A COMPARISON OF INDIVIDUAL AND GROUP DECISIONS INVOLVING RISK

by

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SUBMITTED IN PARTIAL FULFILLMENT OF THE
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Signature of the Author _____
School of Industrial Management

Certified by _____
Faculty Advisor of the Thesis

July 31, 1961

Professor Philip Franklin
Secretary of the Faculty
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Professor Franklin:

In accordance with the requirements for graduation, I herewith submit a thesis entitled "A Comparison of Individual and Group Decisions Involving Risk."

I would like to express my sincere appreciation to Professors Donald G. Marquis and Michael A. Wallach for their guidance, assistance and encouragement throughout the life of this thesis. In addition I would like to thank the graduate students in Course XV whose participation as subjects at a time of the semester when it involved an appreciable sacrifice for many of them made the experiment possible. Finally, my wife, Diane, deserves much appreciation for her aid in reducing data and for the typing of numerous rough drafts of the text.

Sincerely yours,

James A. F. Stoner

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by

James Arthur Finch Stoner

SUBMITTED TO THE SCHOOL OF INDUSTRIAL MANAGEMENT ON JULY 31, 1961 IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

A B S T R A C T

Decision making groups have become an important and controversial part of the American scene. Both in business and in government far more group decisions are made today than were made a generation ago. Although many characteristics of decision making groups have been investigated, one area of interest which has been neglected is the relative riskiness of decisions made by groups and individuals. The belief that groups are more cautious than individuals is held by a number of people, and possibly by a majority.

One hundred and one graduate students at the School of Industrial Management of the Massachusetts Institute of Technology participated in an experiment designed to compare the riskiness of decisions made by groups with decisions made by individuals. A set of twelve decision making problems was used. The problems require a choice between two courses of action. One course has a relatively certain outcome. The other course contains the components of risk: a prize, which is greater than that which would be received if the more certain course of action were followed; a stake, which is also greater; and probabilities of winning the prize and of losing the stake. The subjects were asked to advise the central character in each situation by selecting the lowest probability of success for which the character should pursue the risky course of action. The subjects were also asked to express their confidence in their decisions.

The 101 students were first asked to respond to the decision problems individually. Seventy-eight of the subjects were assembled into thirteen six man groups approximately one week after they had filled out the questionnaire. They were instructed to attempt to reach a unanimous group decision on each of the twelve questions. The remaining twenty-three students were control subjects who were asked to respond again to the questionnaire individually after a few weeks to determine if there would be a tendency to give more risky answers or to be more confident on a second administration of the questionnaire.

Four methods are used to analyze the data. The analyses show that when the subjects reached decisions as members of a group they tended to advocate significantly more risky courses of action than they had chosen when they reached decisions as individuals. A slightly different phrasing of this result states that the experimental groups chose courses of action which were significantly more risky than the individual members had advocated when they reached decisions alone.

The control subjects did not exhibit any systematic shift in either riskiness or confidence.

No relation was found between the subjects' confidence scores and riskiness scores from the individual session.

Thesis Advisor: D. G. Marquis

Title: Professor of Industrial Management

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CHAPTER I

INTRODUCTION

Decision making groups have become an important and controversial part of the American scene. Both in business and in government far more group decisions are made today than were made a century ago. Some observers rejoice at the growing importance of groups in the Nation's life; they cite the advantages of having many minds focused on the same problem, the increased morale which is believed to be connected with "participation" in the decision making process, and so on. Other observers complain about the slowness of the group process, the conservatism and caution of groups, and the difficulties of determining who is "really" responsible for a decision made by a group.

A passing remark of a local business executive aroused the author's interest in a particular phase of the subject of group decision making. The executive, who is also a retired general, was commenting upon managerial decision making and responsibility. He pointed out that Councils of War were discontinued as strategical and tactical decision making bodies during the Civil War because the courses of action which they recommended tended to be very cautious. It was reported that the most cautious member of the group would refuse to accept any course of action other than

the safest and that he would succeed in convincing the other members to follow the safest course.

This executive seemed to feel that a similar situation would prevail in the business environment, and probably in other areas of society where decisions involving risk were being made. The author's casual discussions with a number of classmates and other individuals indicated that the belief that groups are more cautious than individuals is held by a number of people, and possibly by a majority.

Group Decision Making

A literature search did not uncover any studies which treat the subject of group decision making under conditions of risk. Much of the research on group decision making focuses upon the group processes involved in reaching a decision. Rather than being useful in predicting what decision will be reached, these studies tend to describe how the individuals will interact during the discussion and how the interaction will vary over time.

To the extent that these studies can be used to predict the type of decision a group would reach in a situation involving risk, the decision expected would be a compromise approximating some measure of the "average" of the initial opinions of the group members. The group pressures toward consensus would be expected to operate most strongly upon the members holding

opinions most at variance with the group's "average" opinion. Where there are only one or two members who are very distant from the opinions of the other members, Schacter's (1951) results would predict that an increasing amount of communication would be addressed toward the deviants as the discussion proceeded. Although Asch (1952) was dealing with a situation which required the distortion of the subjects' judgment or perception, the strength of the pressures felt by the subjects in that situation would lead to the expectation that a single deviant would move to the position of the other group members. Compromise and concession would be expected to be the order of the day, but there would be no basis for assuming that the group decisions would tend to be predominately in either the cautious or the risky direction.

The group problem solving studies have compared individual and group solutions to the same tasks. The emphasis in those studies, however, has been on the correct solution to a solvable problem. If a "correct" solution to a problem involving risk could be found, it would be logical to infer from these studies that the group would be more likely to achieve the "correct" solution than would the average group member when he worked alone. However, few researchers would be willing to suggest rigid standards for a "correct" solution to a particular problem involving risk. The concept of expected value is an aid to the decision maker; but, even when it can be calculated, it is not

the ultimate answer - especially for decisions which are "one-shot propositions." In addition there are likely to be variations among individuals in the utilities of the factors involved and in the subjective probabilities of success and failure.

Leadership Studies

Leadership studies are not of much help because it is not known whether leaders are likely to be more cautious or more risky than other group members. The general lack of success of the studies aimed at a "trait theory of leadership" does not suggest that such an avenue would be a particularly promising one to follow.

Individual Decision Making Under Risk

Although many studies have been performed in the area of individual decision making under conditions of risk and uncertainty, the studies do not throw light on the relative caution of groups and individuals.

Edwards (1954) has discussed quite thoroughly the literature on decision making under risk and uncertainty. Feather (1959) has summarized five models for decision making under uncertainty and has discussed their similarities and differences. He attributes the models to Lewin, et al. (1943), Tolman (1955),

Rotter (1954), Edwards (1955) and Atkinson (1957). Basically, these five models are of the form:

$$\text{Resultant force} = f(\text{valence, subjective probability})$$

Possibly the model most easily recognized is the one attributed to Edwards. This model asserts that individuals choose so as to maximize subjectively expected utility (SEU):

$$\text{SEU} = \sum_i p_i^* u_i$$

where p_i^* is the subjective probability of the ith event and u_i is the utility of that event. The form of combination of p_i^* and u_i is taken to be multiplicative and the two parameters are generally considered to be independent.

Attempts to use an SEU type model have not yet been very successful with individuals; and even if success could be achieved on the individual level, the problems of applying such a model to a group would be very great.

Necessity for an Empirical Approach

Because the existing studies do not treat the subject of group decision making under risk or uncertainty and because the general social psychological literature does not offer an unambiguous line of reasoning which would help to predict the relative riskiness of individuals and groups, it is necessary to proceed with a simple question rather than with a firm hypothesis to be tested.

THE PROBLEM

The problem to be explored is: "Are decisions made by groups more or less cautious than decisions made by individuals?" A slightly different focus can also be employed; it asks the question: "Are individuals more cautious when they make decisions as members of a group or when they reach decisions by themselves?" These two questions are closely related and one tends to reduce to the other, but making them explicit at this point allows the use of more than one method of analyzing the subsequent data.

The realm of decision making under risk is not clearly understood at the present; in fact the very word "risk" means different things to different people. The author will not attempt a rigorous definition of risk, but will instead describe the four parameters which he considers to be inherent in situations involving risk. The parameters are the stake, the prize, the probability of losing the stake and the probability of winning the prize.

The stake is that which the individual must expose to loss in order to participate in the "risky" situation. For simplicity it is assumed here that all stakes and prizes have positive utility.

The prize is that which he stands to gain if the situation is decided in his favor.

The probability of losing the stake and the probability of winning the prize are largely self-explanatory terms, but it should be pointed out that the author is referring to "objective" or "statistical" probabilities and not to "subjective" or "psychological" probabilities. It is assumed that the decision maker has some knowledge about the probabilities involved, but the author does not feel that complete knowledge of the probabilities, the prizes, or the stakes is necessary in order to classify a situation as one involving risk rather than merely as one involving uncertainty.

Although "risky decision" is a hard term to define in such a way that most individuals will agree with the definition, it is not difficult to establish some rules which make it possible to classify one course of action as more risky than another.

Choice A will be considered to be more risky than choice B if:

... both choices have the same prize and the same probabilities of winning the prize and of losing the stake, but choice A has a higher stake than choice B.

... both choices have the same stakes and probabilities of winning and losing, but choice A has a smaller prize.

Similarly, with the other parameters constant, A is more risky than B: if the chance of winning the prize in A is less,

or - other things constant - the chance of losing the stake in A is greater.

These four considerations are summarized below:

Choice A is more risky than choice B if:

$$S_A > S_B, \quad P_A = P_B, \quad Pr(P_A) = Pr(P_B), \quad Pr(S_A) = Pr(S_B) \qquad (1)$$

$$S_A = S_B, \quad P_A < P_B, \quad Pr(P_A) = Pr(P_B), \quad Pr(S_A) = Pr(S_B) \qquad (2)$$

$$S_A = S_B, \quad P_A = P_B, \quad Pr(P_A) < Pr(P_B), \quad Pr(S_A) = Pr(S_B) \qquad (3)$$

$$S_A = S_B, \quad P_A = P_B, \quad Pr(P_A) = Pr(P_B), \quad Pr(S_A) > Pr(S_B) \qquad (4)$$

where

S_A = the stake in choice A

P_A = the prize in choice A

$Pr(P_A)$ = the probability of winning the prize in choice A

$Pr(S_A)$ = the probability of losing the stake in choice A.

In the experiment which follows, the subjects are asked to set the probability of winning the prize Pr(P) for which a risky choice should be followed. Therefore, in comparing two subjects answering the same question the situation is:

$$S_A = S_B, \quad P_A = P_B, \text{ and } Pr(S) = 1\text{-}Pr(P),$$

that is, the stakes and prizes are equal and the probability of losing the stake is one minus the probability of winning the prize.

So, if subject A demands a lower probability of winning the prize than does subject B, he makes a more risky choice:

$$S_A = S_B, \quad P_A = P_B, \quad Pr(P_A) < Pr(P_B), \quad Pr(S_A) > Pr(S_B) \qquad (5)$$

The experimental situation shown in (5) is a degenerate case of the situations shown in (3) and (4) above.

CHAPTER II

RESEARCH METHODS

I. INSTRUMENTS

The Wallach and Kogan Questionnaire

The instrument employed to measure willingness to choose risky alternatives in both the individual and group setting is a questionnaire devised by Wallach and Kogan (1959, 1961) for a similar purpose. This questionnaire describes twelve situations in which individuals are faced with a choice between two courses of action. One course has a relatively certain outcome. The other course of action contains the components of risk: a prize, which is greater than that which would be received if the more certain course of action were followed; a stake, which is also greater; and probabilities of winning the prize and of losing the stake. The subject is asked to advise the central character in each situation. The advice is given by selecting the lowest probability of success for which the character should pursue the risky course of action.

Therefore, in comparing two individuals who chose different probabilities in accepting the risky course of action, it is possible to say that in situations with "equal" stakes and

"equal" prizes, one individual demanded a lower probability of success, and thus was more risky, than the other.

The first question is given below as an example:

Mr. A, an electrical engineer who is married and has one child, has been working for a large electronics corporation since graduating from college five years ago. He is assured of a lifetime job with a modest, though adequate, salary, and liberal pension benefits upon retirement. On the other hand, it is very unlikely that his salary will increase much before he retires. While attending a convention, Mr. A is offered a job with a small, newly founded company with a highly uncertain future. The new job would pay more to start and would offer the possibility of a share in the ownership if the company survived the competition of the larger firms.

Imagine that you are advising Mr. A. Listed below are several probabilities or odds of the new company's proving financially sound. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE TO MAKE IT WORTHWHILE FOR MR. A TO TAKE THE NEW JOB.

_____ The chances are 1 in 10 that the company will prove financially sound.

____ The chances are 3 in 10 that the company will prove financially sound.

____ The chances are 5 in 10 that the company will prove financially sound.

____ The chances are 7 in 10 that the company will prove financially sound.

____ The chances are 9 in 10 that the company will prove financially sound.

____ Place a check here if you think Mr. A should not take the new job, no matter what the probabilities are.

The entire questionnaire is presented in Appendix A-1. A brief description of the remaining eleven questions is given below:

(2) a man with a heart ailment must choose between changing his life habits or undergoing a dangerous medical operation; (3) a man may invest in secure, low-return stocks or in risky securities which offer the chance for large gains; (4) a football captain can choose a safe play which will tie the score or a more risky play which might bring victory; (5) a corporation president may build additional facilities in America with the result of a moderate return on the investment, or build additional facilities in a foreign country with an unstable political history, but where returns would be much higher; (6) a college

senior has the choice of attending a graduate school with very high standing where he might flunk out, or a graduate school with a lesser reputation where he would be sure to pass; (7) a chess player in a national tournament has the chance to employ a risky strategy which would bring victory if successful, but quick defeat if not; (8) a young man of considerable musical talent must decide whether he wishes to enter medical school, or a conservatory of music for further training in a field of uncertain success; (9) an American prisoner of war has the chance to escape, with the risk of execution if caught; (10) a man must decide whether or not to run for Congress in a hot campaign filled with attacks by his opponents; (11) a research physicist has the choice of working on a difficult but very important problem with the risk of complete failure, or on easy but much less important problems where success would be assured; (12) a couple must decide if they should marry despite recent indications of sharp differences of opinion.

Wallach and Kogan have shown that the probability of success demanded by subjects[1] increases from young adulthood to old age for both males and females. They have also found that

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[1]Wallach and Kogan define the probability of success which a subject demands as his "deterrence of failure" score; in this paper the term "riskiness score" will be used.

the "deterrence of failure" score is positively related to the subjective probability of failure as measured in a separate procedure for both a sample of older men and a sample of older women.

The cover sheet for the questionnaire contains the following instructions:

On the following pages you will find a series of situations that are likely to occur in everyday life. The central person in each situation is faced with a choice between two courses of action. We want your opinion as to how desirable it is for this person to follow one of the two courses of action. Read each situation carefully before giving your opinion.

The only way in which the questionnaire used in this experiment differs from the one used by Wallach and Kogan is that the following statement appears on the cover sheet: "Please do not discuss the material in this session with any of your fellow students even if they have already taken part in the experiment."

The questionnaire has a number of features which make it a logical choice as the instrument for this experiment. It offers the subject twelve different situations in which the stakes and prizes differ greatly. Each question is quite ambiguous, forcing the subject to project himself into the situation in order to be

able to make a choice which is meaningful to himself. Although the concept of expected value can be used as a convenient tool for working towards a solution to some of the questions, none of the questions is sufficiently detailed to allow more than a very rough approximation to be made through this means. Subjects tend to find the situations both interesting and involving. The number of situations increases the reliability of the instrument, and the variety of situations helps to give the results a degree of generality.

The major disadvantage of this instrument is the subjects' lack of direct involvement with the prizes and stakes. If a subject firmly disagrees with the majority of the group members on the course of action to be pursued, he can still agree to the choice without running the risk of suffering a tangible loss.

The Confidence Measure

After he had completed the deterrence of failure questionnaire, each subject was asked to indicate his confidence in each of his choices. The confidence measuring instrument has the following instructions:

Please review each question and indicate on this sheet how certain you are of your choice on each of the twelve questions:

very sure	quite sure	moderately sure	slightly sure	not sure at all

It was desired to explore three questions with the confidence measuring instrument:

First, is there a systematic relationship between a subject's score on the questionnaire and his confidence in his decisions? Are "risky" subjects more or less confident of their choices than are cautious subjects?

