RISK TAKING AND RATIONALITY IN INDIVIDUAL, GROUP, AND LEADERSHIP SITUATIONS

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Submitted to the faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the degree of
DOCTOR OF PHILOSOPHY
May, 1969

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ACKNOWLEDGMENTS

Since this dissertation was not a solitary labor, I would like to express my gratitude to those who contributed to its completion: To my committee Chairman, Dr. Roy Gladstone, who gave generously of his time and whose suggestions were always cogent or facilitative; to Dr. William Rambo and Dr. David Bee, who served on my committee; to my friends, Dr. Charles Befort, who assisted during the collection of the data, and Captain Wayne S. Sellman, who contributed to the final preparation of the manuscript; to the typist, Mrs. Martha Henry; and to my wife, Barbara, who provided both tangible and intangible support.

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CHAPTER I

THE PROBLEM

Situations in which behavior may vary according to degree of risk involve four variables: the probabilities associated with both gain and loss, and the magnitudes of gain and loss. If three variables are constant, risk may be said to increase as the probability or magnitude of loss increases, or as the probability or magnitude of gain decreases. Efforts to predict responses to situations in which the values of these variables are known have fallen under the general area of decision making. However, no completely deterministic model of decision making has adequately accounted for risk-taking behavior. Thus the question arises as to which factors affect risk-taking behavior. Efforts to identify these factors and to determine their effects on risk taking generally fall into one of three categories: personal characteristics, situational influences, and social influences.

A substantial number of studies have examined the effect of social influences on risk-taking behavior and have led to the general conclusion that individuals interacting as a group take greater risk than do individuals acting alone. One study (Wallach, Kogan, and Bem, 1964) has shown additionally that individuals who occupy positions of leadership in which they make decisions involving risk for their group tend to take less risk than do individuals acting for themselves or as a member of a group.

Although these findings have been generalized to real-life situations, such as risk taking in a military or investment context, many of the studies of risk behavior measure risk-taking behavior in hypothetical situations rather than situations in which subjects are directly affected by their decisions. A more general shortcoming of many of these studies is that there may be extraneous utility for taking greater risk in the group, such as a desire for appearing aggressive.

Although many studies support the hypothesis that groups react to problems more rationally than do individuals, this phenomenon has not been examined in conjunction with risk taking. Another factor which has not been examined in the context of risk-taking behavior is that of the degree of rationality with which the decisions involving risk can be made.

It is the purpose of this study to investigate social influence on risk-taking behavior and on rationality in situations in which subjects are directly affected by their decisions involving risk, and where the ability to make rational decisions varies with the situation. Specifically, this study intends to answer the following questions: Do individuals differ in risk-taking behavior and rationality in individual, group and leadership situations? Are these social influences dependent on whether or not the situation can be dealt with rationally, and if so, whether or not the individual can arrive at a rational response?

CHAPTER II

REVIEW OF THE LITERATURE

Introduction. The problem of intra- and inter-individual differences in risk-taking behavior arises from the failure of mathematical models to provide a deterministic account of behavior in situations involving uncertain outcomes (Kogan and Wallach, 1967). Since these models do not use a risk-taking construct, their success would have indicated that the concept of risk taking is unnecessary.

The simplest mathematical model of behavior in situations involving uncertain outcomes is that of expected value (EV), in which the probability of gain and magnitude of gain (i.e., money) are multiplied together to produce an expected value for a certain act. When an individual is presented with two or more choices in which these variables are different, the model predicts he will choose the act which is associated with the greatest expected value. A somewhat improved model is that of subjectively expected money (SEM). This model substitutes subjective probabilities for the actual probabilities used by the EV model. The expected utility (EU) model is another refinement of the EV model as it replaces objective values with subjective values, or utilities. The last model is that of subjectively expected utility (SEU), in which subjective values of both magnitude and probability of gain and loss are used. A major problem with the SEU model is that these subjective values must be determined independently from the situation

in which predictions are made, in order to avoid circularity.

Although these models provide an intriguing attempt to quantify the variables which account for decision making, their success has been modest. The inadequacy of these models to make accurate predictions suggests the need for other constructs, such as that of risk taking.

There have been three major approaches to the investigation of risk taking: the effect of personal characteristics on risk taking, the effect of situational variables on risk taking, and the effect of group interaction on risk taking. The present study falls under the last of these groups.

Group Versus Individual Risk. A study that has generated much interest and research in the area of group versus individual risk taking was done by Stoner (1961). The subjects of Stoner's research, male graduate students in industrial management, were asked first to reach individual decisions concerning 12 hypothetical "real-life" situations developed earlier by Wallach and Kogan (1959), in which a protagonist is faced with a choice between a high probability of attaining a small gain or a lower probability of a higher gain. Subjects' tasks were to state the lowest probabilities of attaining the higher gain they would accept in order to recommend the riskier course of action based on a scale of 1-9 in 10. Two examples of the problems, called "Choice Dilemmas," may be summarized as follows:

1. A man with a severe heart ailment must seriously curtail his customary way of life if he does not undergo a delicate medical operation which might cure him completely, or might prove fatal.

2. A man of moderate means may invest some money in secure low return securities or in more risky securities that offer the possibility

of large gains.

Subjects subsequently were divided into groups of six and instructed to discuss the same problems in order to reach a unanimous group decision.

Twelve of the 13 groups reached decisions which were riskier than the average of the group members' individual decisions. Although this result was unexpected, it might be explained as a result of the hypothetical nature of the problems used to measure risk. Subjects might have responded to the group with a greater awareness of the role expectation of taking risks, especially since risk taking is an expectation for both males and managers.

