expected outcome trials when
                paired with an intermediate risk option

Col. 23 - 24   number of higher expected value choices
                made on different expected outcomes trials
                (out of 18)

Col. 26 - 27   number of lower expected value choices
                made on different expected outcomes trials
                (out of 18)

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001 11 10  6 4 4 2 0 2  10 08
002 11 08  4 4 5 5 2 2  12 06
003 11 07  3 4 4 2 3 2  11 07
004 11 07  2 5 3 3 4 1  08 10
005 11 09  4 5 4 2 2 1  12 06
006 11 06  4 2 3 3 2 4  11 07
007 11 08  5 3 4 2 1 3  11 07
008 11 07  3 4 1 5 3 2  08 10
009 11 09  5 4 3 3 1 2  14 04
010 11 09  6 3 4 2 0 3  12 06
011 11 06  3 3 4 2 3 3  14 04
012 11 09  5 4 5 1 1 2  13 05
013 11 09  6 3 3 3 0 3  11 07
014 11 07  3 4 2 4 3 2  12 06
015 11 08  4 4 4 2 2 2  11 07
016 21 08  5 3 2 4 1 3  14 04
017 21 06  4 2 3 3 2 4  07 11
018 21 09  4 5 2 4 2 1  12 06
019 21 05  3 2 3 3 3 4  11 07
020 21 09  4 5 4 2 2 1  11 07
021 21 06  3 3 3 3 3 3  13 05
022 21 08  3 5 4 2 3 1  14 04
023 21 06  2 4 2 4 4 2  14 04
024 21 07  3 4 1 5 3 2  11 07
025 21 11  6 5 2 4 0 1  11 07
026 21 07  3 4 4 2 3 2  14 04
027 21 08  4 4 1 5 2 2  10 08
028 21 10  4 6 0 6 2 0  09 09
029 21 09  4 5 2 4 2 1  13 05
030 21 11  5 6 1 5 1 0  12 06
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032 12 03  2 1 5 1 4 5  14 04
033 12 07  4 3 4 2 2 3  13 05
034 12 04  2 2 6 0 4 4  12 06
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042 12 05  2 3 4 2 4 3  10 08
043 12 03  1 2 5 1 5 4  09 09
044 12 07  4 3 5 1 2 3  08 10
045 12 06  3 3 4 2 3 3  12 06
046 22 05  3 2 2 4 3 4  10 08
047 22 02  1 1 1 5 5 5  14 04
048 22 06  4 2 3 3 2 4  09 09
049 22 09  5 4 0 6 1 2  09 09
050 22 08  4 4 2 4 2 2  12 06
051 22 03  1 2 1 5 5 4  12 06
052 22 05  2 3 1 5 4 3  10 08
053 22 06  3 3 2 4 3 3  13 05
054 22 06  2 4 1 5 4 2  14 04
055 22 07  2 5 2 4 4 1  11 07
056 22 04  2 2 2 4 4 4  11 07
057 22 01  0 1 2 4 6 5  12 06
058 22 06  2 4 3 3 4 2  10 08
059 22 04  2 2 1 5 4 4  12 06
060 22 05  2 3 4 2 4 3  13 05
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Appendix C

Instructions and Data

Study Three

Instructions to Participants

You can see here [point] the ball-throwing task for this experiment. What I would like you to do first is to take seven throws from set distances. I'll ask each of you to do this and I will then give you more instructions. The purpose of these seven throws is simply to familiarize you with the task. You may only throw underhanded, like so [illustrate].

[to first participant] Could you please stand on line one and throw? Now, line four. Now line eight, line 12, line 16, line 20, and finally line 25 [go through all participants and record the order in which participants throw. also record accuracy.].

Now, could you please all take a seat. I'm handing out a page and I'll give you instructions to go with it. You can see on the page a diagram of the ball-throwing task on the left side of the page, with the target and the 25 distance markers. What I would like you to do is decide which lines represent for you as an individual the differing probabilities of scoring a hit, which is getting the ball in the basket. I would like you to make these decisions on the basis of your feeling about the task at this moment in time. You can see I've provided you with attempted throws and successful throws, which is how the probabilities in the next column are calculated. For example, if a person is successful on 10 out of 10 tries, the probability or scoring a hit is 1.00 (10/10). If no hits are scored, it would be 0.00 (0/10). Your task is to decide which lines represent the different probabilities for you at this particular time. First, decide the distance that you would stand from the

target where, if you were to take 10 throws, you would score 10 hits. Then go on to fill in the rest of the probabilities in order until you decide what line represents the 0.00 probability for you. When you are done, I will give you more instructions.