Second, do subjects of high confidence on an item tend to take a more active part in the group session and thus tend to be more influential?

Third, how does the subject's confidence in the decisions change as a result of the group discussion, and how does his direction of change on a particular question relate to his confidence? Do subjects who become more risky on an item become more confident than subjects who change in a more cautious direction?

II. SUBJECTS

The subjects were 101 graduate students in Massachusetts Institute of Technology's School of Industrial Management.[2]

[2] More precisely, there were 99 currently enrolled students; one subject had been graduated at the end of the previous semester, and one had transferred from industrial management to economics at the end of the previous semester.

Candidates for both the Master of Science and Doctor of Philosophy degrees were included. The 101 subjects constitute a reasonably complete segment (86 per cent) of the available population. With the exception of five Canadian students and one English student, foreign students were not included in the experiment because some of the situations might be unfamiliar to them and because language difficulties and cultural differences might inhibit their participation in the group discussion.

After foreign students had been eliminated from the list of available students, there remained 117 potential subjects. From this group 78 experimental subjects and 23 control subjects were obtained. Two individuals refused to participate; 2 agreed to participate but found the instrument so ambiguous that they were not able to answer the questions; 3 students agreed to participate but did not return the questionnaire; and 5 students could not be reached during the experimental period. The remaining 4 students completed the first part of the experiment and appeared for the second part, but the two other members of their 6-man group did not make an appearance. Although the 4-man group did meet and discuss the questions, the data from their session are not included in this paper.

The subjects can be described as relatively homogeneous in several respects: all were male graduate students between the

ages of twenty-one and thirty-five; they were well above average in educational attainment and intelligence; and they were specializing in industrial management. They were well acquainted with the concept of expected value and with at least the rudiments of utility theory. Because the experimenter was a member of the same graduate department, the subjects were also acquainted with him in varying degrees. The subjects were not paid for their participation.

III. FIRST ADMINISTRATION

Initial Contact

The initial contact with each subject was made by telephone or in person. In the first contact the subject was asked to participate in a social psychological experiment which had two parts. He was told that he could fill out the first part anywhere that was convenient for him and that it would require less than one-half hour to complete. The second part would take not more than one and one-half hours, and it would be necessary for the experimenter and the subject to be together during that period. The subject was told that it would be extremely important that he not discuss the material or procedures in the experiment with anyone until all of the subjects had completed both stages of the experiment. He was given no further information at

this stage. No subject was given any indication that the second part would involve a group discussion.

Procedures in the First Administration

Each subject was given the questionnaire and an envelope which contained the confidence measuring instrument. The following instructions were presented either orally or in printed form:

There is no time limit on this opinion questionnaire. Answer the questions at a comfortable pace. This whole section of the experiment will take you between twenty and thirty minutes. You should give your opinions on the twelve questions contained in the thirteen page booklet before you open the envelope. After you have opened the envelope, you should not change any of the answers you have given to the questions in the booklet. (Do not be troubled by this point because it is very doubtful that the material in the envelope will make you want to change any of your answers).

While you are giving your opinions on these questions and after you have finished the material and returned it, it is very important that you not discuss the material or your answers with anyone. (When all School of Industrial Management students have completed the second phase of the experiment, I will put a

note in your folder informing you that secrecy about the material is no longer required).

You may wish to have additional information on some of the questions. I am sorry but I can not give you more information; instead I must request that you re-read the instructions and do the best that you can. Please give only one opinion on each question.

IV. SECOND ADMINISTRATION

The study design called for using the results from the first administration of the two instruments to estimate the experimental subjects' positions on the questions at the time they became members of 6-man groups. Therefore, it was necessary to use control subjects to see if there would be systematic changes over time in the subjects' individual opinions or confidence. All of the group sessions were completed before the control subjects were scheduled for their final participation in the experiment.

Procedures with the Groups

For the second part of the experiment, 78 subjects were assembled into thirteen 6-man groups. Initially it was hoped that the subjects could be assigned to groups in a random manner, but the practical difficulties of scheduling over a dozen 6-man

groups in a seven day period made such a procedure impossible. Instead, the group assignments were made on a basis which could be described as haphazard. The basic constraint which was imposed on the scheduling procedure was that close friends were not placed in the same group if such an arrangement could be avoided. The size of the group was set at 6 because it was believed that small groups in the size range of 6 to 8 are most likely to achieve a high level of interaction and involvement while still providing adequate opportunities for all members to participate. At the same time it was desirable to keep the size of the group small so that as many groups as possible could be formed from the limited number of subjects available.

The group members were seated around a desk facing each other. In the middle of the desk was placed the microphone for a tape recorder. The tape recorder was placed under a low table about six feet from the microphone and not within the natural line of sight of the subjects.

The subjects were given verbal instructions which were essentially as follows (because the experimenter was using a sheet of notes instead of a prepared schedule and because the subjects requested clarification, the exact phrasing differed among the groups):

Even after this part of the experiment is completed, your continued silence is important because not all of the subjects have finished the second part, and a few have not yet completed the first part.

The group discussion will be tape recorded. The goal of the group is to reach a unanimous group decision on each of the twelve questions. (The word unanimous was heavily emphasized and was repeated).

Each of you should record the unanimous group decision on the sheet provided for that purpose.

Once you have started work you should not address questions to me; I am a "non-participant observer." You should continue to work if I leave the room.

When subjects asked questions about how deadlocks would be handled, the experimenter attempted to change the subject and said that such a problem might not even arise and so it was not necessary to worry about it in the beginning. If a subject were persistent, the experimenter offered the information that virtually all groups were able to reach unanimous group decisions on all of the questions. No method of resolving a deadlock was suggested to any of the groups at this stage.

The experimenter did not tell or remind the subjects what opinions they had indicated during the first administration of the material.

After the first group meeting, some of the subjects said that they would have preferred having enough time to read the question before the group started to discuss the material. Therefore, subsequent groups were asked to allow about one-half minute for the members to review the material before the discussion. This was merely a suggestion; the experimenter did not try to force the groups to follow such a procedure.

Each group member was given a copy of the questionnaire and an answer sheet with the following instructions:

You have each been given a copy of the questionnaire identical to the one you filled out a short time ago. Now you are asked to reconsider each item as a group. Your goal should be to reach a unanimous group decision on each item. Each of you should record the group's answer on the answer sheet below.

There were three reasons for having each subject record the group decision on the answer sheet.

First, it was desired to avoid having a formal leader appointed by the experimenter or chosen by the group. Allowing one person to have the power of judging the time when all group members agreed on an answer was undesirable.

Second, in order for the group members to have as little interaction as possible with the experimenter, it was necessary that they have a clear and simple procedure for communicating their answer to him. The existence of the answer sheet made it unnecessary for any of the group members to turn to the experimenter to inform him of the group's choice.

Third, the recording of a decision on the answer sheet was an overt commitment to the choice. Although the gesture was not a massive one, it was still a positive one which prevented the subject from being able to withdraw completely from the situation.

The constraint of having to reach a unanimous group decision was designed to encourage careful discussion of the questions. Because the subjects had already filled out the questionnaire, they possessed positions on the questions when they entered the group setting. If they had been allowed to vote on each item and to accept a majority decision, there would have been less motivation to discuss the material. The fact that it was necessary for some subjects to change their initial opinions before the group could proceed to the next question was a strong stimulant to discussion.

After the initial instructions had been given and the questionnaire and answer sheets were distributed, each person was asked to give his name and undergraduate college so that the experimenter could make sure that the tape recorder was picking

up his voice. This procedure helped to introduce any strangers among the group members and made it possible to identify the subjects from the tapes when subsequent analyses were being made.

Once the discussion had started, the experimenter attempted to interfere as little as possible, but he did intercede when a group attempted to violate its instructions or when it reached a deadlock. In general, when a subject asked the experimenter a question about the material, the reply was: "Please do not direct any questions to me." There would then be a chuckle from the group members, and the discussion of the question would continue. Other situations were handled in the following ways:

When the subjects were proceeding so slowly that it appeared that they would not be able to finish all of the questions, the experimenter encouraged them to work more quickly.

When a couple of members of the second group suggested that they should all compromise quickly on the second question because one of their goals was to finish the twelve questions quickly, so that they could leave early, the experimenter told the group members that they had all been committed for one and one-half hours and even if they finished the twelve questions very quickly, there would be other material for them to consider; they would not "get out" early. (An informal post-discussion check indicated that this type of motivation for hurrying was removed; therefore, this ploy was used subsequently when it

appeared to the experimenter that the group might sacrifice discussion for speed).

When the subjects became deadlocked on a question and agreed to proceed to the next question, planning to return later, the experimenter insisted that they continue the discussion until a decision was reached.

When the subjects attempted to compromise on a probability not shown on the original questionnaire, e.g., 2/10, the experimenter insisted that they agree on one of the six available choices.

When a group attempted to vote on a decision to end a deadlock, the members were reminded that the choice had to be unanimous.

When it appeared that a deadlock could not be broken with further discussion, the experimenter suggested that the group proceed to the next question. There were only two clear deadlocks; in three other cases the time was exhausted while the subjects were still attempting to reach a solution. After one of groups became completely deadlocked, the experimenter asked the subjects to take a poll and to proceed to the next question. Then he added that no other group had been unable to reach a decision on the questions, a statement which was not true. That statement was the strongest one made by the experimenter in response to a potential or actual deadlock. Generally, the

experimenter simply interrupted with the request that the group "...try to reach a decision in the next two or three minutes," and waited for a couple of subjects to yield.

The experimenter also operated the tape recorder and took notes for use in the subsequent analysis of the tapes.

Post-Discussion Procedures

At the end of the discussion period, the subjects were each given a copy of the post-discussion answer sheet (Appendix A-4). In the first column, which is labeled "group decision," the subject was asked to copy the answers he had recorded during the discussion. He was then asked to go through the questionnaire and to try to recall his feelings at the time each group decision was reached. In the second column he was asked to indicate the opinion he personally held at the time that the group discussion was reached. In addition he was asked to indicate his confidence in the group decision with a circle and, in each case where he disagreed with the group decision, to indicate his confidence in his own personal opinion with a square.[2] For example, on question 1, subject 2-Y agreed with the group decision and was quite sure of it. On the second question he disagreed with the

[2]This procedure was used for all groups except the first one, whose members indicated confidence only for the group choice.

group decision, of which he was not sure at all, and he was quite sure of his own dissenting opinion. His responses to the two questions appeared as follows:

	group decision	your opinion at the time the group reached its decision	How sure are you of the group's choice? very sure	quite sure	moderately sure	slightly sure	not sure at all
1.	3	3	X	(X)	X	X	X
2.	9	7	X	[X]	X	X	(X)

When the subject completed the individual answer sheet he was asked to answer the satisfaction measuring questions on the sheet in Appendix A-5. Finally, the subjects were thanked for their participation in the experiment and again reminded not to discuss the material or any aspect of the experiment.

Some of the subjects pointed out that the information requested on the individual answer sheets could be given more easily and more accurately after each choice during the experiment. This observation is undoubtedly correct, but such a procedure would offer each subject an opportunity to register his disagreement with, and lack of confidence in, the group decision. It was feared that if the subject were provided with such a ready means of expressing his dissent, his motivation to influence the

group in the direction of his opinion would be decreased and he would be less involved in the discussion and less committed to the final decision.

The administration of the material at the end of the group discussion was unfortunately far from ideal. Many of the subjects were rushed and so they filled out the sheets in a hurry.

Procedures with the Control Subjects

The questionnaire and confidence measure were re-administered individually to 23 subjects after periods ranging from six to twenty-two days. These students are control subjects who never took part in the group discussions. The selection of control subjects was not very random. The controls included five individuals who were originally scheduled for group meetings, but who were unable to keep their appointments for one reason or another and could not be rescheduled as group members. In general, the other controls were individuals who could more easily arrange to meet with the experimenter during the two weeks which followed the group sessions. These factors in the selection process probably did not bias the results in any systematic way. Because the scheduling of the groups was much more difficult than the scheduling of the controls, the group sessions were completed before the controls met with the experimenter. This arrangement meant that the average time between the two stages of the

experiment was longer for the controls than for the group members. The difference in time periods is not a serious problem because if it did have any effect, it would probably cause a larger rather than a smaller change in the responses of the controls, which would simply make it more difficult to demonstrate an effect with the experimental groups. Therefore, the difference in time periods would tend to deflate rather than to inflate the experimental results.

Each control subject was given a questionnaire and a sheet for recording his answers (Appendix A-6). The experimenter asked the subject to proceed naively, simply following the instructions as given and not attempting to second-guess the experimenter. The subject was told that he should give the opinions he currently held; he should not feel constrained to answer the way he thought he had answered the first time he filled out the questionnaire, but, at the same time, he should not choose differently just for the sake of indicating a different answer. He was asked to re-read the question carefully and not to hurry. When he finished the questionnaire, he was given the confidence instrument and was asked to fill it out.

The experimenter then collected the two sheets, leaving the questionnaire, and gave the subject an answer sheet (Appendix A-7) which requested him to recall the probabilities of success and confidence he had indicated during the first

administration. The purpose of this sheet was simply to start the subject thinking about how his opinions and confidence had changed between the first and second stages of the experiment. The plans for analyzing the data did not include an analysis of this material.

When this sheet had been completed, the experimenter set up a tape recorder and asked the subject to discuss briefly the information which was important to him in reaching a decision on each question. He was also asked to try to remember if he had changed his opinion on a question or his confidence in his answer, and, if so, why he had changed.

This rather elaborate procedure with the controls was undertaken to explore three questions: first, was there a systematic change in the subjects' riskiness or confidence over time? Second, if there were such a change, what was the cause? Could part of the change be attributed merely to additional familiarity with the material? Third, had the material been carefully considered or were the individual judgments essentially superficial ones?

The controls were also given the same satisfaction measuring sheet given to the group members at the end of the group discussion. Finally, the controls were thanked for their participation in the experiment and cautioned not to discuss the experiment or the material with anyone.

CHAPTER III

RESULTS

I. CONTROL SUBJECTS

The data show clearly that the control subjects did not shift in either direction between the first and second sessions. For the 23 control subjects there were 54 shifts in the more risky direction, 51 shifts in the more cautious direction and 171 questions on which the subjects did not shift.

Table III-1 presents this information question by question. The raw data for the controls is given in Appendix B. On six of the questions (3, 4, 5, 7, 8 and 12) more subjects shifted in the risky (+) direction than in the cautious direction. On five of the questions (1, 2, 6, 10 and 11) the dominant direction of shift was in the cautious (-) direction. On question 9 as many subjects (five) shifted in the risky direction as shifted in the cautious direction. It should be noted that on each of the questions the number of subjects who did not shift was greater than the total of the subjects who shifted in either direction.