Three possible explanations of Stoner's findings were offered by Marquis (1962). The first possibility, as mentioned above, is that the role expectation for both males and managers is for risk taking, and that the group situation enhances these expectations. The second possibility is that a diffusion or spreading of responsibility occurs when decisions are made by groups, and that this feeling of reduced responsibility by the individuals results in greater risk taking. The third possible explanation offered by Marquis is that the more risky members of the group have a disproportionately greater influence on the other group members than less risky members and are thus able to guide the group decision toward greater risk.

Two experiments are reported by Marquis. The first of these is basically a replication of Stoner's procedure, but with middle-level managers as subjects. Because of time limitations, Marquis used only six of the 12 Choice Dilemmas. Subjects first made individual decisions concerning the lowest probability of success they would accept before recommending the more favorable course of action. The subjects then

discussed each dilemma in groups of six individuals each and reached a unanimous group decision. In the third stage, subjects again indicated their current individual decision.

The results substantiated Stoner's findings. Of 33 shifts in risk from the mean of initial individual decisions to the group decisions, 24 were in the risky direction. When the initial individual decisions were compared with the post-discussion individual decision, it was found that the predominance of shifts was also in the risky direction. This experiment confirmed the finding that the group caused a shift to more risky decisions than those made by individuals before discussion, and it extended the generality of the phenomenon to other kinds of subjects.

The second experiment reported by Marquis was conducted to determine the effect of group discussion on the risk taken by an individual designated as leader of the group. As before, individuals first completed the Choice Dilemmas in private. Then they were randomly placed into groups of five members each such that the individual whose initial level of risk was in the mid-portion of the group was selected by the experimenter as leader for the group. The leader was to discuss the problems with the group, but to make his own decision concerning each of the Choice Dilemmas and to be prepared to defend his position in an open discussion with the other group leaders. No votes, group decisions, or concensus occurred in the group discussions.

The primary interest was in the direction and magnitude of shifts in the leaders' decisions from before group discussion to after group discussion. These shifts were significantly in the risky direction. The other group members also shifted to more risky decisions. The mean shift of leaders was as great as the shift caused by unanimous group

decisions in the first experiment. Marquis concluded that the greater riskiness of group decisions cannot be attributed to a sharing of responsibility with the group. One problem with this interpretation, however, is that the "responsibility" aspect may have been trivial since there were no adverse consequences for making a "wrong" decision. In other words, the group-induced risky shift does not appear to occur as a consequence of sharing responsibility with the group.

In order to test the generality of the group risky shift phenomenon and its independence from role and sex considerations, Wallach, Kogan, and Bem (1962), presented both male and female liberal arts students with the Choice Dilemmas under four conditions. Subjects first made their decisions individually, then as a member of a group, again individually (post-discussion individual), and individually from two to six weeks later (post-post discussion). The groups were required to reach a consensual group decision. In the control group, subjects were tested twice individually, the second test coming one week after the first test.

For both males and females, initial decisions were significantly less risky than either group decisions or post-discussion individual decisions. Only the data concerning the post-post discussion individual decisions of males was available, and it indicated that these decisions were significantly more risky than initial decisions. In other words, the higher risk levels attained in the group were maintained over a substantial period of time. There was no shift in risk level for the subjects in the control group.

Additionally, subjects rated members of their group on both degree of influence and popularity. For both males and females, subjects with greater perceived influence had significantly higher initial risk levels.

Popularity was not related to level of initial risk.

This experiment offers evidence against the hypothesis that the group risky shift phenomenon is due to sex-linked role expectations. Further, support is found for the explanation set forth by Marquis that the phenomenon can be accounted for by the fact that initially risky individuals have relatively greater influence in the group discussions.

As has been mentioned above, one of the shortcomings of the studies which show groups to be more risky than individuals has been the hypothetical nature of the problems concerning which decisions of risk were made. There has also been a problem of identifying the dynamics of the group situation which lead to decisions for greater risk. Wallach et al. (1964) conducted an experiment which was designed to answer these questions. They replaced the hypothetical Choice Dilemmas with situations in which the decisions made involved outcomes with actual monetary payoffs. Their hypothesis of group dynamics was that groups take greater risks because of diffusion of responsibility.

The subject's task was to answer questions to be drawn from a pool of questions taken from old College Board Examinations. Subjects were able to select the difficulty level from which the questions were to be drawn. Subjects were paid for correct answers and the amount of payoff varied inversely with difficulty level, so that expected gains for all difficulty levels were equal. The expected gains were held constant to insure that rationality would not be a factor influencing the decisions. Both males and females served as subjects.

In addition to a control group, there were four experimental groups which varied mainly in terms of whether or not an individual was responsible only for himself or shared responsibility with the group and

whether or not decisions were made individually or through discussion. In the first experimental condition, one individual of a group was chosen at random to answer a question. Each member of the group received a payoff if the question was answered correctly. However, decisions of difficulty level were made individually without discussion. In this condition decisions were significantly less risky than in any of the other conditions.

In the second condition, groups decided on one difficulty level for all members, but each member was paid according to his own performance. Groups also decided on difficulty level in the third condition, but a member of the group was designated at random to be responsible for the payoff to the entire group. The fourth condition was the same, except the group designated the responsible member. This last condition resulted in risk which was significantly greater than in any of the other conditions. A control group in which subjects worked individually was more conservative than all but the most conservative group.

The following conclusions are suggested by these findings: responsibility for a group without opportunity for discussion leads to greater conservatism; situations in which group decisions involve group responsibility are most conducive to greater risk; and situations in which group decisions affect members individually result in an intermediate level of risk.

The authors interpret these findings as support for their hypothesis that groups will take greater risks than individuals because of a diffusion of responsibility which results from group discussion.