[When participants are finished the probability task, give them the sheet with the point structure on it. Leave the probability sheet with them as they will copy the distances they have assigned to probabilites onto this sheet. When they have completed this, give them the scales, rating information and affective value, and the mood questionnaire. Once all have completed this, begin the 20 free throws.]

You will now each take 20 throws. You may stand anywhere you like, at any distance from the target, and you may move at any point as well.

[Record distances and accuracy and record the order in which they throw.]

Now, I would like you to do the probability assignments again. Remember, I would like you to assign distances to the probabilities on the basis of how you feel about the task at this moment in time. Finally, fill in the sheet attached to this task.

[Give them the second probability assignment sheet and the question regarding the most diagnostic distance.]

Probability Assignment Task

	Attempted throws	Successful throws	Probability	Your line
1′ ———				
2′ ———				
3′ ———				
4′ ———	10	10	1.0	———
5′ ———	10	9	0.9	———
6′ ———	10	8	0.8	———
7′ ———	10	7	0.7	———
8′ ———	10	6	0.6	———
9′ ———	10	5	0.5	———
10′ ———	10	4	0.4	———
11′ ———	10	3	0.3	———
12′ ———	10	2	0.2	———
13′ ———	10	1	0.1	———
14′ ———	10	0	0.0	———
15′ ———				
16′ ———				
17′ ———				
18′ ———				
19′ ———				
20′ ———				
21′ ———				
22′ ———				
23′ ———				
24′ ———				
25′ ———				

In a few moments, you will be taking 20 throws of the
ball. For these throws, you will be able to stand
anywhere you wish and you will be able to change
distances anytime and as often as you wish. You will be
awarded points for a 'hit' (getting the ball in the
basket). The points are indicated below. The point
scores will be kept private. I will tell you at the end
of the 20 throws how you did on each throw and where you
stood and your final point score.

probability	.1	.2	.3	.4	.5	.6	.7	.8	.9
your lines	—	—	—	—	—	—	—	—	—
points for a hit	+9	+8	+7	+6	+5	+4	+3	+2	+1

Please circle the number on the scale below each question that
best describes how you feel.

1. How important is doing well on the ball-throwing task
    to you?

        1   2   3   4   5   6   7

    not at all   moderately   very
    important   important   important

2. How important is doing well on the ball-throwing task
    to your self-concept?

        1   2   3   4   5   6   7

    not at all   moderately   very
    important   important   important

3. How important is finding out about your ability on the
    ball-throwing task to you?

        1   2   3   4   5   6   7

    not at all   moderately   very
    important   important   important

4. How important is finding out about your ability on the
    ball-throwing task to your self-concept?

        1   2   3   4   5   6   7

    not at all   moderately   very
    important   important   important

Indicate below how much each one of the following words
describes how you feel at the moment. Circle the appropriate
number on the scale opposite each word. Work quickly; your
first reaction is best. Please complete all scales.

	definitely feel						definitely don't feel
drowsy	7	6	5	4	3	2	1
affectionate	7	6	5	4	3	2	1
regretful	7	6	5	4	3	2	1
eager	7	6	5	4	3	2	1
clutched-up	7	6	5	4	3	2	1
hopeful	7	6	5	4	3	2	1
nervous	7	6	5	4	3	2	1
anxious	7	6	5	4	3	2	1
tired	7	6	5	4	3	2	1
kind	7	6	5	4	3	2	1
sad	7	6	5	4	3	2	1
enthusiastic	7	6	5	4	3	2	1
fearful	7	6	5	4	3	2	1
sluggish	7	6	5	4	3	2	1
interested	7	6	5	4	3	2	1
warmhearted	7	6	5	4	3	2	1
sorry	7	6	5	4	3	2	1
excited	7	6	5	4	3	2	1
jittery	7	6	5	4	3	2	1

Probability Assignment Task

1′	——
2′	——
3′	——
4′	——
5′	——
6′	——
7′	——
8′	——
9′	——
10′	——
11′	——
12′	——
13′	——
14′	——
15′	——
16′	——
17′	——
18′	——
19′	——
20′	——
21′	——
22′	——
23′	——
24′	——
25′	——