Because the sign test is used in Table III-1 and in much of the data analysis which follows, its use will be illustrated briefly at this point. Table III-1 indicates that on the first question 2 control subjects answered in a more risky way (i.e.,

TABLE III-1

SHIFTS IN RISKINESS CHOICES BY CONTROL SUBJECTS
BETWEEN THE FIRST AND SECOND SESSIONS

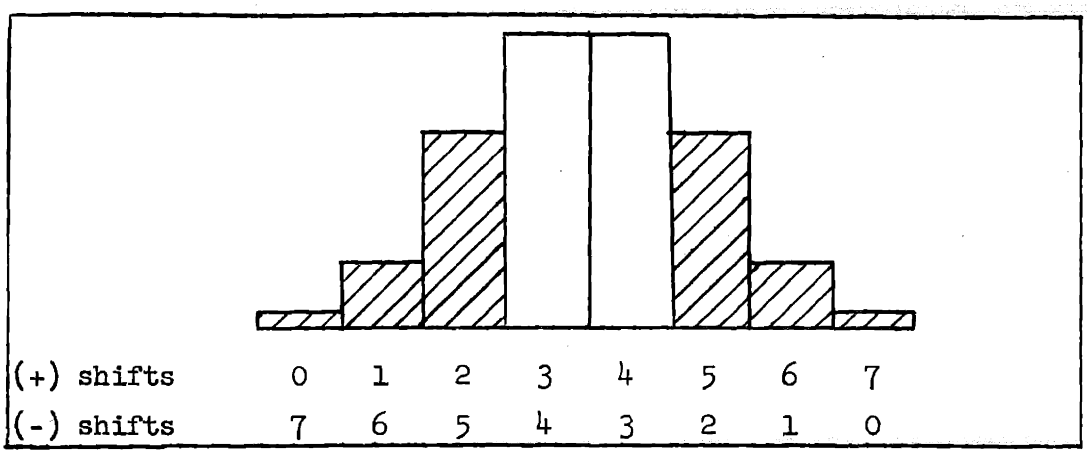
	Question Number											
	1	2	3	4	5	6	7	8	9	10	11	12
Number of subjects who did not shift	16	16	13	15	12	15	14	13	13	16	12	16
Number of subjects who shifted in the risky (+) direction	2	2	6	7	7	3	7	5	5	3	3	4
Number of subjects who shifted in the cautious (-) direction	5	5	4	1	4	5	2	5	5	4	8	3
Direction in which the larger number of subjects shifted (+) = risky (-) = cautious (0) = equal number of shifts in each direction	(-)	(-)	(+)	(+)	(+)	(-)	(+)	(+)	(0)	(-)	(-)	(+)
$P_{(\text{two-tailed})}$*	.45	.45	.75	.07	.55	.73	.18	1.00	1.00	1.00	.23	1.00
	1	2	3	4	5	6	7	8	9	10	11	12

*Probability of as few or fewer shifts in the direction of the smaller number of shifts if each direction of shift is equally likely (using the sign test).

demanded a lower probability of success) during the second session; 5 subjects answered that question in a more cautious manner (demanded a higher probability); and 16 subjects gave the same answer at both sessions. Of the 7 subjects who shifted on this question, the majority shifted in the more cautious direction. The sign test can be used to indicate how often a shift of at least 5 subjects in one direction and not more than 2 subjects in the opposite direction can be expected to occur by chance if the subjects are as likely to shift in one direction as in the other. Since there was no prior prediction about the direction of change, it is necessary to use a two-tailed test. The probability that not more than two shifts are in the direction of the smaller number of shifts is obtainable from the two tails of the binomial distribution for which N=7 and p=0.5. The areas shaded in Figure III-1 represent the probability of two or fewer shifts in one direction (direction unspecified) and five or more shifts in the opposite direction. In this case, $P_{(\text{two-tailed})}=.45$. When the sign test is used, the subjects who did not shift on a question are excluded from consideration. This treatment, linked with the fact that for each question more than half of the subjects did not shift between the two sessions, makes the sign test a conservative means of analyzing the data.

FIGURE III-1

BINOMIAL DISTRIBUTION FOR N=7 AND p=0.5



In Table III-1 the shifts for only questions 4 and 7 approach significance at the .05 level. The shifts are both in the more risky direction.

Table III-2 contains similar data for shifts in confidence for each question. In the second session the controls indicated a higher level of confidence on 57 questions, a lower level of confidence on 69 questions, and the same degree of confidence on 149 questions. On no question does the shift approach significance.

Table III-3 shows the relation between changes in confidence and changes in the probability of success demanded. Subjects who shifted to more risky or more cautious choices showed no systematic change in confidence, but subjects who demanded the

TABLE III-2

SHIFTS IN CONFIDENCE BY THE CONTROL SUBJECTS BETWEEN THE FIRST AND SECOND SESSIONS

	Question Number											
	1	2	3	4	5	6	7	8	9	10	11	12
Number of subjects who did not shift	15	13	10	14	7	10	9	14	18	9	15	15
Number of subjects who became more (+) confident	3	3	5	5	9	5	6	4	3	6	4	4
Number of subjects who became less (-) confident	5	7	8	3	7	8	8	5	2	8	4	4
Direction in which the larger number of subjects shifted (+) = more confident (-) = less confident (0) = equal number of shifts in each direction	(-)	(-)	(-)	(+)	(+)	(-)	(-)	(-)	(+)	(-)	(0)	(0)
$P_{(\text{two-tailed})}$*	.73	.34	.58	.73	.80	.58	.79	1.00	1.00	.79	1.00	1.00
	1	2	3	4	5	6	7	8	9	10	11	12

*Probability of as few or fewer shifts in the direction of the smaller number of shifts if each direction of shift is equally likely (using the sign test).

TABLE III-3

A COMPARISON OF RISKINESS CHOICES AND CONFIDENCE SCORES BY THE CONTROL SUBJECTS IN THE FIRST AND SECOND SESSIONS

Question Number	Cases in which the riskiness choice was the same in each session			Cases in which the riskiness choice was more risky in the second session			Cases in which the riskiness choice was less risky in the second session		
	No. of individuals becoming more confident	Number becoming less confident	Number not changing in confidence	Number becoming more confident	Number becoming less confident	Number not changing in confidence	Number becoming more confident	Number becoming less confident	Number not changing in confidence
1	2	2	12	0	2	0	1	1	3
2	0	5	11	1	1	0	2	1	2
3	3	6	4	2	1	3	0	1	3
4	2	2	10	3	1	3	0	0	1
5	4	6	2	4	1	2	1	0	3
6	3	5	7	1	0	2	1	3	1
7	1	6	7	4	2	1	1	0	1
8	1	4	8	0	1	4	3	0	2
9	1	1	11	2	1	2	0	0	5
10	5	6	5	0	2	1	1	0	3
11	2	1	9	1	0	2	1	3	4
12	3	4	9	0	0	4	1	0	2
Totals	27	48	95	18	12	24	12	9	30
$P_{(\text{two-tailed})}$*	.02			.36			.66		

*Probability of as few or fewer shifts in the direction of the smaller number of shifts if each direction of shift is equally likely (using the sign test).

same probability of success in both sessions became significantly less confident ($p=.02$) of their opinions.

The way in which Table III-3 is arranged implies an assumption on the part of the author. The arrangement asks the question: "As the controls become more or less risky on these questions, how does their confidence vary?" Another approach would be to think of the controls as becoming more or less confident and then inquiring into the way in which the probability of success which they demanded varied. Such a comparison was made and it showed no systematic direction of change.

II. EXPERIMENTAL SUBJECTS

The Experimental Groups

In the data analysis which follows, the opinions expressed by the subjects on the first administration of the material will be considered to be accurate estimates of the subjects' opinions at the time they entered the group session. The information reported above for the control subjects does not suggest a systematic change over time for that group of subjects; therefore, it is assumed that there were no systematic shifts among the group members between the time when they first completed the material and the time when they joined the other members of the group.

Four methods of analyzing the group decisions are used. Each of the methods indicates that the group decisions on the questionnaire as a whole are significantly more risky than the initial opinions of the group members. The raw data for the group sessions are given in Appendix C. To aid in explaining the methods of analysis, the data for one group (#1) are given in Table III-4. The numbers shown in the body of the table are the probabilities of success demanded by the 6 subjects during the first session. For example, the subject with the code number 1-U indicated on the first question that he felt a 1 in 10 chance was an adequate probability for Mr. A to take the job with the newly founded company; on the second question he felt that the chances of a successful operation should be at least 9 in 10 before Mr. B should agree to have the operation. The N for subject 1-Z on question 2 indicates that he felt Mr. B should not have the operation, no matter what the probabilities were. Below the matrix is a row titled: "Group decision," in which is indicated the "unanimous" decision which the members of the group reached on each question.

The first method of analyzing the data from the group discussion compares, for each question, the number of subjects who shifted in the risky direction with the number who shifted in the cautious direction in order to reach the group decision. The dominant direction of shift among the subjects is recorded for

TABLE III-4

INITIAL RISKINESS CHOICES OF THE MEMBERS OF GROUP #1 AND THE DECISIONS REACHED BY THE GROUP (COMPARED ON THE BASIS OF THE NUMBER OF MEMBERS WHO HAD TO SHIFT IN EACH DIRECTION TO REACH THE UNANIMOUS DECISION)

	Question Number											
	1	2	3	4	5	6	7	8	9	10	11	12
Subject Number												
1-U	0.1	0.9	0.3	0.3	0.9	0.7	0.1	0.3	0.3	0.3	0.7	0.9
1-V	.3	.1	.5	.3	.7	.1	.5	.9	.3	.7	.1	N
1-W	.3	.9	.5	.1	.9	.1	.1	.1	.3	N	.3	.9
1-X	.7	.7	.3	.5	.7	.5	.5	.9	.5	.7	.5	.9
1-Y	.3	.7	.1	.1	.7	.3	.1	.9	.5	.9	.3	.7
1-Z	.3	N	.5	.3	.9	.7	.3	.3	.3	.3	.3	.9
Group Decision	.3	.7	.3	.1	.9	.3	.1	.5	.3	.9	.3	.9
Number of Group Members shifting in the:												
risky (+) direction	1	3	3	4	0	3	3	3	2	1	2	1
cautious (-) direction	1	1	1	0	3	2	0	3	0	4	1	1
Direction in which the larger number of group members shifted	(0)	(+)	(+)	(+)	(-)	(+)	(+)	(0)	(+)	(-)	(+)	(0)

each question. For example, in Table III-4 on question 1, 1-U shifted in the more cautious direction (from 0.1 to 0.3) and 1-X shifted in the more risky direction (from 0.7 to 0.3). As many subjects shifted in the risky direction as shifted in the cautious direction; so the question is scored in the last row with a (0), indicating that there was no dominant direction of shift. On the second question, three subjects (1-U, 1-W and 1-Z) shifted in the risky direction and one (1-V) shifted in the cautious direction; therefore the dominant direction of shift on question 2 was in the risky (+) direction. For the twelve questions there were seven for which the dominant shift was in the risky direction, two with cautious shifts, and three with no dominant direction of shift.

This method of analysis focuses on each individual subject and notes in which direction he is influenced by the group discussion. The magnitude of his shift is ignored; a subject who changes from 0.9 to 0.3 is not weighted more heavily than one who shifts from 0.1 to 0.3. At the same time, this method makes no assumptions about the scale of probabilities used, other than the assumptions that it is an ordinal scale for each subject and that "Not" is a more cautious position than "9/10."

The summary for the thirteen groups analyzed on this individual shift basis is presented in Table III-5. The row

TABLE III-5

DIRECTION OF GROUP SHIFTS ON EACH QUESTION (DETERMINED BY COMPARING THE NUMBER OF INDIVIDUALS SHIFTING IN THE RISKY DIRECTION WITH THE NUMBER SHIFTING IN THE CAUTIOUS DIRECTION FOR EACH QUESTION)

	Question Number						
Group Number	1 rcd/	2 rcd	3 rcd	4 rcd	5 rcd	6 rcd	7 rcd
1	110	31+	31+	40+	03-	32+	30+
2	42+	X	30+	50+	50+	50+	30+
3	21+	30+	12-	31+	31+	41+	50+
4	220	24-	330	31+	31+	05-	40+
5	20+	12-	41+	32+	21+	23-	50+
6	32+	42+	42+	31+	50+	30+	32+
7	31+	02-	21+	40+	42+	12-	40+
8	32+	X	41+	12-	41+	31+	60+
9	20+	02-	30+	50+	51+	31+	40+
10	60+	40+	40+	40+	40+	30+	30+
11	10+	110	40+	50+	02-	51+	30+
12	03-	42+	220	40+	13-	51+	40+
13	20+	14-	41+	50+	40+	42+	20+
Individual question summary:							
Risky (+) shifts	10	5	10	12	10	10	13
Cautious (-) shifts	1	5	1	1	3	3	0
No net shift (0)	2	1	2	0	0	0	0
Not answered (X)	0	2	0	0	0	0	0
Direction in which the larger number of groups shifted	+	0	+	+	+	+	+
$P_{(\text{two-tailed})}$*	.01	1.00	.01	.004	.09	.09	.0002

/r = number of individuals shifting in the risky (+) direction
c = number of individuals shifting in the cautious (-) direction
d = direction in which the greater number of individuals shifted

(table continued on following page)

TABLE III-5 (continued)

Group Number	Question Number 8 rcd	9 rcd	10 rcd	11 rcd	12 rcd	No. of questions for which there were more shifts in one direction than in the other: risky (+) shifts	cautious (-) shifts	Direction in which each group shifted for the larger no. of questions
1	330	20+	14-	21+	110	7	2	+
2	23-	60+	21+	12-	12-	8	3	+
3	12-	42+	41+	20+	04-	9	3	+
4	330	15-	220	30+	04-	4	4	0
5	30+	02-	50+	220	21+	8	3	+
6	50+	21+	12-	41+	03-	10	2	+
7	000	220	13-	30+	04-	6	4	+
8	X	220	41+	32+	X	7	1	+
9	220	31+	31+	220	02-	8	2	+
10	03-	32+	110	32+	220	9	1	+
11	50+	02-	110	05-	X	6	3	+
12	14-	X	X	X	X	4	3	+
13	32+	12-	23-	04-	04-	7	5	+
Individual Question Summary:								
Risky (+)	4	6	5	7	1			
Cautious (-)	4	4	4	3	7			
No net shift	4	2	3	2	2			
Not answered	1	1	1	1	3			
Direction in which the larger no. of groups shifted	0	+	+	+	-			+
$P_{(\text{two-tailed})}$*	1.00	.75	1.00	1.00	.07			.0005

Group Summary:

Risky (+) shifts	12
Cautious (-) shifts	0
No net shift	1

*Probability of as few or fewer shifts in the direction of the smaller number of shifts if each direction of shift is equally likely (using the sign test).

total for Group 1 shows that the group had a dominant shift in the risky direction for seven questions and a cautious shift for two questions. Therefore, the group shifted in the risky direction on more questions than it shifted in the cautious direction, and a (+) is placed in the last column of the table, "Direction in which each group shifted for the larger number of questions."

The total for the last column indicates that twelve groups shifted in the risky direction on more questions than they shifted in the cautious direction and that one group (#4) shifted in one direction on as many questions as it shifted in the opposite direction. Use of the two-tailed sign test reveals that the groups shifted significantly (p=.0005) in the risky direction.

The column totals of Table III-5 give the group shifts for each question. For example, on question 1, ten groups shifted in the risky direction, one group shifted in the cautious direction, and two groups had no dominant direction of shift. The shift in the risky direction is significant at the .01 level.

On questions 1, 3, 4 and 7 the groups shifted significantly in the risky direction (p=.01, .01, .004 and .0002, respectively). On questions 5 and 6 the shifts in the risky direction approached significance (p=.09 for each question). Questions 2 and 8 showed non-significant shifts in the risky direction. The only reversal came on question 12 which showed a cautious shift which approached significance (p=.07).

The second and third methods of analysis involve the use of arithmetic means of the riskiness scores of the 6 subjects in each group. This approach weights the shift of one subject from 0.9 to 0.3 more heavily than the shift of another subject from 0.1 to 0.3. But it involves the assumption that the individuals' questionnaire scales are interval scales and that the intervals are equal in different parts of the scale and from one subject to another. There is no basis for this assumption, so the justification for using this approach must rest upon the fact that arithmetic means are a convenient method of allowing for the different magnitudes of shift illustrated above.

To demonstrate the two methods of analysis, the raw data from Table III-4 are repeated in Table III-6 and some additional calculations are added. The row immediately below the body of the matrix gives the mean probability of success demanded on each question by the 6 subjects. For question 1 the mean is (0.1+0.3+0.3+0.7+0.3+0.3)/6=0.333. The second method compares the group decision with the mean of the subjects' initial opinions. The group decision was 0.3, so on question 1 the group was more risky than the mean of the individual decisions.[1]

The third method compares the mean of each group's decisions on the questionnaire as a whole with the grand mean for the

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[1] "Not" is scored as 10 in 10.