In the foregoing study, a favorable outcome resulted in a gain, whereas an unfavorable outcome resulted merely in a lack of gain with no

loss involved. Bem, Wallach, and Kogan (1965) tested the generality of the risky shift phenomenon by examining group risk in situations in which physical discomfort resulted from an unfavorable outcome. Subjects were led to believe that they were to be exposed to stimulation which in some cases would prove to be very unpleasant. To measure their degree of risk taking, they were asked to state what probability they were willing to accept that stimulation to which they were to be exposed would be unpleasant. Subjects were then retested in one of six conditions: controls (retested with same instructions); discussion to consensus-group decision; discussion to consensus-individual decision; anticipated presence of others; anticipated public disclosure; and anticipated decision to consensus. Both conditions involving discussion to consensus resulted in greater risk, whereas no shift to greater risk occurred in the groups which did not have discussion. The authors conclude that the generality of the risky shift phenomenon includes situations in which aversive consequences are possible. Also, the fact that greater risk did not occur in the situations in which social pressure might have been anticipated lends support to the diffusion of responsibility hypothesis.

Wallach, Kogan, and Burt (1965) identified the basic operation involved in the risky shift effect as a group discussion to consensus. They further identified the components of this process as that of receiving information about the judgments of other group members, group discussion and arrival at a consensus. To determine the significance of these components for the risky shift phenomenon, three experimental conditions were used. The first of these involved group discussion to consensus, which was the procedure followed in earlier studies. The other conditions involved consensus without discussion and discussion with out consensus.

The decisions involving risk were made in response to the Choice Dilemmas. Subjects initially made their decisions individually, and later made their decisions in one of the three experimental conditions.

In both conditions involving discussion, there was a significant risky shift in the group situation. However, the consensus without discussion resulted in an averaging of group members' initial decisions. The extent of risky shifts were approximately equal for both conditions involving discussions. These findings were alike for both male and female subjects.

These results support the conclusion that the crucial component of the risky shift phenomenon is group discussion. The experience of discussion is both necessary and sufficient for producing the shift. On the other hand, consensus is neither sufficient nor necessary.

Another explanation of the risky shift was put forward by Rabow et al. (1966). The authors suggested that the crucial determinant of an individual's influence during group discussion was that his position be supported by social norms. It follows that if alternatives involving less risk had normative support, groups would be less risky than individuals.

Subjects were presented both individually and in groups with three kinds of problems: the Choice Dilemmas, similar problems except that the protagonist was related to the subject, and problems in which there was a conflict of social norms.

The authors confirmed earlier findings with the Choice Dilemmas that groups are riskier than individuals. For the problems in which the protagonist was related to the subject, there was no change in risk from individual to group situations. Groups were less risky in response

to the problems involving conflicting social norms.

Another hypothesis is that the risky shift is a result of greater familiarization with the risk taking problem. Bateson (1966) investigated this possibility using the Choice Dilemmas. Subjects completed the problems first in private, then they were retested in one of three conditions: group discussion, private study of the problems, and without having further considered the problems. The first two conditions both resulted in a significant risky shift, but the last condition did not. Bateson concluded that familiarization with the risk-taking task was sufficient to cause a shift to greater risk.

Support for the importance of familiarization for the risky shift phenomenon comes from a study by Flanders and Thistlethwaite (1967). Subjects were given the Choice Dilemmas individually and again in one of three experimental group situations: familiarization without discussion, familiarization with discussion, and discussion without familiarization. A control group was tested both times without any group participation. The three experimental groups did not differ from each other, but they were all more risky than the control group. The importance of this study for Bateson's position is that familiarization was equally as important as discussion in bringing about the risky shift.

The Rationality of Group Versus Individual Decisions. The basic question to be discussed in this section concerns the relative accuracy of group judgments as opposed to individual judgments. Two general kinds of group judgments are those which represent a mere pooling of the judgments of the group members, and those which represent a single group judgment derived from interaction among the group members.

One of the earliest studies concerning group versus individual judg-

ments was conducted by Gordon (1924). She had 200 subjects rank order from heaviest to lightest a series of 10 weights ranging from 16 to 17.6 grams. The correlations between each subject's order and the correct order ranged from +.95 to -.81, with a mean correlation of +.41. The individual rankings were then combined into groups of 5, 10, 20 and 50 rankings each and the average of these combined rankings correlated .68, .79, .86, and .94, respectively, with the true order. Gordon concluded that the mean judgments of the group are distinctly superior to those of the average member.

Stroop (1932) replicated Gordon's study and findings. In addition, he had 40 subjects rank the weights 5 times each, 20 subjects 10 times each, 10 subjects 20 times each, and 4 subjects 50 times each. When these grouped judgments made by the same individual were compared to grouped judgments made by different individuals, the results were nearly the same. In other words, the mere combining of judgments resulted in a higher average reliability than that of the average of several individual judgment considered alone.

Preston (1938) points out that the superiority of group judgments demonstrated by Gordon and Stroop may be due merely to a statistical averaging effect. He adds that group superiority is diminished to the extent that the individual judgments are systematically biased.

A study which supports this view was conducted by Gurnee (1937a). He compared the learning rate of a group with that of individuals operating alone. There were 12 groups of approximately 10 individuals each, and 42 individuals working alone. For six learning trials, subjects moved through a maze, each move by the group being made according to a majority vote. The number of errors were recorded. On the seventh

trial, all subjects performed individually. After the initial trial, groups established and maintained substantial superiority over individuals. However, on the seventh trial, there was no significant difference between errors made by subjects who had worked individually and those who had been members of a group. Gurnee concluded that the chief advantage of the group situation was a scattering of individual errors. This is analogous to the fact that the larger the sample size, the more closely a sample mean approximates the population mean.

An additional explanation of group superiority resulted from another study by Gurnee (1937b). Five large groups of subjects were subjected to one of three situations. In the first situation, two groups were administered true-false and multiple choice tests without an opportunity for group interaction. Subsequently, each question was read aloud and a majority decision was made. All subjects had the same opportunity and compulsion to learn the material from which the questions were taken.

The second situation was similar to the first, except the test concerned material for which the subjects had varied experiences and interests. The third situation differed from the other two only in that the questions concerned a complex social event which all subjects had an equal opportunity to observe.