Attempted throws	Successful throws	Probability	Your line
10	10	1.0	——
10	9	0.9	——
10	8	0.8	——
10	7	0.7	——
10	6	0.6	——
10	5	0.5	——
10	4	0.4	——
10	3	0.3	——
10	2	0.2	——
10	1	0.1	——
10	0	0.0	——

From what line would you throw to find out most about your ability

on this task at this point in time?

line _____

Debriefing Information

The purpose of this experiment has been to look at the relationship between two characteristics of people and risk-taking behaviour. The two characteristics are achievement motivation and uncertainty orientation. Achievement motivation is the tendency in people to work hard to achieve something, which is influenced by feelings such as pride in accomplishment and fear of failure. People who are influenced relatively more by pride in accomplishment are called success-oriented and those who are influenced more by fear of failure are called failure-threatened. Uncertainty orientation is the tendency to find relevant either uncertainty or certainty in the self and the environment. Those for whom uncertainty is more relevant are termed uncertainty-oriented and those who find certainty more relevant are labelled certainty-oriented.

Part of the research that has been done in the past in the area of achievement motivation has been on risk-taking. The theory of achievement motivation suggests that people who are success-oriented prefer to take intermediate risks whereas failure-threatened individuals avoid this kind of risk. Generally, the research in the past has found that success-oriented people do prefer intermediate risk, although it has not been the case that failure-threatened people avoid this type of risk.

The study you just completed examines the effects of both uncertainty orientation and achievement motivation on risk-taking behaviour. You were asked to participate in this research because we had assessed your levels of these two characteristics earlier in the year, when you came for the large testing session.

The measure of risk-taking that is being used here is the distance from which you throw and the probabilities that you assigned to those distances. You assigned probabilities that ranged from 0.00 to 1.00, and we want to see the relationship between your characteristics and these probabilities.

Uncertainty orientation is involved in this study because differing probabilities are associated with differing degrees of uncertainty. A probability of 0.90 indicates certainty; it's virtually certain that if you threw from the distance you assigned to the 0.90 probability that you would get the ball in the basket. Similarly, a probability of 0.10 also indicates certainty; in this case it's fairly certain that you would not get the ball in the basket. A probability of 0.50 is the most uncertain. There is a fifty/fifty chance of scoring a hit in this case.

So, in this study, we are looking at two of your characteristics and your behaviour. Exactly what we are expecting in terms of results is very complicated, but generally, we expect that among certainty-oriented people, those who are also success-oriented should be most likely to take extreme risk and failure-threatened persons should take moderate risks. We expect exactly the opposite for uncertainty-oriented people.

This study may seem very artificial to you, but the results do have real-world implications. For example, in business people have to take risks and by understanding how people differ in their risk preference we may be able to understand why some people are better at business than others.

Below, you will find a list of references which describes previous research and our theory. They are in the library if you wish to find out more and my office number is included if you want to ask questions. Thank you for participating, and I would like to ask you not to discuss the specifics of the study with any one who might be in the experiment. I will be finished at the end of next week, at which time you can feel free to discuss it. If people know that I'm assessing risk-taking in this study, it would change their responses and could ruin this study.

Atkinson, J. W., Bastian, J. R., Earl, R. W., & Litwin, G. H. (1960). The achievement motive, goal-setting, and probability preferences. Journal of Abnormal and Social Psychology, 60, 27-36.

Hamilton, J. O. (1974). Motivation and risk taking: A test of Atkinson's theory. Journal of Personality and Social Psychology, 29, 856-864.

Sorrentino, R. M., Short, J. C., & Raynor, J. O. (1984). Uncertainty orientation: Implications for affective and cognitive views of achievement behavior. Journal of Personality and Social Psychology, 46, 189-206.