TABLE III-6

INITIAL RISKINESS CHOICES OF THE MEMBERS OF GROUP #1 AND THE DECISIONS REACHED BY THE GROUP (COMPARED ON THE BASES OF THE MEAN RISKINESS SCORE FOR ALL 6 MEMBERS ON EACH QUESTION AND ON THE GRAND MEAN FOR THE ENTIRE QUESTIONNAIRE)

	Question Number												
Subject Number	1	2	3	4	5	6	7	8	9	10	11	12	Grand Mean
1-U	0.1	0.9	0.3	0.3	0.9	0.7	0.1	0.3	0.3	0.3	0.7	0.9	
1-V	.3	.1	.5	.3	.7	.1	.5	.9	.3	.7	.1	N	
1-W	.3	.9	.5	.1	.9	.1	.1	.1	.3	N	.3	.9	
1-X	.7	.7	.3	.5	.7	.5	.5	.9	.5	.7	.5	.9	
1-Y	.3	.7	.1	.1	.7	.3	.1	.9	.5	.9	.3	.7	
1-Z	.3	N	.5	.3	.9	.7	.3	.3	.3	.3	.3	.9	
Mean riskiness score for the 6 group members	.33	.72	.37	.27	.80	.40	.27	.57	.37	.65	.67	.88	0.497
Group Decision	.3	.7	.3	.1	.9	.3	.1	.5	.3	.9	.3	.9	.467
Group decision relative to the mean riskiness score of the group members: (+) = more risky (-) = less risky	+	+	+	+	-	+	+	+	+	-	+	-	+

entire matrix, i.e., with the mean of the 6 individuals' over-all scores on the questionnaire. For Group 1 the mean for the group's twelve decisions is 0.4667. The mean of the 6 individuals' over-all questionnaire scores is 0.4972. Therefore, the over-all group decisions are more risky than the mean of the subjects' initial decisions.

The summaries of the data for the thirteen groups, analyzed in these two ways, are presented in Tables III-7 and III-8. In both over-all measures, the question-by-question comparisons in Table III-7 and the grand mean comparisons in Table III-8, twelve groups shift in the risky direction and one group shifts in the cautious direction. It is interesting to note that by one method it is Group 12 which is the more cautious group and by the other method it is Group 4.

The arithmetic mean method on a per question basis (Table III-7) shows the group decisions to be significantly more risky on questions 1, 3, 5 and 7. These are the same questions for which significant shifts were found with the first method of analysis. Again, the risky shifts on questions 5 and 6 approach significance. The cautious shift on question 12 becomes significant at the .002 level by this method. Finally, questions 2, 8 and 9 show non-significant cautious shifts and questions 10 and 11 show non-significant risky shifts.

TABLE III-7

DIRECTION OF GROUP SHIFTS ON EACH QUESTION (DETERMINED BY COMPARING THE GROUP DECISION ON EACH QUESTION WITH THE ARITHMETIC MEAN OF THE RISKINESS SCORES FOR THE 6 GROUP MEMBERS)

Group Number	1	2	3	4	5	6	7	8	9	10	11	12	Number of questions on which each group shifted in the: risky (+) direction	cautious (-) direction	Direction in which each group shifted on the larger number of questions
1	+	+	+	+	-	+	+	+	+	-	+	-	9	3	+
2	+	X	+	+	+	+	+	-	+	+	-	-	8	3	+
3	+	+	-	+	+	+	+	-	+	+	+	-	9	3	+
4	0	-	+	+	+	-	+	-	-	+	+	-	6	5	+
5	+	-	+	+	+	-	+	+	-	+	-	-	7	5	+
6	+	+	+	+	+	+	+	+	-	-	+	-	9	3	+
7	+	-	+	+	+	-	+	0	-	-	+	-	6	5	+
8	+	X	+	-	+	+	+	X	+	+	0	X	7	1	+
9	+	-	+	+	+	+	+	-	+	+	0	-	8	3	+
10	+	+	+	+	+	+	+	-	0	+	+	-	9	2	+
11	+	-	+	+	-	+	+	+	-	-	-	X	6	5	+
12	-	-	-	+	-	+	+	-	X	X	X	X	3	5	-
13	+	-	+	+	+	+	+	0	-	-	-	-	6	5	+
Individual question summary:													Group summary:		
Risky (+) shifts	11	4	11	12	10	10	13	4	5	7	6	0	Risky (+) shifts	12	
Cautious (-) shifts	1	7	2	1	3	3	0	6	6	5	4	10	Cautious (-) shifts	1	
No net shift (0)	1	0	0	0	0	0	0	2	1	0	2	0			
Not answered (X)	0	2	0	0	0	0	0	1	1	1	1	3			
Direction in which the larger no. of groups shifted	+	-	+	+	+	+	+	-	-	+	+	-			
$P_{(\text{two-tailed})}$	.006	.55	.02	.004	.09	.09	.0002	.75	1.00	.77	.75	.002			.004

TABLE III-8

DIRECTION OF GROUP SHIFTS ON THE QUESTIONNAIRE AS A WHOLE (DETERMINED BY COMPARING THE GRAND MEAN OF THE INITIAL RISKINESS SCORES FOR THE 6 GROUP MEMBERS WITH THE ARITHMETIC MEAN OF THE 12 DECISIONS REACHED BY THE GROUP)

	Group Number												
	1	2[a]	3	4	5	6	7	8[b]	9	10	11[c]	12[d]	13
Grand mean of the first session riskiness scores of the group members	0.497	0.492	0.647	0.579	0.568	0.538	0.547	0.415	0.567	0.547	0.542	0.385	0.490
Mean of the riskiness choices reached by each group	.467	.342	.508	.592	.500	.450	.517	.325	.483	.467	.475	.383	.458
Mean of the group decisions relative to the initial choices of the group members: (+) = more risky (-) = less risky	+	+	+	-	+	+	+	+	+	+	+	+	+

Number of more risky groups 12
Number of more cautious groups 1

$P_{(\text{two-tailed})}$ .004

[a] Excluding question 2
[b] Excluding questions 2, 8 and 12
[c] Excluding question 12
[d] Excluding questions 9, 10, 11 and 12

The fourth method of analyzing these same data takes account of the fact that many of the group decisions are close to the arithmetic mean of the individual subjects' initial positions. Therefore, the question is asked: Of the decisions not adequately predicted by the mean of the subjects' initial positions, are more in the risky direction or in the cautious direction for each of the thirteen groups? A group decision will be said to be "adequately predicted" if it is the same as the mean of the subjects' initial positions, rounded to the nearest probability offered as a choice. For example, from Table III-6, for question 1 the mean of the subjects' initial positions is 0.333. The nearest choice probability available to the group members is 0.3, and so the subjects' initial opinions "adequately predicted" the group choice. On question 4 the mean is 0.2667, which would predict a choice of 0.3. The group choice is 0.1, a more risky choice than would have been predicted by the mean of the subjects' individual choices.

The analysis of the group data by this method is summarized in Table III-9. In the cases where the mean is an even number exactly and the group chose one of the adjacent odd probabilities, the direction of shift is marked with an asterisk. For example, on question 5 the mean for the 6 subjects in Group 1 is 0.8, but this probability was not available to the group - the nearest choices available were 0.7 and 0.9. The group chose 0.9 and this

TABLE III-9

GROUP SHIFTS ON EACH QUESTION (DETERMINED BY COMPARING THE GROUP DECISION WITH THE DECISION WHICH WOULD BE "PREDICTED" BY THE ARITHMETIC MEAN OF THE INDIVIDUAL RISKINESS SCORES OF THE GROUP MEMBERS)

(0) = Group decisions "adequately predicted" by the mean of the group members' first session riskiness scores.
(+) = Group decisions more risky than the "predicted" riskiness choice.
(-) = Group decisions more cautious than the "predicted" riskiness choice.

Group Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12	Totals for Each question +	+*	-	-*	0
1	0	0	0	+	-*	+*	+	0	0	-	+	0	3	1	1	1	6
2	+	X	+	+	+	+	+	-	+	0	0	0	7	0	1	0	3
3	0	+*	0	+	0	+	+	0	0	+	0	-	4	1	1	0	6
4	0	-	0	+*	0	-	+	0	-	0	+	-	2	1	4	0	5
5	0	-	+	+*	0	0	+	+*	-*	+	0	0	3	2	1	1	5
6	+*	0	0	+	+	+	+*	+	0	0	+	-	5	2	1	0	4
7	0	0	0	+	+*	0	+	0	0	0	+	-	3	1	1	0	7
8	0	X	+	-*	0	+	+	X	+*	+*	0	X	3	2	0	1	3
9	0	0	+*	+	+	+*	+	-*	0	+*	0	0	3	3	0	1	5
10	+	+	+	+	+	+	+*	-	0	0	0	-	6	1	2	0	3
11	0	0	+	+	-	+	+	+	-*	0	-	X	5	0	2	1	3
12	-*	0	-	+	-	+	+	-	X	X	X	X	3	0	3	1	1
13	0	-	+	+	+	+	+	0	-*	0	-	-	5	0	3	1	3
Totals for Each question +	2	1	6	10	5	8	11	2	1	2	4	0					
+*	1	1	1	2	1	2	2	1	1	2	0	0					
-	0	3	1	0	2	1	0	3	1	1	2	6					
-*	1	0	0	1	1	0	0	1	3	0	0	0					
0	9	6	5	0	4	2	0	5	6	7	6	4					

Starred shifts are those for which the mean was an even probability exactly (e.g., 2/10) and for which the group decision was one of the adjacent odd probabilities (e.g., 3/10).

cautious shift is marked with an asterisk in Table III-9. These cases are separated in this manner because, in effect, a single prediction is not available for them. It seems reasonable that these shifts should not be ignored, in the sense that recording a (0) would ignore them; at the same time, they should be weighted less heavily than the other shifts described above. In Table III-9 they are tabulated separately.

This method yields results which do not differ appreciably from the ones obtained by the three other methods. The method of scoring the asterisk-marked shifts affects the results slightly. Three simple ways of scoring the shifts will be considered: weighting the asterisk-marked shifts as heavily as the other shifts, one-half as heavily, and not at all. If the unstarred shifts are counted as one shift each, these three methods count the starred shifts as 1 shift, 1/2 shift, and 0 shifts, respectively.

On the group basis, if the starred shifts are weighted at 1 or 1/2,[2] eleven groups have more risky shifts than cautious shifts, and two groups (4 and 12) have more cautious shifts than risky ($p=0.02$). If the starred shifts are scored with zeroes, Group 12 no longer shows a dominant direction of shift and the

[2]Or actually at any value greater than zero.

other twelve groups show eleven risky shifts and one cautious shift ($p=0.006$).

The effect of this method on a per question basis is to reduce the total number of shifts in both directions, but it does not change the general appearance of the data. The results are shown in Table III-10 with the three methods of scoring the starred shifts.

These four methods of analyzing the data yield the same result for the over-all data at approximately the same level of significance. By any of the methods of analysis, only two groups (4 and 12) show cautious shifts on the questionnaire as a whole, but each of these groups shows a risky shift by at least one method. The remaining eleven groups show risky shifts by every method of analysis. Therefore, it seems safe to conclude that the effect is not an artifact of a particular method of analysis.

Questions 4 and 7

The control subjects did not shift significantly on any of the questions or on the questionnaire as a whole. However, the shifts on questions 4 and 7 do approach significance ($p=.07$ and .18, respectively) and are in the same direction as the group shifts. In Appendix D it is assumed that the group members tended to shift on questions 4 and 7 about as much between the first and

TABLE III-10

THREE METHODS OF SCORING THE GROUP SHIFTS TABULATED IN TABLE III-9

I. Scoring all shifts as 1

Question	1	2	3	4	5	6	7	8	9	10	11	12
Risky (+) shifts	3	2	7	12	6	10	13	3	2	4	4	0
Cautious (-) shifts	1	3	1	1	3	1	0	4	4	1	2	6
Direction in which the larger number of groups shifted	+	-	+	+	+	+	+	-	-	+	+	-
$P_{(\text{two-tailed})}$			.07	.004		.01	.0002					.03

II. Scoring all shifts as $\frac{1}{2}$

Question	1	2	3	4	5	6	7	8	9	10	11	12
Risky (+) shifts	$2\frac{1}{2}$	$1\frac{1}{2}$	$6\frac{1}{2}$	11	$5\frac{1}{2}$	9	12	$2\frac{1}{2}$	$1\frac{1}{2}$	3	4	0
Cautious (-) shifts	$\frac{1}{2}$	3	1	$\frac{1}{2}$	$2\frac{1}{2}$	1	0	$3\frac{1}{2}$	$2\frac{1}{2}$	1	2	6
Direction in which the larger number of groups shifted	+	-	+	+	+	+	+	-	-	+	+	-

III. Scoring all shifts as 0

Question	1	2	3	4	5	6	7	8	9	10	11	12
Risky (+) shifts	2	1	6	10	5	8	11	2	1	2	4	0
Cautious (-) shifts	0	3	1	0	2	1	0	3	1	1	2	6
Direction in which the larger number of groups shifted	+	-	+	+	+	+	+	-	0	+	+	-
$P_{(\text{two-tailed})}$			.12	.002		.04	.001					.03

second sessions as the control subjects did. The data are "adjusted" on the basis of this assumption and are then re-analyzed using the four methods of analysis described above. These adjustments do not change the results appreciably on an individual question basis or for the group shifts on the questionnaire as a whole.

Confidence and Over-all Riskiness

Figure III-2 shows the relation, or lack of relation, between the over-all probability of success demanded by each group member[3] and his confidence in his opinions. No relationship between these two parameters is discernible from the figure. Nor were any interesting results obtained when these two parameters were plotted on a per question basis.

Post-Discussion Data

The subjects who disagreed with the "unanimous" group decision did not tend, on the average, to hold opinions either more or less risky than the group decision. There were 318 separate cases in which a subject indicated that he disagreed with the unanimous group[4] decision at the time it was reached.

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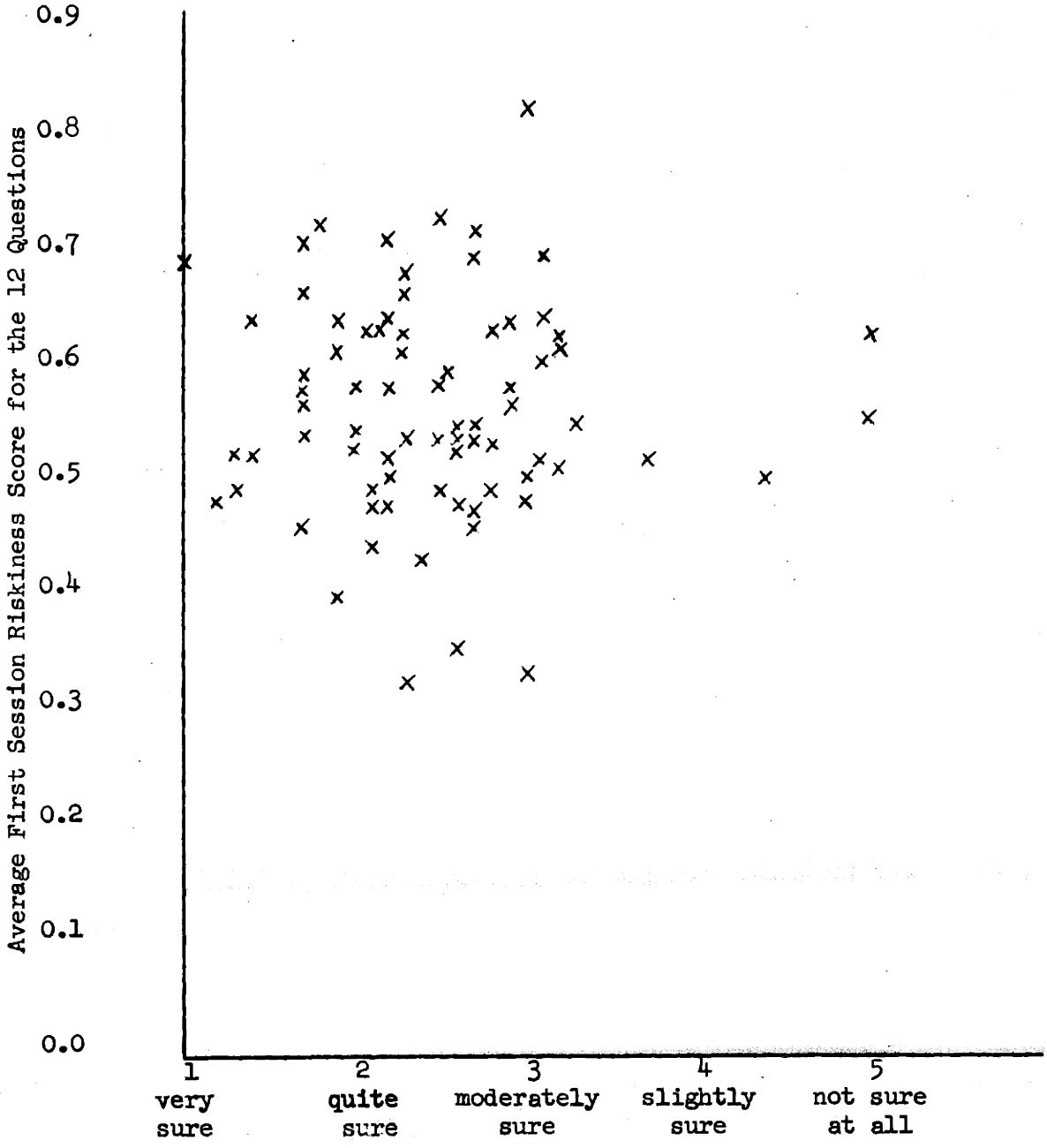
[3]Two subjects answered only 11 of the 12 questions, so only 76 subjects are represented in Figure III-2.