For all situations, the groups performed better than did the group members responding individually. The majority of individual responses for each question was correct, so that a majority answer would have been superior to the average individual answer. But in the first two situations, the group scores were superior to that which would have resulted from a majority answer. Gurnee concluded that subjects who were uncertain of their responses were probably influenced by the more vocal and

confident group members.

This conclusion was supported by a study conducted by Thorndike (1938). He presented several kinds of problems to each of 1200 subjects to solve individually and to indicate their degree of confidence in their answers. The subjects were then divided into 222 groups, where they discussed each problem and reached a group decision. The results showed that the group decision was superior to the majority decision reached by the subjects working individually, which in turn was superior to that of the average individual decision. In support of the preceding study, Thorndike's study demonstrated that those subjects making correct decisions were more confident than those making erroneous decisions, although the confidence an individual exhibits in his decision will influence the group to accept his decision regardless of whether the decision is correct or incorrect.

Similar findings were reported by Timmons (1942). In his study, all subjects ranked five solutions to problems covered in reading materials before reading and again immediately after reading. Experimental subjects then discussed the problems in small groups, and the group made a ranking of the solutions. Control subjects made an additional ranking of the solutions after additional individual study. These rankings were compared with those made by informed experts. Average and majority scores were also computed.

Analysis of the results showed that group scores were superior to the average individual scores. Group scores were also better than the majority individual scores but the difference was not statistically significant.

Finally, Klugman (1944) conducted a study to determine whether or

not two children could solve mathematical problems faster and more accurately than each child working alone. One half of the subjects solved the problems first working in pairs, then working alone. The other half reversed this procedure. The pairs performed more accurately, but took a greater amount of time. Both findings were statistically significant.

CHAPTER III

METHOD

Subjects. Participants in the experiment were 54 male students of basic and intermediate-level psychology courses at the Oklahoma State University. All subjects volunteered for the experiment and they were given extra credit in their psychology course for their participation.

Materials. A series of games of chance was specially created for this experiment (see Appendix A). The games were designed so that for some games (1-6) it would be relatively easy to calculate odds of winning and for other games (7-9) it would be difficult or impossible to calculate such odds. The materials necessary for the games include a coin, three dice, and a dish containing an equal number of red, green, and blue marbles. Also, there were five sets of 3X5 cards, each card having a number written on it. The first set of cards contained 11 cards, numbered 0-10; there were 21 cards in the second set numbered 0-20; the third set consisted of 26 cards numbered 0-25; the fourth set consisted of 34 cards numbered 0-33; and the fifth set consisted of 51 cards numbered 0-50.

Procedure. The subjects were divided into six groups of nine each. Each member of a group was treated simultaneously. The nine members of a group were seated in widely spaced, numbered chairs in the following arrangement:

1 2 3

4 5 6

7 8 9

Each subject was then furnished these written instructions:

> This is a test of your ability to make decisions in the face of uncertain outcomes. We hope you will find this experiment to be interesting, fun and a challenging test of your decision-making ability. In addition, it will be possible for you to win $1, $2, or $3, so pay close attention to the instructions.
>
> You will be presented with several different situations with uncertain outcomes, or you might call them games of chance. You will be playing these games both as individuals and as teams.
>
> There are two decisions for you to make for each game: (1) the outcome of the game and (2) the number of points you are willing to risk (bid) on the chance that your guess will be correct. Your skill in making these two decisions will determine how much money you will win.
>
> After each game is described to you, you must decide your guess and the number of points you are willing to risk. Only the person or team which bids the most points is eligible to have his guess considered. The highest bidder will win 100 points if his guess is correct, but if his guess is not correct, he will lose the number of points he was willing to risk. Persons or groups whose bids are not highest will neither win nor lose points.
>
> As you can see, the problem is to bid high enough to win the bid, but not so high as to lose points in the long run. You will improve your chances of winning money if you keep your bid in line with the odds of winning.
>
> So that your judgment will not be influenced by how lucky you are, you will not be told the outcome until all of the games are over.
>
> In order to keep a record of your guesses and bids, there is a piece of paper for each game on your seat on which you are to write your guess and the number of points you are willing to risk for the game.
>
> Every person or team starts out with 0 points. Some people will probably win points, some may lose points,

and some will finish up with 0 points (those whose bids were never the highest). After the games are over, the winning person or team will be the one with the most points relative to the other two persons or teams. For example, even if all persons or teams lose points overall, the person or team which loses the fewest points will be declared the winner.

After each subject had an opportunity to finish reading the instructions, the experimenter answered any questions and said:

This is a straightforward experiment and there are no tricks involved. I am interested in seeing how skillful you are at deciding how many points to bid. Although there is an element of luck involved in winning, your chances of winning money will be improved if you follow good strategy.

I am going to give you some examples of good and bad strategy. First, let's see how good you are at making bids in a simple game. Suppose you were to guess whether a tossed coin would be a head or a tail. Suppose the rules were just like those instructions in which you are bidding against two other persons. If the guess of the highest bidder is correct, he wins 100 points. If his guess is incorrect, he loses the number of points he bid. Now, think to yourselves: What is the highest bid that you can make and still be expected to win in the long run if you repeated this game a large number of times?

Actually the highest bid one can make in the coin-tossing game and still be expected to win in the long run is 99. Suppose the game is played 200 times. Since the odds of winning are 50-50, you would expect to lose 100 times and win 100 times. If you bid 99 points each time and lose 100 times, you will lose a total of 9,900 points. However, if you win 100 times you will win a total of 10,000 points for a net gain of 100 points. So, the highest bid you can make in the coin-tossing situation and still expect to win is 99.