Erin C. Hewitt   SSC 4219

Data

Line	Column	Variable
1	1 - 3	Participant Code Number
1	5	Gender (1 = Female 2 = Male)
1	6 - 7	Experimental Session Number
1	8	Member Number
1	10 - 11	TAT n Uncertainty Story 1
1	12 - 13	TAT n Uncertainty Story 2
1	14 - 15	TAT n Uncertainty Story ◆
1	16 - 17	TAT n Uncertainty Story 4
1	18 - 20	TAT n Achievement Total
1	21 - 23	Authoritarianism Scale Score
1	24 - 26	Test Anxiety Questionnaire Score
1	28 - 67	Distances of Shots One to Twenty
2	6 - 7	Distance Assigned to P(s) 1.0 Prior to Task
2	8 - 9	Distance Assigned to P(s) 0.9 Prior to Task
2	10 - 11	Distance Assigned to P(s) 0.8 Prior to Task
2	12 - 13	Distance Assigned to P(s) 0.7 Prior to Task
2	14 - 15	Distance Assigned to P(s) 0.6 Prior to Task
2	16 - 17	Distance Assigned to P(s) 0.5 Prior to Task

2	18 - 19	Distance Assigned to P(s) 0.4 Prior to Task
2	20 - 21	Distance Assigned to P(s) 0.3 Prior to Task
2	22 - 23	Distance Assigned to P(s) 0.2 Prior to Task
2	24 - 25	Distance Assigned to P(s) 0.1 Prior to Task
2	26 - 27	Distance Assigned to P(s) 0.0 Prior to Task
2	29 - 30	Distance Assigned to P(s) 1.0 After the Task
2	31 - 32	Distance Assigned to P(s) 0.9 Prior to Task
2	33 - 34	Distance Assigned to P(s) 0.8 After the Task
2	35 - 36	Distance Assigned to P(s) 0.7 After the Task
2	37 - 38	Distance Assigned to P(s) 0.6 After the Task
2	39 - 40	Distance Assigned to P(s) 0.5 After the Task
2	41 - 42	Distance Assigned to P(s) 0.4 After the Task
2	43 - 44	Distance Assigned to P(s) 0.3 After the Task
2	45 - 46	Distance Assigned to P(s) 0.2 After the Task
2	47 - 48	Distance Assigned to P(s) 0.1 After the Task
2	49 - 50	Distance Assigned to P(s) 0.0 After the Task
2	56	Rating of Importance of Doing Well (1 = not at all important 7 = very important)

2	57	Rating of Importance of Doing Well to Self-Concept (1 = not all all 7 = very)
2	58	Rating of Importance of Finding Out (1 = not at all 7 = very)
2	59	Rating of Importance of Finding Out to Self-Concept (1 = not at all 7 = very)
3	7 - 25	Raynor Affect Scale
3	27 - 28	Most Diagnostic Distance
4	7 - 26	Accuracy of Twenty Shots (1 = hit 0 = miss)
4	29 - 35	Accuracy of Practice Shots (1 = hit 0 = miss)