[4]There were 564 cases of agreement.

FIGURE III-2

AVERAGE FIRST SESSION CONFIDENCE AND RISKINESS SCORES OF EACH OF THE GROUP MEMBERS FOR THE TWELVE QUESTIONS



Of these disagreements, 159 were in a more cautious direction and 159 were in a more risky direction. The raw data from the sheets filled out by the subjects following the group discussion are given in Appendix C.

The only questions which showed differences which might be thought to be non-random were questions 7 and 12. On question 7 two subjects indicated that their final opinions were more risky than the group's, and thirteen indicated that they felt more cautious. For question 12 there were ten subjects who felt more risky than the group decision and four who felt more cautious. Although these figures are rather striking, they are easily explained. The group decisions on question 7 tended to be at the risky end of the scale; there were eleven 1/10's and two 3/10's. Therefore, it was possible for twelve subjects at the most to hold a final opinion which was more risky than the group decision; any other dissenters had to be more cautious. Question 12 was also probably influenced by a similar ceiling effect. Seven groups chose 9/10 and the other three groups who answered the question chose "not at all."

The changes in confidence of the subjects who expressed agreement with the group decision are shown in Table III-11. It is interesting to note that the group members who agreed with

TABLE III-11

CHANGES IN CONFIDENCE OF SUBJECTS WHO EXPRESSED AGREEMENT WITH THE GROUP DECISION

Question Number	Group members who shifted in the risky (+) direction			Group members who did not change their opinions			Group members who shifted in the cautious (-) direction		
	Number who became more confident	Number who did not change in confidence	Number who became less confident	Number who became more confident	Number who did not change in confidence	Number who became less confident	Number who became more confident	Number who did not change in confidence	Number who became less confident
1	13	2	4	16	4	7	3	1	2
2	3	2	3	9	10	4	1	5	0
3	11	9	3	10	3	2	1	3	2
4	5	16	8	10	3	1	0	0	0
5	6	11	7	5	6	5	3	4	0
6	11	8	8	5	9	1	3	4	1
7	13	14	6	17	7	1	0	0	0
8	7	3	2	6	6	3	3	2	3
9	6	3	2	6	9	4	5	2	2
10	2	9	5	10	6	6	2	3	4
11	6	4	4	6	8	7	8	2	1
12	0	1	1	10	10	5	5	10	0
Totals	83	82	53	110	81	46	34	36	15

the final decision tended to become more confident of their decisions, even if they changed their opinions during the discussions.

The subjects who disagreed with the decision reached by the group were less confident of both the group decision and the opinion they held at the end of the group session than they were of the opinions they expressed during the first session. There were 286 cases for which sufficient data were available to compare the subject's confidence in his opinion in the first session with his confidence in the group decision - with which he expressed disagreement. In 27 cases the subjects were more confident of the group decision than they were of their own opinion in the first session. In 49 cases they expressed the same level of confidence in each session. And in 210 cases they were less confident of the group decision.

In 266 cases it was possible to compare the subject's confidence in his first session decision with the confidence he expressed in the dissenting opinion he held at the time the group decision was reached. In 73 cases the subjects were more confident of their dissenting opinions than they had been of the initial opinions they expressed in the individual sessions. In 93 cases the subjects expressed the same level of confidence in each decision, and in 100 cases the subjects were less sure of

their dissenting opinions than they had been of the opinions they expressed in the first session.

CHAPTER IV

DISCUSSION

The tendency of individuals to choose more risky courses of action when they reach their decisions as members of a group has been demonstrated clearly. The reasons for this tendency toward more risky choices are not known. Subsequent experiments will have to be designed to test explicit hypotheses concerning the causes of the observed phenomenon. However, it is possible to discuss a few factors which may have causal influence.

Relative Amount of Interaction of Group Members

In attempting to investigate the means of exerting influence in the group session, one area of interest is the prominence in the group discussion of the subjects who demanded low probabilities of success in the first session (the more risky subjects). If it could be shown that the more risky group members tended to be the most talkative members in the discussions, the phenomenon could be interpreted in terms of the "leadership" of those subjects. From the tape recordings, it was possible to measure the length of time each subject spoke during the group discussion. This information was obtained for Groups 1, 8, 9 and 11. Spearman rank correlation coefficients (r_s's) are shown in Table IV-1 for the relation between amount of verbal

TABLE IV-1

SPEARMAN RANK CORRELATION COEFFICIENTS FOR THE RELATIONSHIP BETWEEN TALKATIVENESS AND RISKINESS FOR THE MEMBERS OF GROUPS #1, 8, 9 AND 11

Question Number	Group Number			
	1	8	9	11
1	+0.34	-0.09	-0.21	-0.13
2	+ .12	X	+ .21	+ .26
3	+ .66	+ .55	- .10	- .26
4	- .15	- .22	+ .40	+ .06
5	+ .10	- .30	- .37	- .78
6	- .62	+ .02	+ .88	+ .03
7	- .53	+ .03	+ .37	- .44
8	- .03	X	- .26	+ .65
9	- .41	- .05	+ .77	+ .07
10	+ .53	+ .70	+ .09	+ .17
11	- .33	- .33	.00	- .46
12	- .51	X	+ .21	X
For the questionnaire as a whole	- .70	+ .20	+ .03	+ .06

interaction and relative riskiness. An r_s of +1 would indicate that the most risky member spoke the most, the second most risky member was next in amount of interaction, and so on. The r_s's in Table IV-1 do not indicate that the more risky subjects were more talkative than the less risky ones. The group (#1) which had a negative r_s (-0.70) showed a very strong shift in the risky direction (nine risky shifts and three cautious shifts by the first two methods of analysis).

A similar comparison is made for amount of interaction and relative confidence in Table IV-2. An r_s of +1 would indicate that the most talkative member of the group was also the most confident member, and so on. There seems to be no over-all correlation between amount of interaction and confidence for the subjects.

The data in Table IV-1 can be used to infer whether or not the riskier group members would have been chosen as "leaders" by the other members of the group. Bales (1953) has reported a clear tendency for the most talkative group member to be ranked by the other members as having contributed most to the group product and that the group members tend to be ranked as decreasing in contribution to the group solution as their rank in participation decreases. Bass (1949) found close correlations (0.82 to 0.92) between the time spent talking by an individual and the number of votes he received from fellow group members and

TABLE IV-2

SPEARMAN RANK CORRELATION COEFFICIENTS FOR THE RELATIONSHIP BETWEEN TALKATIVENESS AND CONFIDENCE FOR THE MEMBERS OF GROUPS #1, 8, 9 AND 11

Question Number	Group Number			
	1	8	9	11
1	-0.48	-0.49	-0.70	-0.12
2	- .53	X	+ .09	- .63
3	- .55	+ .26	+ .43	.00
4	- .18	- .62	+ .34	- .46
5	- .93	.00	+ .82	+ .72
6	- .27	- .18	.00	- .80
7	- .51	+ .03	+ .31	+ .35
8	- .26	X	- .43	- .15
9	+ .18	- .62	- .70	+ .68
10	- .55	+ .26	- .12	- .12
11	- .80	.00	+ .29	+ .09
12	+ .09	X	- .06	X
For the questionnaire as a whole	- .60	- .26	+ .26	+ .14

from observers on thirteen leadership questions (the correlation for all items combined was 0.93). If the group members had been asked to rank each other on a "leadership" scale, it is doubtful that the more risky individuals would have been ranked higher than the cautious ones.

The word "leadership" has been used above with care because it has many definitions. If leadership were defined in terms of objectively verified influence (e.g., change in the riskiness scores of the subjects), then the high risk members of the groups were "leaders," since the groups tended to shift in the risky rather than the cautious direction.[1] But this is neither a profound nor enlightening observation. The interesting question is, why and how are they more influential? At this stage it is reasonable to say that their influence is not simply a matter of their dominant participation in the group discussion.

Role Expectations

Also deserving of attention are two role expectations which may have influenced the subjects more in the group situation than

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[1] But questions on which all 6 group members appear to shift in the risky direction do present something of a puzzle when the influence of the risky members is being discussed (Group 2, question 9; Group 8, question 7; Group 10, question 1). Of course, it is only fair to observe that one or more group members may have become more risky between the first and second administrations.

in the individual setting. First, all of the subjects are males. In our culture the male is considered to be less cautious than the female. In the individual setting the subjects may have been less conscious of this male role expectation than they were in the group situation. If such a change in their awareness of the role expectation occurred, it would tend to make them more willing to assume risk in the group situation.

The second factor which may have contributed to the subjects' greater riskiness in the group situation is the image of the businessman as a risk-taker. All of the group members were enrolled in the School of Industrial Management; and therefore, it is likely that many of them conceive of themselves as entering a field in which risk-taking is an important factor. This role expectation may have been more salient in the group situation when the subjects met with their peers than in the first session when the subjects were completing the questionnaire by themselves.

In connection with the possible influence of a "businessman role expectation," it is interesting to note that in the first session both the control subjects and the group members were somewhat more risky[2] than the male college students who were studied by Wallach and Kogan (1959). Although the two

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[2]Use of the "t" test to compare the riskiness scores of the Industrial Management students with the scores of the students studied by Wallach and Kogan yielded a $p < .20$.

populations from which the subjects were drawn differed in a number of respects, the most striking factor was that one population consisted of undergraduate students with a variety of fields of concentration at Northeastern University and the other consisted of graduate students in the School of Industrial Management at Massachusetts Institute of Technology.

Sharing of Responsibility

The possible explanation which may be the most difficult to investigate is the suggestion that the presence of other individuals allowed the subjects to feel less responsible for an unsuccessful outcome and that this change made it easier for them to choose a more risky course of action. It is interesting to recall at this point that the subjects who agreed with the final group decision tended to become more confident of their choice, regardless of whether they became more risky, more cautious, or did not change their opinion.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDY

Conclusions

When the subjects reached decisions as members of a group they tended to advocate significantly more risky courses of action than they had chosen when they reached decisions as individuals. A slightly different phrasing of this result states that the experimental groups chose courses of action which were significantly more risky than the individual members had advocated when they reached decisions alone.

No relation was found between the subjects' confidence in their decisions and the riskiness of those decisions. Subjects who agreed with the final group decision tended to become more confident of that decision, whether or not they actually changed their opinion in order to reach the group's choice. Subjects who expressed disagreement with the final group decision tended to be less confident of both the group decision and of their own dissenting opinions than they were of the opinions they held during the individual session.

Recommendations for Further Study

Clearly the first goal to be achieved is a replication of the findings in a setting less specialized than the one which was

used for this study. If a similar result is found with another population, some degree of generalization will have been achieved. Additional generalizability will demand the use of different procedures and different instruments. Replication of the results with a different population of male students would allow the "businessman role expectation" suggestion to be eliminated as the dominant cause of the results. If similar results are obtained with groups of women, it would appear that the male role expectations are not a dominant factor. The expectation that women are the more cautious members of our society would lead one to expect groups of women to become less risky, rather than more risky.

Although the more risky group members did not tend to dominate the discussion periods, it may be of interest to obtain sociometric measures of leadership from the group members in future studies. If the more risky members are not perceived to be the leaders of the discussion, there will be the clear question: why do the more cautious group members tend to shift towards the opinions of the riskier members without attributing greater influence to those members?

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APPENDIX A-1

WALLACH-KOGAN QUESTIONNAIRE

Name_____

INSTRUCTIONS

On the following pages you will find a series of situations that are likely to occur in everyday life. The central person in each situation is faced with a choice between two courses of action. We want your opinion as to how desirable it is for the person to follow one of the two courses of action. Read each situation carefully before giving your opinion.

Please do not discuss the material in this session with any of your fellow students, even if they have already taken part in the experiment.

APPENDIX A-1 (continued)

1. Mr. A, an electrical engineer who is married and has one child, has been working for a large electronics corporation since graduating from college five years ago. He is assured of a lifetime job with a modest, though adequate, salary, and liberal pension benefits upon retirement. On the other hand, it is very unlikely that his salary will increase much before he retires. While attending a convention, Mr. A is offered a job with a small, newly founded company with a highly uncertain future. The new job would pay more to start and would offer the possibility of a share in the ownership if the company survived the competition of the larger firms.

Imagine that you are advising Mr. A. Listed below are several probabilities or odds of the new company's proving financially sound. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE TO MAKE IT WORTHWHILE FOR MR. A TO TAKE THE NEW JOB.

_____ The chances are 1 in 10 that the company will prove financially sound.

_____ The chances are 3 in 10 that the company will prove financially sound.

_____ The chances are 5 in 10 that the company will prove financially sound.

_____ The chances are 7 in 10 that the company will prove financially sound.

_____ The chances are 9 in 10 that the company will prove financially sound.

_____ Place a check here if you think Mr. A should not take the new job, no matter what the probabilities.

APPENDIX A-1 (continued)

2. Mr. B, a 45-year old accountant, has recently been informed by his physician that he has developed a severe heart ailment. The disease would be sufficiently serious to force Mr. B to change many of his strongest life habits - reducing his work load, drastically changing his diet, giving up favorite leisure time pursuits. The physician suggests that a delicate medical operation could be attempted which, if successful, would completely relieve the heart condition. But its success could not be assured, and in fact, the operation might prove fatal.

Imagine that you are advising Mr. B. Listed below are several probabilities or odds that the operation will prove successful. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR THE OPERATION TO BE PERFORMED.

_____ Place a check here if you think Mr. B should not have the operation, no matter what the probabilities.

_____ The chances are 9 in 10 that the operation will be a success.

_____ The chances are 7 in 10 that the operation will be a success.

_____ The chances are 5 in 10 that the operation will be a success.

_____ The chances are 3 in 10 that the operation will be a success.

_____ The chances are 1 in 10 that the operation will be a success.

APPENDIX A-1 (continued)

3. Mr. C, a married man with two children, has a steady job that pays him about $6000 per year. He can easily afford the necessities of life, but few of the luxuries. Mr. C's father, who died recently, carried a $4000 life insurance policy. Mr. C would like to invest this money in stocks. He is well aware of the secure "blue-chip" stocks and bonds that would pay approximately 6% on his investment. On the other hand, Mr. C has heard that the stocks of a relatively unknown Company X might double their present value if a new product currently in production is favorably received by the buying public. On the other hand, if the product is unfavorably received, the stocks would decline in value.

Imagine that you are advising Mr. C. Listed below are several probabilities or odds that Company X stocks will double their value. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR MR. C TO INVEST IN COMPANY X STOCKS.

_____ The chances are 1 in 10 that the stocks will double their value.

_____ The chances are 3 in 10 that the stocks will double their value.

_____ The chances are 5 in 10 that the stocks will double their value.

_____ The chances are 7 in 10 that the stocks will double their value.

_____ The chances are 9 in 10 that the stocks will double their value.

_____ Place a check here if you think Mr. C should not invest in Company X stocks, no matter what the probabilities.

APPENDIX A-1 (continued)

4. Mr. D is the captain of College X's football team. College X is playing its traditional rival, College Y, in the final game of the season. The game is in its final seconds, and Mr. D's team, College X, is behind in the score. College X has time to run one more play. Mr. D, the captain, must decide whether it would be best to settle for a tie score with a play which would be almost certain to work; or, on the other hand, should he try a more complicated and risky play which could bring victory if it succeeded, but defeat if not.

Imagine that you are advising Mr. D. Listed below are several probabilities or odds that the risky play will work. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR THE PLAY TO BE ATTEMPTED.