Now let's look at some examples. Suppose players A, B, and C are competing in a game where they are to guess whether or not a tossed coin will be a head or a tail. Let's say they play this game two times and each player repeats his bid in each game. If player A bids 10 points, B bids 100 and C bids 200, player C will have his guess considered for both games since he is highest bidder. Players A and B will neither win nor lose points. Since the odds of guessing a side of a coin are 50-50, C might very well lose one game and win another. For the game he guesses incorrectly, he will lose the number of points he bid, or in this case, 200 points. His net total for

the two games is minus 100 points. You can see that C made bids that were too high. Suppose, however, that the players repeat the same game two times, but this time player A bids 10 points, B bids 15 and C bids 20. Again neither A nor B win or lose points since C makes the highest bid. If C guesses correctly for one game and incorrectly for another, he will lose the amount he bid, 20 points, and win 100 points. His gain is 80 points. As you can see, players A and B bid too conservatively. For a final example, suppose A bid 99 points for two games, B 98 points and C 90 points. This time A is the highest bidder so his guess is considered. If he guesses correctly one game and incorrectly for the other, he will win 100 points and lose 99, for a net gain of 1 point. This is sufficient to beat B and C as they have 0 points. As I have said, 99 is the best bid in the coin-tossing game.

(The experimenter also presented these examples on the blackboard.)

As opposed to the coin-tossing game, most of the games involve odds of less than 50-50. Suppose you were to guess a number drawn at random from 1-100. If you were to play this game many times, what is the highest you can bid, and still be expected to win in the long run? The answer is 1. Out of 100 times, you would expect to win once, therefore, winning 100 points. You would be expected to lose 99 times, thereby losing 99 points if you bid 1 point each time. Your net gain for every 100 times would be expected to be 1 point. If you had bid 2 points each time, and won once out of 100, you would have lost a total of 198 points, won 100 points, for a net loss of 98. Actually, you will not have this particular game, although there will be similar games, but with differing odds of winning.

All subjects played the same series of games in three situations: Individual, Group and Leadership. In order to equate all situations for familiarization, all of the six possible sequences of these situations were used. The six groups of nine subjects each were randomly matched with these sequences. The instructions for each situation were as follows:

Individual. For this series of games each of you is a member of a three person group. Those at seats 1, 6, and 8 will be one group; those at 2, 4, and 9 another; and those at 3, 5, and 7 will be the last group. You will be competing only against the two other persons in your group. What the people in the other two groups do will have no effect on you. When this series of games is over, there will be three

winners, one from each group. Each individual winner will win $1.

Group. For this series of games each of you will be working as a member of a team. Those at seats numbered 1, 4, and 7 will be one team; those at 2, 5, and 8 another; and those at 3, 6, and 9 the other team. After each game is described, each team will go to a separate room to decide on a guess and to discuss the bid. You will have three minutes in which to discuss with the other members of your team the number of points to be bid. After the discussion, each of you should return to your seat and write on the piece of paper the guess that the team decided to make and the number of points you feel the group should bid. It is not necessary that all team members agree on the number of points to bid. In fact, your team members will not find out how many points you felt the team should bid. The actual team bid will be the average of the points recommended by each team member. Each member of the winning team will win $1. Members of the other two teams will win nothing.

Leadership. This series of games is a test of your decision-making ability as leader of your team. Those seats numbered 1, 2, and 3 will be one team; those at 4, 5, and 6 another and those at 7, 8, and 9, the other team. Each of you must make your choice of points to bid without any discussion with your team members. When the games are over, we will determine which of you made the best decisions for your team and which of you made the worst decisions. Each member of the winning team will receive $1 and those on the two other teams will receive nothing. Each of you then will actually be the bidder for your team for only 1/3 of the games, but you will not know in advance which game your bid will represent the group. Your team members will be depending on you in the games for which you are responsible. This is like a relay race in that each member of the team has sole responsibility for a portion of the games, except that you will not know which games are your responsibility until the games are completed. At that time, you will see how well the other members of your group did and they will see how well you did on their behalf.

After the instructions for each situation had been given, the experimenter carried out the operation of the game in front of the room. Subjects could not see the results because of a small screen. In order to avoid a paradigm of operant conditioning, subjects were never told the results of the individual games. The slips of paper upon which subjects wrote their guesses and bids were collected after each game by the ex-

pericenter. Except for the instructions, there was no difference in procedure between the Individual and Leadership Situations. The procedure for the group situation differed in that the subjects left the room for discussion after each game was described.

At the conclusion of all of the games, subjects were asked to write down what they considered to be the best guess for each game and the highest bid which one could make and still be expected to make a gain if the game were played a large number of times. This was done to verify the assumption that for some games it would be more difficult to make a rational bid, and to determine each subject's ability to calculate odds for each game.

At the conclusion of the experiment, winners were paid the amount of money they had won.

CHAPTER IV

RESULTS

Risk. The raw data collected in this experiment are presented in Appendix B. For each game each subject was classified according to the situation in which he made the highest bid. Data from subjects who made the same bids in all situations for a game were not analyzed for that game. If the bids for two situations were the same, but differed from the bid made in the other situation, each of the two situations received a score of one half. Results for Games 1-6 (relatively easy to calculate optimal bids) were combined, as were results from Games 7-9 (difficult to calculate optimal bids). The optimal bid was defined as the highest bid which had an expected gain. For Games 1-6 an additional breakdown was made between subjects who did and did not closely estimate the optimal bid for each game based upon the measure of this ability taken at the conclusion of the experiment. These results are presented with a chi-square analysis in Table I. Significance levels are reported where substantial differences exist.

Table I shows that more of the highest bids were made in the Group Situation than either the Individual or Leadership Situations. This tendency was statistically significant for subjects on Games 1-6 who knew the optimal bids and for all subjects on Games 7-9, but not for subjects on Games 1-6 who did not know the optimal bids.