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181 1011 -1-103-1-02 82 43   3 4 4 4 5 6 7 7 7 8 ⌒ 9 910111213141414
         5 6 7 8 910111213141 3 4 5 6 7 8 910111213      4444
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720 1012 0304-1-1 00 66 48   1 2 3 4 5 5 6 7 8 8 9 910101112121213 13
         3 4 5 6 7 8 910111213   3 4 5 6 7 8 910111213      3333
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724 1014 02-1-1-1 04 83 40   5 6 6 6 7 8 912121112131315161818182021
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640 1021 -1-1-1 4-02 59 38   5 6 6 6 5 7 7 7 6 8121112 8 91513131310
         1 4 6 8 910121315202 2   2 4 5 610121416182021      1222
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         00001000110110100111   1100000
191 1022 03-1-1-1 01 76 51   8 8 4 4 9 910 9 91212101010101212121 212
         1 6 8 9111214151618 20   1 4 5 7 810111315162 8      2222
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635 1031 -101-103-02 78 34  10121212141414171616191919191818202020 21
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453 1032 -1-1-1-1-02 64 49   6 6 6 8 8 810101 0 9111111110111212121010
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684 1062 -1-1-1-1 2-02 65 48   5 5 5 5 5 8 8 8 8 9 9 8 8 8 9 9 9 8 8 8
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623 1101  -1-1-1-1-03 71 49   3 5 7 7 7 9 9 9 9 9101010 9 9 9 9 9 910
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315 1103  -1-1-1-1-01 75 59   4 4 5 6 6 6 6 7 7 7 7 7 7 7 7 7 8 9 9
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313 1113  -1-1-1-1 04 70 49   3 4 4 4 5 6 7 7 8 8 9 9  910101010 9 9 9
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          5455466665545554542   4
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713 1114  -1 301 4 04999 60   6 6 6 6 6 4 4 4 5 5 6 6 6 6 7 7 8 8 8 8 8
          3 4 4 4 5 7 7 8 8 825   2 5 5 5 6 6 7 7 7 825     4342
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267 1121   2-2 3-1-02 74 50   6 6 8 810101013131312121212121212101024
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728 1125 -1-1-1 1 03 69 49   5 5 7 7 7 7 7 7 7 7 7 7 7 7 8 8 8 8 8
       1 4 4 4 4 4 7 7 7 725  1 3 3 3 4 4 7 7 71025      3222
       41113355622223342112  7
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694 1131  5-1-1-1 03 83 48   5 5 5 4 4 4 5 5 7 7 7 6 6 7 7 7 8 8 8 8
       3 4 5 6 7 8 910111225  4 5 6 6 7 8 910111225      6555
       64171525761611 76162 12
       01011111100110100111  1100000
030 1132  3 3 1-1 01 70 57   5 5 5 7 7 9 9 9 91010 9 8 8 8 8 910 9 9
       5 5 6 6 6 7 7 8 8 910  7 7 7 8 8 9 910101012      4232
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       11111101100010111001  1100000
709 1133  3-1-1-1-02 70 46   6 6 6 7 7 7 8 8 8 8 8 8 8 9 9 9 910 9 9
       3 4 5 6 7 81013162022  3 4 5 6 7 8 910141620      2233
       25143511151512641 42  9
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205 1134  3-1 3-1 00 60 37   7 7 7 7 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8
       8 910121415161718 2021  810121415161718192021      2342
       45143533462513 55141 14
       10111111111111001111  1111000
301 1135  4 3 2-1 06 66 26   5 5 6 9 9111313151516161515141416161616
       4 5 6 7 91113161 72123  4 5 6 7 8 91911 1121314      5656
       51447577557575 51557  7
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394 1136  2-1 4-1 07 49 67   2 3 4 4 4 5 6 6 6 6 6 6 6 7 7 8 8 8 8 8
       3 4 5 6 7 8 910101011  3 4 5 6 7 8 910111112      5353
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206 1141 -1-1-1-1-03 80 41  131313111414151515181818 17 7 71010151515
       4 510121315161 8202122  6 7 810101113161 72022      5644
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702 1142 -1-1-1 3 03 90 47   7 7 8 8 8 9 9 9 7 7 910101010101010101 111
       6 7 8 910121413182025  5 6 7 8 910121415162 0      4455
       43234434462423 45233  6
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738 1143 -1 4 3-1 10 72 51   8 8 91010101112121212121313121212141414
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       6 7 810131516182022 25  8 8 91010111212131516      2222
       3213141134141244131 10
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Appendix D

Analysis of Variance

Summary Tables

Study Three

Table 1

Analysis of Variance Summary Table
Ratings of Importance of Doing Well
Gender and Uncertainty Orientation
as Between-Subjects Factors

Factor	SS	df	Ms	F	p
Gender	1.22	1	1.22	0.73	n.s.
Uncertainty Orientation	0.11	1	0.11	0.06	n.s.
Gender X Uncertainty Orientation	0.77	1	0.77	0.41	n.s.
Error	151.33	90	1.68		

Table 2

Analysis of Variance Summary Table

Ratings of Importance of Finding Out

Gender and Achievement-Related Motives

as Between-Subjects Factors

Factor	SS	df	Ms	F	p
Gender	0.14	1	0.14	0.09	n.s.
Uncertainty Orientation	2.25	1	2.25	1.38	n.s.
Gender X Uncertainty Orientation	5.08	1	5.08	3.11	n.s.
Error	146.92	90	1.63		

Table 3

Analysis of Variance Summary Table

Ratings of Importance of Doing Well

Gender and Achievement-Related Motives

as Between-Subjects Factors

Factor	SS	df	Ms	F	p
Gender	1.55	1	1.55	0.92	n.s.
Achievement-Related Motives	0.14	1	0.14	0.08	n.s.
Gender X Achievement-Related Motives	0.16	1	0.16	0.10	n.s.
Error	150.88	90	1.68		

Table 4

<u>Analysis of Variance Summary Table</u>

<u>Ratings of Importance of Finding Out</u>

<u>Gender and Achievement-Related Motives</u>

<u>as Between-Subjects Factors</u>

Factor	SS	df	Ms	F	p
Gender	0.03	1	0.03	0.02	n.s.
Achievement-Related Motives	0.71	1	0.71	0.35	n.s.
Gender X Achievement-Related Motives	0.007	1	0.007	0.003	n.s.
Error	180.39	90	2.00		