_____ Place a check here if you think Mr. D should not attempt the risky play, no matter what the probabilities.

_____ The chances are 9 in 10 that the risky play will work.

_____ The chances are 7 in 10 that the risky play will work.

_____ The chances are 5 in 10 that the risky play will work.

_____ The chances are 3 in 10 that the risky play will work.

_____ The chances are 1 in 10 that the risky play will work.

APPENDIX A-1 (continued)

5. Mr. E is president of a light metals corporation in the United States. The corporation is quite prosperous, and has strongly considered the possibilities of business expansion by building an additional plant in a new location. The choice is between building another plant in the United States, where there would be a moderate return on the initial investment, or building a plant in a foreign country. Lower labor costs and easy access to raw materials in that country would mean a much higher return on the initial investment. On the other hand, there is a history of political instability and revolution in the foreign country under consideration. In fact, the leader of a small minority party is committed to nationalizing, that is, taking over, all foreign investments.

Imagine that you are advising Mr. E. Listed below are several probabilities or odds of continued political stability in the foreign country under consideration. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR MR. E'S CORPORATION TO BUILD A PLANT IN THAT COUNTRY.

_____ The chances are 1 in 10 that the foreign country will remain politically stable.

_____ The chances are 3 in 10 that the foreign country will remain politically stable.

_____ The chances are 5 in 10 that the foreign country will remain politically stable.

APPENDIX A-1 (continued)

5. (continued)

_____ The chances are 7 in 10 that the foreign country will remain politically stable.

_____ The chances are 9 in 10 that the foreign country will remain politically stable.

_____ Place a check here if you think Mr. E's corporation should <u>not</u> build a plant in the foreign country, no matter what the probabilities.

APPENDIX A-1 (continued)

6. Mr. F is currently a college senior who is very eager to pursue graduate study in chemistry leading to the Doctor of Philosophy degree. He has been accepted by both University X and University Y. University X has a world-wide reputation for excellence in chemistry. While a degree from University X would signify outstanding training in this field, the standards are so very rigorous that only a fraction of the degree candidates actually receive the degree. University Y, on the other hand, has much less of a reputation in chemistry, but almost everyone admitted is awarded the Doctor of Philosophy degree, though the degree has much less prestige than the corresponding degree from University X.

Imagine that you are advising Mr. F. Listed below are several probabilities or odds that Mr. F would be awarded a degree at University X, the one with the greater prestige. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE TO MAKE IT WORTHWHILE FOR MR. F TO ENROLL IN UNIVERSITY X RATHER THAN UNIVERSITY Y.

_____ Place a check here if you think Mr. F should not enroll in University X, no matter what the probabilities.

_____ The chances are 9 in 10 that Mr. F would receive a degree from University X.

_____ The chances are 7 in 10 that Mr. F would receive a degree from University X.

_____ The chances are 5 in 10 that Mr. F would receive a degree from University X.

_____ The chances are 3 in 10 that Mr. F would receive a degree from University X.

_____ The chances are 1 in 10 that Mr. F would receive a degree from University X.

APPENDIX A-1 (continued)

7. Mr. G, a competent chess player, is participating in a national chess tournament. In an early match he draws the top-favored player in the tournament as his opponent. Mr. G has been given a relatively low ranking in view of his performance in previous tournaments. During the course of his play with the top-favored man, Mr. G notes the possibility of a deceptive though risky maneuver which might bring him a quick victory. At the same time, if the attempted maneuver should fail, Mr. G would be left in an exposed position and defeat would almost certainly follow.

Imagine that you are advising Mr. G. Listed below are several probabilities or odds that Mr. G's deceptive play would succeed. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR THE RISKY PLAY IN QUESTION TO BE ATTEMPTED.

_____ The chances are 1 in 10 that the play would succeed.

_____ The chances are 3 in 10 that the play would succeed.

_____ The chances are 5 in 10 that the play would succeed.

_____ The chances are 7 in 10 that the play would succeed.

_____ The chances are 9 in 10 that the play would succeed.

_____ Place a check here if you think Mr. G should not attempt the risky play, no matter what the probabilities.

APPENDIX A-1 (continued)

8. Mr. H, a college senior, has studied the piano since childhood. He has won amateur prizes and given small recitals, suggesting that Mr. H has considerable musical talent. As graduation approaches, Mr. H has the choice of going to medical school to become a physician, a profession which would bring certain prestige and financial rewards; or entering a conservatory of music for advanced training with a well-known pianist. Mr. H realizes that even upon completion of his piano studies, which would take many more years and a lot of money, success as a concert pianist would not be assured.

Imagine that you are advising Mr. H. Listed below are several probabilities or odds that Mr. H would succeed as a concert pianist. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR MR. H TO CONTINUE WITH HIS MUSICAL TRAINING.

_____ Please check here if you think Mr. H should not pursue his musical training, no matter what the probabilities.

_____ The chances are 9 in 10 that Mr. H would succeed as a concert pianist.

_____ The chances are 7 in 10 that Mr. H would succeed as a concert pianist.

_____ The chances are 5 in 10 that Mr. H would succeed as a concert pianist.

_____ The chances are 3 in 10 that Mr. H would succeed as a concert pianist.

_____ The chances are 1 in 10 that Mr. H would succeed as a concert pianist.

APPENDIX A-1 (continued)

9. Mr. J is an American who was captured by the enemy in World War II and placed in a prisoner-of-war camp. Conditions in the camp are quite bad, with long hours of hard physical labor and a barely sufficient diet. After spending several months in this camp, Mr. J notes the possibility of escape by concealing himself in a supply truck that shuttles in and out of the camp. Of course, there is no guarantee that the escape would prove successful. Recapture by the enemy could well mean execution.

Imagine that you are advising Mr. J. Listed below are several probabilities or odds of a successful escape from the prisoner-of-war camp. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR AN ESCAPE TO BE ATTEMPTED.

_____ The chances are 1 in 10 that the escape would succeed.

_____ The chances are 3 in 10 that the escape would succeed.

_____ The chances are 5 in 10 that the escape would succeed.

_____ The chances are 7 in 10 that the escape would succeed.

_____ The chances are 9 in 10 that the escape would succeed.

_____ Place a check here if you think Mr. J should not try to escape, no matter what the probabilities.

APPENDIX A-1 (continued)

10. Mr. K is a successful businessman who has participated in a number of civic activities of considerable value to the community. Mr. K has been approached by the leaders of his political party as a possible congressional candidate in the next election. Mr. K's party is a minority party in the district, though the party has won occasional elections in the past. Mr. K would like to hold political office, but to do so would involve a serious financial sacrifice, since the party has insufficient campaign funds. He would also have to endure the attacks of his political opponents in a hot campaign.

Imagine that you are advising Mr. K. Listed below are several probabilities or odds of Mr. K's winning the election in his district. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE TO MAKE IT WORTHWILE FOR MR. K TO RUN FOR POLITICAL OFFICE.

_____ Place a check here if you think Mr. K should not run for political office, no matter what the probabilities.

_____ The chances are 9 in 10 that Mr. K would win the election.

_____ The chances are 7 in 10 that Mr. K would win the election.

_____ The chances are 5 in 10 that Mr. K would win the election.

_____ The chances are 3 in 10 that Mr. K would win the election.

_____ The chances are 1 in 10 that Mr. K would win the election.

APPENDIX A-1 (continued)

11. Mr. L, a married 30-year-old physicist, has been given a five-year appointment by a major university laboratory. As he contemplates the next five years, he realizes that he might work on a difficult long-term problem which, if a solution could be found, would resolve basic scientific issues in the field and bring high scientific honors. If no solution were found, however, Mr. L would have little to show for his five years in the laboratory, and this would make it hard for him to get a good job afterwards. On the other hand, he could, as most of his professional associates are doing, work on a series of short-term problems where solutions would be easier to find, but where the problems are of lesser scientific importance.

Imagine that you are advising Mr. L. Listed below are several probabilities or odds that a solution would be found to the difficult long-term problem that Mr. L has in mind. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE TO MAKE IT WORTHWHILE FOR MR. L TO WORK ON THE MORE DIFFICULT LONG-TERM PROBLEM.

_____ The chances are 1 in 10 that Mr. L would solve the long-term problem.

_____ The chances are 3 in 10 that Mr. L would solve the long-term problem.

_____ The chances are 5 in 10 that Mr. L would solve the long-term problem.

_____ The chances are 7 in 10 that Mr. L would solve the long-term problem.

_____ The chances are 9 in 10 that Mr. L would solve the long-term problem.

_____ Place a check here if you think Mr. L should not choose the long-term, difficult problem, no matter what the probabilities.

APPENDIX A-1 (continued)

12. Mr. M is contemplating marriage to Miss T, a girl whom he has known for a little more than a year. Recently, however, a number of arguments have occurred between them, suggesting some sharp differences of opinion in the way each views certain matters. Indeed, they decide to seek professional advice from a marriage counselor as to whether it would be wise for them to marry. On the basis of these meetings with a marriage counselor, they realize that a happy marriage, while possible, would not be assured.

Imagine that you are advising Mr. M and Miss T. Listed below are several probabilities or odds that their marriage would prove to be a happy and successful one. PLEASE CHECK THE LOWEST PROBABILITY THAT YOU WOULD CONSIDER ACCEPTABLE FOR MR. M AND MISS T TO GET MARRIED.

_____ Place a check here if you think Mr. M and Miss T should not marry, no matter what the probabilities.

_____ The chances are 9 in 10 that the marriage would be happy and successful.

_____ The chances are 7 in 10 that the marriage would be happy and successful.

_____ The chances are 5 in 10 that the marriage would be happy and successful.

_____ The chances are 3 in 10 that the marriage would be happy and successful.

_____ The chances are 1 in 10 that the marriage would be happy and successful.

APPENDIX A-2

CONFIDENCE MEASURING INSTRUMENT

Of course, the advice you have given is the best that you can give, but how certain are you of your advice? Please review each question and indicate on this sheet how certain you are of your choice on each of the questions.

	very sure	quite sure	moderately sure	slightly sure	not sure at all
1. Mr. A	___	___	___	___	___
	___	___	___	___	___
2. Mr. B	___	___	___	___	___
	___	___	___	___	___
3. Mr. C	___	___	___	___	___
	___	___	___	___	___
4. Mr. D	___	___	___	___	___
	___	___	___	___	___
5. Mr. E	___	___	___	___	___
	___	___	___	___	___
6. Mr. F	___	___	___	___	___
	___	___	___	___	___
7. Mr. G	___	___	___	___	___
	___	___	___	___	___
8. Mr. H	___	___	___	___	___
	___	___	___	___	___
9. Mr. J	___	___	___	___	___
	___	___	___	___	___
10. Mr. K	___	___	___	___	___
	___	___	___	___	___
11. Mr. L	___	___	___	___	___
	___	___	___	___	___
12. Mr. M & Miss T	___	___	___	___	___
	___	___	___	___	___
	very sure	quite sure	moderately sure	slightly sure	not sure at all

Name_____

APPENDIX A-3

GROUP DISCUSSION ANSWER SHEET

Group Instructions

You have each been given a copy of the questionnaire identical to the one you filled out a short time ago. Now you are asked to reconsider each item as a group. Your goal should be to reach a unanimous group decision on each item. Each of you should record the group's answer on the answer sheet below.

1.	1/10	3/10	5/10	7/10	9/10	Not
2.	Not	9/10	7/10	5/10	3/10	1/10
3.	1/10	3/10	5/10	7/10	9/10	Not
4.	Not	9/10	7/10	5/10	3/10	1/10
5.	1/10	3/10	5/10	7/10	9/10	Not
6.	Not	9/10	7/10	5/10	3/10	1/10
7.	1/10	3/10	5/10	7/10	9/10	Not
8.	Not	9/10	7/10	5/10	3/10	1/10
9.	1/10	3/10	5/10	7/10	9/10	Not
10.	Not	9/10	7/10	5/10	3/10	1/10
11.	1/10	3/10	5/10	7/10	9/10	Not
12.	Not	9/10	7/10	5/10	3/10	1/10

APPENDIX A-4

POST-DISCUSSION ANSWER SHEET (GROUP)

Individual Answer Sheet

You may have felt it was necessary to compromise in order to reach a group decision on some of the questions. Below are listed each of the questions. Please think back over each item and indicate the opinion which you held as an individual when the group decision was reached. Also circle the statement which most clearly indicates your confidence in the group opinion or decision.

	group decision	your opinion at the time the group reached its decision	How sure are you of the group's choice? very sure	quite sure	moderately sure	slightly sure	not sure at all
1.	___	___	X	X	X	X	X
2.	___	___	X	X	X	X	X
3.	___	___	X	X	X	X	X
4.	___	___	X	X	X	X	X
5.	___	___	X	X	X	X	X
6.	___	___	X	X	X	X	X
7.	___	___	X	X	X	X	X
8.	___	___	X	X	X	X	X
9.	___	___	X	X	X	X	X
10.	___	___	X	X	X	X	X
11.	___	___	X	X	X	X	X
12.	___	___	X	X	X	X	X

APPENDIX A-5

SATISFACTION MEASURING INSTRUMENT

Ignoring for the moment the poor timing of this experiment, how would you characterize your reactions to the experiment.

1st PART

Enjoyed very much filling it out	Rather enjoyable to fill out	Neither enjoyed nor disliked filling it out	Rather disliked filling it out	Disliked very much filling it out

It stimulated my thinking quite a bit	I thought about it once or twice	I didn't give it a second thought

2nd PART

Enjoyed it very much	Rather enjoyed it	Neither enjoyed nor disliked it	Rather disliked it	Disliked it very much

APPENDIX A-6

SECOND SESSION ANSWER SHEET (CONTROL SUBJECTS)

Instructions

Please read each question carefully and record your opinion in the space provided below. Do not hurry; for each question allow as much time for thought and reflection as you feel is justified. This questionnaire is identical to the one you filled out earlier, but you should not attempt simply to remember and repeat the answers you gave earlier. Instead, consider each question carefully, and give the opinion you currently hold.

1.	1/10	3/10	5/10	7/10	9/10	Not
2.	Not	9/10	7/10	5/10	3/10	1/10
3.	1/10	3/10	5/10	7/10	9/10	Not
4.	Not	9/10	7/10	5/10	3/10	1/10
5.	1/10	3/10	5/10	7/10	9/10	Not
6.	Not	9/10	7/10	5/10	3/10	1/10
7.	1/10	3/10	5/10	7/10	9/10	Not
8.	Not	9/10	7/10	5/10	3/10	1/10
9.	1/10	3/10	5/10	7/10	9/10	Not
10.	Not	9/10	7/10	5/10	3/10	1/10
11.	1/10	3/10	5/10	7/10	9/10	Not
12.	Not	9/10	7/10	5/10	3/10	1/10

APPENDIX A-7

ADDITIONAL SECOND SESSION ANSWER SHEET (CONTROL SUBJECTS)

Instructions

Refer back to the questionnaire and indicate on this sheet your best approximation of the opinions you gave on each question when you filled out the questionnaire a week or so ago. Also indicate, to the best of your recollection, how sure you were of each of your opinions when you answered the questionnaire earlier. (In other words, you should now attempt to repeat on this sheet the opinions and statements of confidence you gave a week or so ago).

							very sure	quite sure	moderately sure	slightly sure	not sure at all	
1.	1/10	3/10	5/10	7/10	9/10	Not	___	___	___	___	___	1.
2.	Not	9/10	7/10	5/10	3/10	1/10	___	___	___	___	___	2.
3.	1/10	3/10	5/10	7/10	9/10	Not	___	___	___	___	___	3.
4.	Not	9/10	7/10	5/10	3/10	1/10	___	___	___	___	___	4.
5.	1/10	3/10	5/10	7/10	9/10	Not	___	___	___	___	___	5.
6.	Not	9/10	7/10	5/10	3/10	1/10	___	___	___	___	___	6.
7.	1/10	3/10	5/10	7/10	9/10	Not	___	___	___	___	___	7.
8.	Not	9/10	7/10	5/10	3/10	1/10	___	___	___	___	___	8.
9.	1/10	3/10	5/10	7/10	9/10	Not	___	___	___	___	___	9.
10.	Not	9/10	7/10	5/10	3/10	1/10	___	___	___	___	___	10.
11.	1/10	3/10	5/10	7/10	9/10	Not	___	___	___	___	___	11.
12.	Not	9/10	7/10	5/10	3/10	1/10	___	___	___	___	___	12.