An analysis of the data for each pair of situations is shown in

Table II. For subjects who knew optimal bids for Games 1-6, the number of highest bids made in the Group Situation was significantly greater than those made in either the Individual and Leadership Situations. This finding was replicated for all subjects for Games 7-9. For subjects on Games 1-6 who did not know optimal bids, there were no statistically significant differences between any of the paired situations.

TABLE I

ANALYSIS OF THE NUMBER OF HIGHEST BIDS MADE IN EACH SITUATION

	Individual	Group	Leadership	Chi-Square
Games 1-6: Subjects who know optimal bid	45.0	82.0	58.0	11.43**
Games 1-6: Subjects who did not know optimal bid	23.5	31.5	26.0	1.24
Games 7-9: All subjects	44.0	66.0	40.0	7.04*

*.02
**.01

TABLE II

ANALYSIS OF THE NUMBER OF HIGHEST BIDS FOR EACH PAIR OF SITUATIONS

	Individual	Group	Leadership	Chi-Square
Games 1-6: Subjects who knew optimal bid	45.0	82.0		10.78***
	45.0		58.0	1.64
		82.0	58.0	4.11*
Games 1-6: Subjects who did not know optimal bid	23.5	31.5		1.16
	23.5		26.0	<1
		31.5	26.0	<1
Games 7-9: All subjects	44.0	66.0		4.40*
	44.0		40.0	<1
		66.0	40.0	6.36**

*.05
**.02
***.01

Rationality. The procedures followed for the analysis of the rationality of bids were similar to those followed for the analysis of risk taking. The only difference for this analysis was that each subject was classified according to the situation in which his bid most closely approximated the optimal bid. The results are shown in Table III.

TABLE III

ANALYSIS OF THE NUMBER OF MOST RATIONAL BIDS MADE IN EACH SITUATION

	Individual	Group	Leadership	Chi-Square
Games 1-6: Subjects who knew optimal bid	71.0	61.5	52.5	2.76
Games 1-6: Subjects who did not know optimal bid	21.5	39.5	20.0	8.72**
Games 7-9: All subjects	51.0	61.0	38.0	5.32*

*.10
**.02

These results show that a lack of knowledge of optimal bids was associated with most of the optimal bids being made in the Group Situation. Subjects who knew optimal bids (Games 1-6) tended to respond most rationally in the Individual Situation. In all instances fewest of the most rational bids were made in the Leadership Situation, although this trend was not always substantial.

An analysis of each pair of situations is presented in Table IV. For subjects who did not know optimal bids for Games 1-6, and for all subjects for Games 7-9, the difference between Leadership and Group Situations was statistically significant. For Games 1-6, subjects who did not know optimal bids responded significantly more rationally

in the Group Situation than in the Individual Situation. For subjects who knew optimal bids for Games 1-6, the difference between the Individual and Leadership Situations was substantial.

TABLE IV

ANALYSIS OF THE NUMBER OF MOST RATIONAL BIDS FOR EACH PAIR OF SITUATIONS

	Individual	Group	Leadership	Chi-Square
Games 1-6: Subjects who knew optimal bid	71.0	61.5		<1
	71.0		52.5	2.77*
		61.5	52.5	<1
Games 1-6: Subjects who did not know optimal bid	21.5	39.5		5.31**
	21.5		20.0	<1
		39.5	20.0	6.39***
Games 7-9: All subjects	51.0	61.0		<1
	51.0		38.0	1.90
		61.0	38.0	5.34**

*.10
**.05
***.02

CHAPTER V

DISCUSSION

The results of this study support the general finding that individuals acting as a group take greater risk than individuals acting alone; either for themselves only or while serving a leadership role. On the basis of previous studies this phenomenon has held for situations in which the decisions involving risk were hypothetical, for situations in which all alternatives were associated with equal expected gains, and for situations in which the expected outcomes were aversive. The results of this study support a further generalization of this phenomenon to situations in which decisions involving risk have real consequences for the persons making the decisions. This generalization is strengthened by the fact that the phenomenon cannot be accounted for in this study by the hypothesis that greater risk in the group results from a desire to fulfill the role expectations of boldness or aggressiveness, since all bids were made in private.

As a result of his study, Bateson (1966) concluded that familiarization with the risk-taking task is sufficient to cause a shift to greater risk in the group. If this conclusion, which has been supported by Flanders and Thistlethwaite (1967), is valid, familiarization alone could account for the risky shift phenomenon in the majority of studies in which it has been examined, since the individual risk-taking situation has usually preceded that of the group. However, the results of

the present study concerning both risk and rationality cannot be accounted for by familiarization, since the use of all possible sequences of social situations equates familiarization for all situations. That is, each situation was presented first, second, and third an equal number of times (twice).

A variable introduced in this study was the difficulty in calculating the optimal bids. Previous studies have not used situations in which the optimality of risk could be measured. Therefore, the problems they used as a context for decisions involving risk are most closely related to Games 7-9, for which subjects would not accurately estimate the optimal bids. As might be expected, the results for Games 7-9 are similar to the results of other studies which show the risky shift phenomenon.

The situation for the subjects who did not know the optimal bids for Games 1-6 differed from that of the subjects on Games 7-9 in that during the group discussion, the former were interacting with subjects who knew the optimal bids. This difference could account for the difference in risk taking between the two groups. On the other hand, subjects who knew optimal bids for Games 1-6 responded similarly to all subjects for Games 7-9 in terms of risk. The factor which these groups had in common was that both were interacting with individuals who did not know the optimal bids. This similarity could account for the similarity of their risk-taking behavior.

The present results do not support the findings of Wallach et al. (1964) that persons occupying a leadership role act more conservatively than do persons acting only in their own behalf. In the present study, there was little difference in terms of risk between the responses

made in the Individual and Leadership Situations. Responses in the Leadership Situation were consistently less rational than those made in the Individual Situation. This difference was most pronounced for those subjects who knew the optimal bids. The differences in the experimental conditions of the Individual and Leadership Situations should have possible relevance for the rationality of decisions only for those individuals who <u>can</u> respond rationally. Whatever differences are inherent in these situations, none of these differences could affect the rationality of a response by an individual who does not have the ability to make a rational response, since in both situations the individual reaches his decision while working alone. The differences between the rationality of responses made in the Individual and Leadership Situations should be accepted tentatively until verified by research specifically designed to investigate this area.