Table 5

Analysis of Variance Summary Table

Ratings of Positive to Negative Affect

Gender and Uncertainty Orientation

As Between-Subjects Factors

Factor	SS	df	Ms	F	p
Gender	44.08	1	44.08	1.76	n.s.
Uncertainty Orientation	2.26	1	2.26	0.09	n.s.
Gender X Uncertainty Orientation	3.07	1	3.07	0.12	n.s.
Error	2250.31	90	25.00		

Table 6

Analysis of Variance Summary Table

Ratings of Positive to Negative Affect.

Gender and Achievement-Related Motives

as Between-Subjects Factors

Factor	SS	df	Ms	F	p
Gender	0.94	1	0.94	0.05	n.s.
Achievement-Related Motives	1.05	1	1.05	0.06	n.s.
Gender X Achievement-Related Motives	80.02	1	80.02	4.39	.05
Error	1660.08	91	18.24		

Table 7

Analysis of Variance Summary Table

Ratings of the Most Diagnostic Distance

Gender and Uncertainty Orientation

as Between-Subjects Factors

Factor	SS	df	Ms	F	p
Gender	75.81	1	75.81	0.51	n.s.
Uncertainty Orientation	4.24	1	4.24	0.03	n.s.
Gender X Uncertainty Orientation	10.72	1	10.72	0.07	n.s.
Error	13484.67	90	149.83		

Table 8

Analysis of Variance Summary Table

Ratings of the Most Diagnostic Distance

Gender and Achievement-Related Motives

as Between-Subjects Factors

Factor	SS	df	Ms	F	p
Gender	79.42	1	79.42	0.48	n.s.
Achievement-Related Motives	13.27	1	13.27	0.08	n.s.
Gender X Achievement-Related Motives	6.72	1	6.72	0.04	n.s.
Error	14776.91	92	164.19		

Appendix E

Analysis of Variance Summary Table

and Means for the Interaction of

Gender, Uncertainty Orientation,

Achievement-Related Motives and

Risk Level

Study Three

Analysis of Variance Summary Table

Gender, Uncertainty Orientation and Achievement-Related Motives as Between-Subjects Factors, Risk Level as the Within-Subjects Factor

Factor	SS	df	Ms	F	p
Between-Subjects Effects					
Gender (G)	0.00	1	0.00	—	
Uncertainty Orientation (UO)	0.00	1	0.00	—	
Achievement-Related Motives (ARM)	0.00	1	0.00	—	
G x UO	0.00	1	0.00	—	
G x ARM	0.00	1	0.00	—	
UO x ARM	0.00	1	0.00	—	
G x UO x ARM	0.00	1	0.00	—	
Error	0.00	57	0.00		

(Table continues)

Factor	SS	df	Ms	F	p

Within-Subjects Effects

Factor	SS	df	Ms	F	p
Risk Level (R)	3575.94	2	1787.97	1.63	n.s.
R x G	5400.58	2	2700.29	2.46	n.s.
R x UO	0.62	2	0.31	0.00	n.s.
R x ARM	1283.04	2	641.52	0.59	n.s.
R x G x UO	3091.39	2	1545.70	1.41	n.s.
R x G x ARM	1293.81	2	646.91	0.59	n.s.
R x UO x ARM	3167.74	2	1583.87	1.44	n.s.
R x G x UO x ARM	6400.37	2	3200.19	2.92	.054
Error	124960.37	114	1096.14		

Mean Percentage of Shots Taken from
Three Risk Levels as a Function of
Gender, Achievement-Related Motives
and Uncertainty Orientation

		Risk Level	
Group	Low	Intermediate	High

Females

Uncertainty-oriented

S/Oa	(9)	54.44	29.44	16.12
F/Tb	(7)	28.57	27.87	43.57

Certainty-oriented

S/O	(6)	31.67	46.67	21.66
F/T	(14)	63.93	22.14	13.93

Males

Uncertainty-oriented

S/O	(11)	25.91	45.91	28.18
F/T	(5)	38.00	42.00	20.00

Certainty-oriented

S/O	(8)	25.00	38.12	36.88
F/T	(5)	27.00	38.00	35.00

Note: Cell n's are in parentheses.

a Success-oriented

b Failure-threatened