APPENDIX TABLE B-1

FIRST AND SECOND SESSION RISKINESS SCORES
OF CONTROL SUBJECTS FOR EACH QUESTION

Question No.	1		2		3		4		5		6	
Session	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Subject No.												
C-1	0.1	0.3	N	N	0.9	0.7	0.1	0.1	0.7	0.9	0.5	0.5
C-2	.1	.1	.9	.9	.7	.7	.1	.1	.7	.7	.7	.7
C-3	.5	.5	.7	.7	.9	.9	.9	.9	.7	.9	.3	.3
C-4	.3	.3	.9	.9	.7	.5	.7	.7	.9	.7	.7	.5
C-5	.5	.5	.9	.9	.7	.7	.5	.1	.9	.9	.7	.7
C-6	.5	.7	.7	.9	N	N	.7	.7	N	N	.1	.3
C-7	.3	.3	.5	.5	.7	.3	.7	.7	N	.9	.7	.9
C-8	.1	.3	.1	.7	.7	.3	.3	.3	.3	.3	.9	.9
C-9	.7	.3	.5	.7	.3	.7	.3	.7	.9	.7	.1	.3
C-10	.5	.5	.9	.9	.3	.1	.1	.1	.9	.9	.1	.5
C-11	.3	.5	.7	.7	.5	.5	.5	.1	.5	.5	.7	.7
C-12	.5	.5	.9	.9	.5	.5	.3	.3	.9	.7	.5	.5
C-13	.1	.1	.5	.7	.1	.3	.7	.5	.7	.7	.3	.3
C-14	.1	.1	.3	.5	.3	.7	.7	.5	.7	.9	.3	.3
C-15	.3	.3	.5	.5	.5	.5	.1	.1	.5	.3	.3	.3
C-16	.3	.3	.9	.9	.7	.7	.5	.5	.5	.5	.1	.1
C-17	.3	.3	N	.9	N	N	.5	.5	.7	.7	.1	.1
C-18	.3	.3	N	N	.9	.9	N	N	.9	.9	.3	.3
C-19	.5	.5	.9	.9	.5	.7	.1	.1	.5	.7	.7	.5
C-20	.3	.3	.9	.9	.3	.3	.3	.1	.7	.3	.1	.3
C-21	.5	.7	.7	.5	.7	.5	.7	.5	.7	.7	.7	.3
C-22	.9	.5	N	N	.7	.7	.5	.3	.9	.7	.5	.5
C-23	.3	.3	.7	.7	.5	.5	.3	.3	.7	.7	.7	.7

(table continued on following page)

APPENDIX TABLE B-1 (continued)

Question No.	7		8		9		10		11		12	
Session	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Subject No.												
C-1	0.3	0.1	0.7	0.7	0.1	0.1	0.5	0.5	0.3	0.5	0.9	0.9
C-2	.1	.1	.7	.5	.9	.7	.1	.1	.1	.5	.9	.9
C-3	N	N	.9	.7	.5	.5	.7	.7	.5	.5	.7	.7
C-4	.5	.5	.7	.7	.7	.5	.5	.7	.7	.7	.7	.9
C-5	.1	.1	.5	.7	.7	.9	.9	.7	.5	.7	.9	.9
C-6	.9	.9	.7	.7	.3	.5	.9	.7	.7	.7	N	N
C-7	.3	.1	.5	.9	.3	.9	.7	.9	.3	.7	N	N
C-8	.1	.1	.1	.9	.9	.9	.1	.3	.1	.1	.3	.9
C-9	.5	.3	.3	.3	.1	.3	.9	.7	.1	.1	.9	.7
C-10	.1	.1	.7	.5	.9	.9	.1	.1	.5	.5	.9	.5
C-11	.1	.3	.7	.9	.7	.7	.5	.5	.3	.5	.5	.5
C-12	.1	.3	N	N	.7	.7	.3	.5	.3	.5	.7	.7
C-13	.1	.1	N	N	.3	.3	.7	.7	.5	.5	N	N
C-14	.5	.3	.5	.3	.5	.5	.7	.7	.3	.3	.7	.7
C-15	.1	.1	.3	.3	.1	.3	.3	.3	.1	.1	.7	.7
C-16	.3	.3	.9	.9	.9	.9	.9	.9	.9	.5	N	N
C-17	.3	.3	.7	.7	N	N	.3	.3	.1	.5	N	N
C-18	.3	.1	.1	.1	.9	.9	N	N	.3	.3	.9	N
C-19	.3	.3	.9	.7	.9	.7	.7	.7	.5	.5	.9	.9
C-20	.1	.1	.3	.3	.9	.9	.1	.1	.1	.1	N	.9
C-21	.9	.7	.7	.9	.1	.1	.7	.7	.3	.5	.9	.9
C-22	.7	.3	.5	.5	N	.9	.5	.5	.5	.3	.9	.7
C-23	.3	.3	.9	.9	.5	.3	.7	.7	.7	.5	.5	.5

APPENDIX TABLE B-2

FIRST AND SECOND SESSION CONFIDENCE SCORES
OF CONTROL SUBJECTS FOR EACH QUESTION

1 = very sure
2 = quite sure
3 = moderately sure
4 = slightly sure
5 = not sure at all

Question No.	1		2		3		4		5		6	
Session	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Subject No.												
C-1	2	2	1	2	1	3	1	1	3	3	2	3
C-2	2	2	1	1	1	2	1	1	1	2	2	2
C-3	2	2	2	2	1	2	1	1	2	2	2	2
C-4	3	2	4	4	2	2	2	2	3	2	3	3
C-5	1	2	2	2	2	3	4	2	1	2	2	3
C-6	3	3	4	3	1	1	2	2	1	2	1	2
C-7	1	1	1	3	1	1	1	3	2	1	3	2
C-8	2	3	5	5	3	2	X	4	2	4	2	3
C-9	1	2	2	1	1	1	1	1	1	1	1	1
C-10	3	3	5	5	2	2	2	1	4	2	2	5
C-11	4	3	3	5	3	2	2	1	4	3	4	3
C-12	1	1	1	1	1	1	1	1	1	1	1	1
C-13	1	1	4	5	2	3	3	4	3	3	3	2
C-14	1	1	3	3	3	3	3	3	2	2	1	2
C-15	1	1	2	2	1	2	1	1	2	1	2	2
C-16	3	3	5	5	3	2	1	1	4	3	2	3
C-17	1	2	2	1	1	1	3	2	2	3	1	1
C-18	2	2	3	4	2	2	3	3	2	2	2	2
C-19	3	2	2	2	3	3	1	1	4	3	3	3
C-20	4	4	5	5	3	4	2	2	4	3	3	4
C-21	3	3	2	4	5	4	2	2	4	3	5	2
C-22	1	2	1	1	1	2	4	2	2	3	5	5
C-23	2	2	3	4	4	3	1	2	2	3	3	2

(table continued on following page)

APPENDIX TABLE B-2 (continued)

Question No.	7		8		9		10		11		12	
Session	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
Subject No.												
C-1	2	1	2	3	1	1	2	2	1	3	1	1
C-2	1	1	2	2	1	2	1	1	2	2	1	1
C-3	1	2	3	3	2	2	2	2	2	2	2	2
C-4	2	3	4	4	3	3	3	3	3	3	4	4
C-5	1	2	3	2	3	3	1	3	3	2	1	2
C-6	2	3	4	4	2	2	2	3	3	2	1	1
C-7	2	1	5	4	2	2	3	2	2	3	2	1
C-8	1	1	5	5	5	2	3	3	2	1	5	2
C-9	1	2	1	1	2	2	1	1	1	1	1	1
C-10	1	1	5	5	4	4	1	2	3	3	5	5
C-11	2	1	5	3	4	5	3	3	3	3	2	4
C-12	1	1	1	1	1	1	1	1	1	1	1	1
C-13	1	1	3	5	3	3	2	3	3	4	1	1
C-14	3	3	3	4	2	2	2	3	2	2	4	3
C-15	1	1	2	2	2	2	2	1	1	1	1	1
C-16	2	3	5	4	4	4	3	2	4	4	3	3
C-17	2	2	2	2	1	1	2	2	2	2	1	1
C-18	1	2	1	2	3	3	3	2	2	2	1	1
C-19	2	2	3	3	4	3	4	3	3	3	3	4
C-20	1	2	5	5	5	5	3	4	2	2	3	3
C-21	4	2	3	3	1	1	2	3	2	3	1	2
C-22	5	4	5	5	5	2	5	2	5	2	2	2
C-23	2	1	1	2	3	3	2	3	4	4	4	2

APPENDIX TABLE C-1

FIRST SESSION RISKINESS SCORES OF
THE 78 GROUP MEMBERS FOR EACH QUESTION

	Question Number											
	1	2	3	4	5	6	7	8	9	10	11	12
Subject Number												
1-U	0.1	0.9	0.3	0.3	0.9	0.7	0.1	0.3	0.3	0.3	0.7	0.9
1-V	.3	.1	.5	.3	.7	.1	.5	.9	.3	.7	.1	N
1-W	.3	.9	.5	.1	.9	.1	.1	.1	.3	N	.3	.9
1-X	.7	.7	.3	.5	.7	.5	.5	.9	.5	.7	.5	.9
1-Y	.3	.7	.1	.1	.7	.3	.1	.9	.5	.9	.3	.7
1-Z	.3	N	.5	.3	.9	.7	.3	.3	.3	.3	.3	.9
2-U	.7	.9	N	.7	.9	.5	.5	N	.7	.3	.3	N
2-V	.5	.9	N	.3	.7	.5	N	.9	.5	.7	.5	.7
2-W	.1	.5	.3	.3	.3	.7	.1	.1	.5	.1	.1	.9
2-X	.1	.9	.7	.7	N	.3	.1	.7	N	.3	.1	.9
2-Y	.5	.3	.3	.3	.7	.7	.5	.7	.7	.5	.3	.9
2-Z	.7	.7	.3	.1	.5	.5	.1	N	.7	.3	.3	.5
3-U	.7	.9	.5	.9	.9	.5	.3	.5	.9	.5	.3	.5
3-V	.5	.7	.5	.3	.5	.5	.3	.7	.9	.5	.5	.5
3-W	.5	.7	.7	.3	.9	.7	N	.7	.9	.5	.3	N
3-X	.7	.7	.1	.5	.7	.5	.3	.7	.5	.3	.5	N
3-Y	.3	.9	.5	.1	.9	.1	.1	.9	.9	.1	.3	.5
3-Z	.5	.9	.3	.7	.7	.3	.3	.3	.5	.7	.3	.9
4-U	.3	.5	N	.5	.7	.5	.9	.1	.3	.3	.1	.9
4-V	.7	N	.5	.1	.9	.3	.1	.9	.9	.3	.1	.9
4-W	.3	.7	.5	.3	.7	.7	.3	N	.5	N	.7	.9
4-X	.7	.5	.9	.5	.3	.1	.9	.3	.5	.5	.3	N
4-Y	.5	N	.9	.3	.9	.7	.5	.5	.3	.7	.1	N
4-Z	.5	.7	.5	.7	.9	.9	.1	.9	.3	.5	.5	.9

(table continued on following page)

APPENDIX TABLE C-1 (continued)

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
5-U	.3	.9	.3	.5	.5	.7	.1	.3	.7	.5	.1	N
5-V	.5	N	N	.5	.9	.3	.3	.3	.7	.9	.5	.9
5-W	.3	.7	.5	.9	.7	.5	.7	.5	.5	.5	.7	.9
5-X	.3	.3	.9	.3	N	.3	.3	.3	.7	.3	.7	.5
5-Y	.5	.9	.7	.1	.7	.9	.7	.5	.3	.7	.3	.9
5-Z	.3	.9	.9	.1	.7	.1	.5	.5	.7	.5	.5	N
6-U	.9	.9	.7	.5	.9	.5	.7	.7	.9	.5	.7	.9
6-V	.5	.9	.9	.3	.7	.3	.5	.5	.7	.3	.3	.9
6-W	.3	.5	.3	.1	.5	.1	.3	.5	.1	.3	.5	.3
6-X	.5	.7	.7	.5	.7	.7	.7	.5	.7	.7	.5	.7
6-Y	.1	.5	.7	.9	N	.1	.1	.3	.9	.5	.1	.9
6-Z	.1	.9	.1	.3	.7	.1	.1	.9	.7	.5	.5	.7
7-U	.3	.9	.5	.3	.7	.1	.5	.7	.5	.3	.3	.7
7-V	.5	.7	.7	.9	.9	.3	.5	.7	.9	.5	.5	.9
7-W	.5	.9	.3	.3	.7	.3	.3	.7	.7	.5	.3	.7
7-X	.5	.9	.7	.5	.7	.3	.5	.7	.9	.7	.5	.7
7-Y	.3	.9	.5	.7	.3	.5	.3	.7	.3	.3	.7	.9
7-Z	.1	.7	.5	.5	.3	.1	.5	.7	.7	.3	.3	.7
8-U	.7	.9	.5	.5	.9	.9	N	X	.9	.7	.7	.9
8-V	.7	.1	.9	.5	.7	.7	.9	.9	.1	.9	.7	.5
8-W	.5	.3	.3	.5	.9	.7	.3	.7	.3	.5	.3	.9
8-X	.1	X	.7	.1	.3	.3	.5	.1	.3	.1	.1	.3
8-Y	.9	.9	N	.1	N	.1	.5	.3	.1	.7	.7	N
8-Z	.3	.5	.7	.7	.9	.3	.3	.1	.7	.7	.5	.3

(table continued on following page)

APPENDIX TABLE C-1 (continued)

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
9-U	.5	.7	.7	.5	.3	.3	.1	.7	.9	.7	.1	.7
9-V	.3	.7	.5	.5	.7	.5	.3	.7	.7	.5	.3	.7
9-W	.3	.9	.7	.1	.7	.1	.3	.3	.9	.9	.3	.9
9-X	.3	.9	.5	.7	.9	.5	.3	.9	.9	.3	.5	.9
9-Y	.3	.9	.5	.3	.9	.3	.1	.1	.7	.7	.1	.9
9-Z	.5	.9	.7	.5	.9	.7	.9	.9	.5	.5	.5	.9
10-U	.5	.7	.3	.3	.7	.9	.1	.9	.9	.5	.5	.1
10-V	.5	.9	.5	.7	.9	.3	.3	.7	.5	.5	.3	N
10-W	.3	.9	N	.1	.7	.5	.1	.1	.9	.5	.1	N
10-X	.3	.9	.3	.3	.9	.5	.3	.5	.9	.3	.1	.1
10-Y	.3	.7	.5	.7	N	.3	.3	.9	.3	.9	.7	.9
10-Z	.3	.9	.7	.1	.9	.3	.1	.9	.7	.5	.5	.9
11-U	.3	.9	.3	.3	.9	.7	.1	.9	.9	.3	.5	.7
11-V	.3	.7	.3	.1	.3	.1	.1	.7	.9	.7	.1	.9
11-W	.3	N	.9	.7	.9	.7	.5	.9	.5	.7	.1	N
11-X	.3	.9	.5	.7	.9	.9	.7	.5	.7	N	.5	N
11-Y	.3	.9	.7	.5	.9	.5	.1	.7	.9	.7	.7	.9
11-Z	.5	.9	.7	.5	.7	.5	.3	.7	.9	.7	.5	.3
12-U	.7	.9	.9	.5	.7	.5	.3	.7	.7	.7	.9	.9
12-V	.7	.9	N	.3	.9	.5	.5	.1	.1	.3	.1	.7
12-W	.5	.9	.9	.7	.9	.7	.9	.9	.9	N	.9	.7
12-X	.5	.9	.7	.3	N	.1	.3	.5	.3	N	.5	.7
12-Y	.7	.1	N	.5	.7	.7	.1	.3	.3	.7	.1	.7
12-Z	.5	.3	.1	.7	.5	.5	.1	.1	.1	.7	.1	.9
13-U	.3	.9	.7	.3	.7	.7	.5	.5	.5	.3	.3	.9
13-V	.3	N	.3	.1	.9	.1	.1	.1	.5	.1	.1	.5
13-W	.3	.5	.5	.3	.7	.7	.1	.7	.7	.5	.1	.7
13-X	.5	.7	.5	.5	N	.5	.5	.9	.1	.7	.1	.9
13-Y	.3	.5	.1	.5	.9	.5	.1	.1	.1	.9	.1	N
13-Z	.5	.7	.9	.7	N	.1	.1	.7	.5	.3	.3	N