The ability to calculate optimal bids was an important variable for both risk and rationality. In both cases, subjects who were divided according to this variable responded differentially. In the case of the measure of risk, the difference was only in degree. All groups of subjects tended to take the greatest risk in the Group Situation, although this tendency was statistically significant only for the subjects who knew the optimal bids for Games 1-6 and all subjects for Games 7-9.

In the case of the measure of rationality, however, there was a difference in trend between groups. Subjects who did not know optimal bids for Games 1-6 and all subjects on Games 7-9 responded most rationally in the Group Situation to a degree that was statistically significant, whereas subjects who knew optimal bids for Games 1-6 tended to make the most rational bids in the Individual Situation, although this

tendency was not statistically significiant. This finding does not contradict other studies whose findings concern the total group since this study deals with individual responses rather than average responses. It does suggest, however, that individuals who are relatively knowledgable about a matter for which a decision is to be made may reach a decision, while working alone only for themselves, which is at least as rational as that which they would make while interacting with individuals who have relatively less knowledge of the matter. On the other hand, individuals who lack a complete understanding of the matter about which a decision is to be made apparently benefit from the group discussion.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The purpose of this study was to examine the effect of the ability to make rational decisions on risk taking and rationality in Individual, Group and Leadership Situations. Fifty-four college undergraduate students participated in a series of games of chance which varied according to the difficulty involved in responding to them rationally. Each subject's ability to make rational responses to the games was measured. Dependent variables were the risk taken and the degree to which actual responses deviated from optimal responses.

The major findings were as follows:

1. Subjects took greater risk in the Group Situation than in either of the other situations.

2. This finding can be generalized to situations in which: Individuals who make decisions involving risk are tangibly affected by their decisions; the influence of role expectations has little or no effect; and the influence of familiarization of the risk-taking task is constant for all situations.

3. Subjects who differed in the accuracy with which they estimated optimal responses also differed in their responses in terms of both risk and rationality.

4. Subjects who estimated the optimal responses less accurately performed most rationally in the Group Situation, whereas subjects who

estimated the optimal responses more closely did not respond more rationally in the group.

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APPENDICES

APPENDIX A

DESCRIPTION OF GAMES

	Games	Prize Points	Best Guess	Optimal Bid
1.	Guess head or tail from tossed coin	100	-	99
2.	Guess number drawn from cards numbered 0-10	100	-	9
3.	Guess number drawn from cards numbered 0-20	100	-	4
4.	Guess number drawn from cards numbered 0-25	100	-	3
5.	Guess number drawn from cards numbered 0-33	100	-	2
6.	Guess number drawn from cards numbered 0-50	100	-	1
7.	Guess number from three tossed dice	100	10 or 11	14
8.	Guess number of green marbles out of 10 drawn from dish containing equal number of red, green and blue marbles	100	3	35
9.	Guess number of heads from coin tossed 10 times	100	5	33

APPENDIX B

RAW DATA: ALL BIDS MADE IN INDIVIDUAL, GROUP, AND LEADERSHIP SITUATIONS

Sequence I G L

Subject:	1			2			3			4			5			6			7			8			9		
Game	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L
1	99	99	99	50	100	100	50	55	99	20	99	99	30	99	99	51	55	55	25	99	10	15	90	95	30	61	52
2	1	50	50	10	12	1	10	1	40	10	50	40	2	10	2	12	3	3	15	50	5	4	14	1	2	1	2
3	1	30	40	3	4	1	5	1	20	10	35	20	1	2	1	9	1	1	5	20	5	4	4	0	2	1	1
4	3	19	3	1	3	1	1	1	3	10	19	3	1	2	1	5	1	1	5	10	5	10	1	1	2	1	1
5	3	3	20	1	2	1	1	1	1	10	3	1	1	2	1	3	1	1	15	1	50	2	0	1	2	1	1
6	3	4	10	1	1	1	1	1	1	9	3	1	1	1	1	2	1	1	5	3	1	4	1	0	10	1	1
7	3	3	25	2	4	1	1	10	8	15	3	8	6	5	9	10	11	15	10	2	10	7	3	0	5	8	10
8	10	99	20	15	11	3	50	10	99	10	99	99	20	8	10	20	15	15	15	99	6	4	10	0	5	10	8
9	10	40	30	50	1	5	10	10	99	20	40	99	25	3	10	30	15	16	10	40	8	4	1	4	10	9	10

APPENDIX B (Continued)

Sequence G L I

Subject:	1			2			3			4			5			6			7			8			9		
Game	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L
1	40	95	90	300	100	100	45	99	99	50	50	50	50	100	50	120	99	99	48	49	40	10	100	50	101	99	102
2	9	10	10	5	1	0	2	5	11	0	15	0	10	1	0	10	5	15	3	8	9	0	1	0	1	5	5
3	3	10	5	0	0	0	5	5	7	0	5	5	1	0	1	1	5	5	0	4	2	0	0	0	1	5	4
4	3	5	4	0	0	0	16	5	25	0	0	1	1	0	1	0	5	5	0	0	0	0	0	0	1	5	4
5	0	3	3	0	0	0	1	5	12	0	0	7	1	0	1	0	5	5	0	1	1	0	0	0	1	5	0
6	0	0	0	0	0	2	1	5	2	0	0	0	1	0	1	0	5	5	0	0	0	0	0	0	0	5	0
7	5	1	2	0	0	0	1	5	2	2	0	0	1	0	10	0	5	5	23	0	6	0	0	0	1	5	1
8	31	25	19	0	25	15	25	5	4	10	25	10	10	25	1	0	5	5	9	28	6	0	25	10	1	5	5
9	10	25	45	0	20	10	25	50	3	40	25	15	10	20	1	5	50	50	9	25	10	0	20	10	10	50	51

APPENDIX B (Continued)

Sequence L I G

Subject:	1			2			3			4			5			6			7			8			9		
Game	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L
1	99	99	50	99	70	99	50	50	25	31	99	35	45	70	60	25	75	25	99	9	99	70	70	50	100	100	100
2	4	8	10	12	10	2	10	5	7	13	8	4	9	9	8	1	3	1	10	10	10	10	9	5	10	10	10
3	25	5	5	5	5	10	1	1	5	7	5	2	4	5	16	6	5	10	5	5	5	5	5	5	5	5	5
4	5	4	55	3	4	10	1	1	4	11	4	15	3	4	11	10	4	4	4	4	4	4	4	5	4	3	4
5	3	3	14	2	3	2	1	1	3	16	3	18	3	3	2	3	4	14	3	3	3	3	3	3	3	4	3
6	6	2	23	1	2	2	1	1	2	11	2	13	2	2	2	2	2	13	2	2	2	2	2	2	2	2	2
7	1	4	4	4	30	5	15	5	15	11	4	22	11	30	3	1	7	4	5	5	1	15	30	16	5	6	2
8	2	34	2	3	40	8	10	10	50	12	34	15	9	40	30	3	16	5	33	34	33	10	40	5	33	15	33
9	2	98	1	20	48	15	10	15	40	8	98	21	20	48	6	10	15	15	99	98	99	50	48	70	99	25	99

APPENDIX B (Continued)

Sequence G I L

Subject:	1			2			3			4			5			6			7			8			9		
Game	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L
1	30	70	50	98	50	10	99	99	99	99	75	99	50	50	10	99	100	1	200	75	100	50	50	8	99	100	99
2	10	20	15	90	12	10	9	9	10	5	20	10	20	12	10	1	10	9	0	20	10	8	12	6	10	10	10
3	2	10	5	20	8	10	4	4	5	5	10	5	10	8	20	5	5	3	0	10	5	8	8	5	5	5	6
4	1	5	5	20	5	20	4	3	4	3	5	0	5	5	20	24	3	4	0	5	3	5	5	4	6	4	4
5	0	5	1	5	5	15	3	3	33	3	5	0	5	5	10	20	3	3	0	5	0	5	5	4	4	3	5
6	0	1	1	12	4	25	2	1	2	1	1	0	5	5	10	24	3	1	0	1	0	4	5	3	3	2	5
7	1	0	0	15	5	12	4	6	5	3	0	1	5	5	10	1	7	4	0	0	0	5	5	5	6	7	7
8	1	0	1	20	5	10	10	24	1	15	0	15	5	5	10	5	25	18	0	0	0	4	5	10	12	25	15
9	15	0	10	15	5	10	50	9	2	10	0	1	5	5	10	10	10	50	0	0	0	5	5	6	15	10	12

APPENDIX B (Continued)

Sequence I L G

Subject:	1			2			3			4			5			6			7			8			9		
Game	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L
1	99	100	52	99	99	90	99	80	99	20	100	7	75	50	50	2	150	1	99	100	99	16	51	21	300	200	500
2	10	12	12	9	25	10	10	0	30	6	2	6	10	25	10	1	0	1	10	10	10	21	26	21	0	0	0
3	6	5	7	5	5	5	5	0	5	4	4	20	20	5	1	1	0	1	1	0	5	26	11	13	0	0	0
4	5	8	6	4	5	4	4	0	4	8	1	10	1	5	10	3	0	1	1	0	4	11	5	12	0	0	0
5	4	6	5	3	4	3	10	0	3	6	2	15	1	4	10	12	0	10	10	0	0	14	4	11	0	0	0
6	3	6	3	2	3	2	10	0	2	7	1	20	1	3	10	1	0	1	0	0	0	6	25	21	0	0	0
7	10	10	10	21	11	9	15	0	10	9	8	21	10	11	10	1	0	1	10	8	20	8	11	16	0	0	0
8	34	20	12	20	25	14	30	0	30	10	14	29	15	25	10	1	0	1	25	10	10	11	25	23	0	0	0
9	15	20	12	5	33	30	50	0	40	17	11	17	50	33	10	12	0	22	51	10	10	13	33	22	0	0	0

APPENDIX B (Continued)

Sequence L G I

Subject:	1			2			3			4			5			6			7			8			9		
Game	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L	I	G	L
1	99	99	99	99	50	80	60	99	20	98	99	90	60	33	10	100	100	99	95	50	60	90	50	20	99	99	99
2	9	9	10	20	9	1	10	4	10	9	9	10	15	9	1	1	1	10	1	9	2	30	9	10	10	9	9
3	4	4	4	30	25	1	8	20	9	4	4	5	5	25	5	1	1	1	1	4	3	20	25	10	5	6	5
4	3	3	3	25	35	4	7	20	13	3	3	4	3	35	4	1	1	1	2	3	4	1	35	10	4	6	3
5	2	2	2	10	22	3	18	27	11	2	2	3	2	22	3	1	1	2	1	27	3	1	22	10	3	5	3
6	1	1	2	5	10	2	5	40	2	1	1	5	1	10	1	0	1	1	1	1	2	1	10	2	4	10	2
7	4	3	7	36	8	5	40	30	20	20	15	10	12	8	5	1	1	5	7	3	5	5	8	5	5	8	6
8	20	10	10	10	20	10	30	60	8	10	10	30	7	20	12	1	100	20	5	10	3	1	20	5	34	20	33
9	10	20	99	45	90	70	10	60	20	15	20	50	5	50	10	1	100	100	6	20	5	10	50	5	90	99	99

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