APPENDIX TABLE C-2

FIRST SESSION CONFIDENCE SCORES OF
THE 78 GROUP MEMBERS FOR EACH QUESTION

1 = very sure
2 = quite sure
3 = moderately sure
4 = slightly sure
5 = not sure at all

	Question Number											
Subject Number	1	2	3	4	5	6	7	8	9	10	11	12
1-U	2	2	2	1	1	1	1	3	4	2	1	5
1-V	1	5	3	3	1	1	3	2	4	3	2	5
1-W	1	1	2	1	1	1	1	1	2	1	2	1
1-X	3	4	2	4	3	3	3	3	4	4	4	2
1-Y	2	2	5	1	2	2	1	1	3	1	3	2
1-Z	3	5	5	3	2	4	2	5	5	5	4	2
2-U	2	4	3	5	4	3	2	1	3	3	2	1
2-V	3	1	2	3	4	2	4	1	4	4	1	3
2-W	2	5	3	2	2	3	2	3	5	3	4	2
2-X	2	3	2	2	4	1	1	2	1	1	1	1
2-Y	3	3	2	3	3	2	2	3	3	4	2	1
2-Z	1	1	1	1	5	3	1	1	5	1	1	5
3-U*	5	5	5	5	5	5	5	5	5	5	5	5
3-V	1	2	2	2	3	4	2	4	5	3	2	4
3-W	2	3	4	1	4	4	5	3	5	2	1	3
3-X	3	5	2	2	4	2	5	4	5	3	4	1
3-Y	3	2	2	2	2	3	2	3	2	2	3	5
3-Z	2	1	3	1	3	4	2	5	2	4	2	1
4-U	1	5	2	1	4	4	2	5	2	4	2	5
4-V	2	1	4	1	1	1	1	2	2	3	1	2
4-W	2	3	2	3	2	2	1	1	3	1	2	1
4-X	5	5	5	5	5	5	5	5	5	5	5	5
4-Y	2	1	3	3	1	2	3	4	2	2	1	1
4-Z	1	3	2	2	1	3	2	2	3	2	2	2

*Subject 3-U stated that he did not understand the instructions.

(table continued on following page)

APPENDIX TABLE C-2 (continued)

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
5-U	2	4	5	1	3	3	2	4	5	4	2	1
5-V	2	2	2	1	2	2	1	1	2	2	2	1
5-W	1	2	2	2	4	3	2	2	2	2	3	3
5-X	4	5	5	4	3	4	3	5	5	5	5	5
5-Y	2	1	3	1	2	1	1	5	3	2	1	1
5-Z	1	3	4	1	3	3	2	5	5	5	2	1
6-U	2	3	3	2	2	2	3	3	3	3	2	2
6-V	2	4	1	3	3	2	1	5	5	3	2	4
6-W	2	3	2	1	3	4	2	3	1	2	2	3
6-X	2	4	2	4	2	3	3	4	4	3	2	4
6-Y	1	4	3	1	1	1	1	3	3	4	1	4
6-Z	5	3	3	3	3	2	3	2	3	3	3	3
7-U	1	2	1	1	1	1	1	2	2	1	1	2
7-V	2	3	2	2	2	2	2	4	3	2	3	1
7-W	2	1	2	1	2	2	2	2	3	2	3	2
7-X	2	1	2	3	2	1	3	4	1	3	2	3
7-Y	2	1	2	3	3	2	2	2	2	1	2	2
7-Z	1	4	2	3	2	2	1	3	4	3	3	4
8-U	3	4	3	3	2	4	3	X	2	3	3	4
8-V	1	1	1	2	1	2	2	1	1	1	2	2
8-W	2	4	2	3	3	2	1	3	3	2	4	4
8-X	1	X	3	1	2	3	4	4	1	1	3	2
8-Y	3	4	2	2	1	5	2	5	5	3	2	4
8-Z	1	3	5	3	2	5	2	1	5	4	5	3

(table continued on following page)

APPENDIX TABLE C-2 (continued)

Question Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
9-U	1	4	2	2	3	4	2	1	1	4	2	5
9-V	1	3	1	2	3	2	1	3	2	3	3	4
9-W	2	1	2	1	2	2	1	2	3	2	2	1
9-X	1	3	3	4	4	3	2	3	3	2	4	3
9-Y	4	3	3	2	3	4	1	2	4	4	1	3
9-Z	2	1	3	2	1	3	1	3	3	3	3	1
10-U	1	2	2	2	3	4	2	4	3	3	4	1
10-V	3	4	2	4	3	2	1	5	4	4	3	2
10-W	1	2	1	1	1	1	1	1	2	1	1	3
10-X	1	3	3	1	2	1	1	3	1	2	1	1
10-Y	1	5	1	3	4	1	2	5	3	2	4	3
10-Z	2	1	2	1	2	3	1	2	2	3	3	2
11-U	3	1	1	2	1	3	1	4	1	2	4	3
11-V	1	4	2	1	3	2	2	3	3	2	1	1
11-W	1	1	1	1	1	1	1	1	1	1	1	1
11-X	2	2	3	3	2	2	1	2	1	1	2	1
11-Y	3	2	2	3	2	3	1	4	2	3	2	1
11-Z	2	1	2	3	3	2	3	3	1	3	2	3
12-U	2	1	1	1	2	2	2	2	2	2	2	1
12-V	1	3	1	1	2	1	1	1	1	1	1	3
12-W	3	3	4	3	4	2	2	2	4	2	3	4
12-X	2	2	1	2	2	1	4	3	2	4	3	4
12-Y	1	2	1	1	3	3	1	4	2	3	4	2
12-Z	1	5	2	2	3	1	1	1	1	2	3	1
13-U	2	3	3	2	3	3	2	3	3	2	3	3
13-V	2	4	3	1	5	2	1	2	5	1	2	3
13-W	1	4	2	2	3	3	1	3	4	2	2	3
13-X	1	3	1	2	1	3	2	1	1	2	2	2
13-Y	2	5	1	4	3	2	1	2	2	3	2	2
13-Z	2	3	2	2	3	3	2	3	4	2	3	1

APPENDIX TABLE C-3

GROUP DECISIONS ON THE WALLACH-KOGAN QUESTIONNAIRE

Group Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
1	0.3	0.7	0.3	0.1	0.9	0.3	0.1	0.5	0.3	0.9	0.3	0.9
2	.3	X	.3	.1	.3	.3	.1	.9	.3	.3	.3	.9
3	.5	.7	.5	.3	.7	.3	.1	.7	.7	.3	.3	N
4	.5	.9	.7	.3	.7	.9	.1	.7	.7	.5	.1	N
5	.3	.9	.5	.3	.7	.5	.1	.3	.7	.3	.5	.9
6	.3	.7	.5	.3	.5	.1	.3	.3	.7	.5	.3	.9
7	.3	.9	.5	.3	.5	.3	.3	.7	.7	.5	.3	.9
8	.5	X	.5	.5	.7	.3	.1	X	.3	.5	.5	X
9	.3	.9	.5	.1	.5	.3	.1	.7	.7	.5	.3	.9
10	.1	.7	.3	.1	.7	.3	.1	.9	.7	.5	.3	.9
11	.3	.9	.3	.1	.9	.3	.1	.5	.9	.7	.7	X
12	.7	.7	.9	.3	.9	.3	.1	.7	X	X	X	X
13	.3	.9	.3	.1	.7	.3	.1	.5	.5	.5	.3	N

X = question was not answered.

APPENDIX TABLE C-4

RISKINESS CHOICES PREFERRED BY GROUP MEMBERS
WHO DISAGREED WITH THE GROUP DECISION

	Question Number											
Subject Number	1	2	3	4	5	6	7	8	9	10	11	12
1-U	0.1	.9				0.7				0.7	0.7	
1-V		.3	.5			.1	.5					N
1-W								.7		N		.7
1-X												
1-Y					.7			.7	.5			.7
1-Z		.9				.5		.7	.7			
2-U												N
2-V	.5		.5		.5					.5		.7
2-W			.1						.5			
2-X				.3	.5	.1		.7	.7			
2-Y										.5		
2-Z								N			.5	.7
3-U	.7		.1	.5				.5	.5			
3-V	.3		.3	.1				.3				.9
3-W				.1				.5				
3-X	.7			.5	.5						.1	
3-Y			.7	.1				.9	.9			
3-Z	.3	.9	.3						.5		.1	
4-U	.3		.9			.3	.9	.3	.3		.3	
4-V	.7	N		.1		.3		.9		.3		.9
4-W	.3	.7	.5				.3	N	.5	.9	.3	
4-X	.7		.9				.5	.3				
4-Y		N	.5	.1	.9			.9		.9		
4-Z	.3	.7	.3		.9			.9	.3	.9	.3	

(table continued on following page)

APPENDIX TABLE C-4 (continued)

Question Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
5-U					.5	.3			.5		.3	N
5-V										.5		
5-W		.7		.5			.5		.5		.7	
5-X					.9		.3					
5-Y				.1	.5	.7		.5	.3		.3	
5-Z				.1		.3						N
6-U												
6-V			.7						.5	.3		
6-W		.5	.3	.1			.1		.3		.1	.7
6-X	.5		.7									
6-Y	.1	.5		.1	.7		.1	.5			.1	
6-Z	.1	.9	.3		.7			.7	.9			
7-U			.3	.1	.3	.1			.5	.3	.1	
7-V	.5			.7							.5	
7-W			.3	.1								
7-X			.7	.5	.7			.5	.9			
7-Y												
7-Z	.1				.3	.1				.3		
8-U	.3			.7		.1			.7		.7	
8-V	.7		.9	.1	.9		.3		.1	.9	.7	
8-W			.3			.5						
8-X	.1		.3	.1	.3					.1		
8-Y	.7		N	.3	.9						.7	
8-Z				.7	.9				.5	.7	.3	

(table continued on following page)

APPENDIX TABLE C-4 (continued)

	Question Number											
Subject Number	1	2	3	4	5	6	7	8	9	10	11	12
9-U		.7	.7	.3	.3			N	.9			
9-V		.7	.3								.1	(.9 or
9-W			.7		.7	.1	.5		.9	.7		
9-X			.3	.3					.9			
9-Y			.3		.3			.3	.9		.1	
9-Z			.3	.3	.7		.3	N	.1			
10-U					.9	.5						
10-V				.3			.3					
10-W		.9	N		.9	.1		.3		.3	.1	
10-X								.7	.9	.3	.1	.7
10-Y				.3	.9	.1			.5	.9	.5	.7
10-Z	.3	.9						N				
11-U	.5			.3		.5		.7		.3		
11-V		.7			.7	.1		.3			.1	
11-W			.7	.3	.7		.3	.7	.7			
11-X				.3			.3	.3	.7			
11-Y			.5					.7				
11-Z	.5					.5						
12-U		.9										
12-V								.3				
12-W		.9						.9				
12-X		.9			N	.1	.3					
12-Y	.5	.3				.5						
12-Z		.5	.1		.1			.1				
13-U			.5			.5				.3		
13-V		.7				.1		.3	.7	.3		
13-W		.7			.5			.7	.7	.7		
13-X		.7							.3		.1	.9
13-Y										.7		
13-Z		.7	.5	.3	.5			.3				

APPENDIX TABLE C-5

CONFIDENCE IN THE GROUP DECISION

1 = very sure
2 = quite sure
3 = moderately sure
4 = slightly sure
5 = not sure at all

	Question Number											
Subject Number	1	2	3	4	5	6	7	8	9	10	11	12
1-U	A*	A*	2	4	2	A*	1	5	3	A*	A*	3
1-V	3	4*	5*	2	1	3*	4*	2	2	3	2	4*
1-W	1	2	1	1	1	2	1	5*	2	1*	1	2*
1-X	3	3	3	3	3	3	3	3	3	3	3	3
1-Y	2	2	2	1	3*	2	1	2*	4*	2	2	3*
1-Z	2	A*	4	4	3	A*	2	A*	A*	3	5	2
2-U	3		4	2	4	2	1	2	4	3	1	3*
2-V	3*		2*	1	2*	1	1	1	2	3*	2	2*
2-W	2		2*	2	3	4	1	3	4*	4	2	2
2-X	1		2	3*	3*	4*	1	4*	5*	1	1	1
2-Y	2		1	1	2	3	1	3	3	4*	2	1
2-Z	1		2	1	1	1	1	4*	1	1	4*	5*
3-U	3*	2	3*	4*	2	2	1	4*	4*	2	2	1
3-V	A*	2	3*	3*	2	2	2	4*	4	3	2	4*
3-W	2	3	3	5*	3	2	5	5*	5	1	2	1
3-X	4*	A	4	5*	4*	A	A	5	5	4	3*	1
3-Y	3	3	5*	5*	3	2	1	5*	5*	2	3	1
3-Z	3*	2*	4*	A	2	2	2	A	3*	2	2*	A

*A confidence score marked with an asterisk indicates that the subject disagreed with the unanimous decision.

A = Apparently misunderstood the instructions.

(table continued on following page)

APPENDIX TABLE C-5 (continued)

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
4-U	4*	1	2*	2	3	5*	5*	4*	3*	3	3*	1
4-V	3*	5*	3	4*	1	4*	1	3*	2	3*	1	2*
4-W	4*	4*	3*	2	3	2	3*	4*	3*	5*	4*	2
4-X	5*	3	5*	3	3	2	5*	5*	3	4	3	1
4-Y	1	3*	3*	2*	2*	2	2	3*	2	3*	3	2
4-Z	3*	2*	4*	1	3*	2	1	4*	4*	4*	3*	1
5-U	2	2	3	2	4*	4*	1	3	4*	1	5*	3*
5-V	2	2	3	2	3	2	1	2	3	A*	3	2
5-W	2	3*	2	4*	2	2	4*	2	3*	4	3*	1
5-X	4	3	3	5	5*	4	4*	5	5	5	4	5
5-Y	2	1	2	2*	3*	4*	3	2*	3*	3	3*	1
5-Z	1	1	1	3*	3	3*	1	3	2	2	2	2*
6-U	2	4	3	3	3	2	2	2	4	4	3	A
6-V	3	4	4*	2	2	2	2	3	5*	3*	3	1
6-W	3	4*	5*	4*	3	1	4*	5	5*	3	4*	5*
6-X	2*	2	2	5*	2	2	2	4	3	4	3	4
6-Y	2*	2*	2	2*	3*	1	2*	3*	3	3	2*	1
6-Z	4*	4*	4*	3	4*	2	3	4*	4*	3	3	2
7-U	1	1	4*	5*	4*	5*	2	1	4*	5*	5*	1
7-V	5*	3	2	5*	2	2	1	2	3	3	4*	1
7-W	2	2	4*	5*	3	2	3	2	2	2	2	2
7-X	2	2	3*	3*	3*	2	3	4*	3*	3	2	2
7-Y	2	1	2	2	2	3	2	2	3	2	3	1
7-Z	4*	1	2	3	4*	4*	1	3	5	3*	2	1
8-U	4*		3	4*	3	4*	A		4*	3	4*	
8-V	3*		A	4*	2*	3	2*		3*	3*	3*	
8-W	2		3*	1	2	4*	1		2	2	3	
8-X	5*		3*	4*	4*	A	1		1	5*	3	
8-Y	4*		5*	3*	2*	3	2		5	3	3*	
8-Z	3		5	5*	5*	3	1		5*	5*	5*	

(table continued on following page)

APPENDIX TABLE C-5 (continued)

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
9-U	2	2*	5*	2*	4*	2	2	3*	A	4	3	2
9-V	2	3*	4*	1	2	2	1	4	3	3	3*	A
9-W	3	1	5*	1	5*	4*	4*	3	4*	5*	2	2
9-X	2	2	4*	5*	3	3	2	3	4*	3	2	2
9-Y	2	3	5*	1	4*	3	1	5*	4*	4	5*	2
9-Z	3	2	4*	4*	5*	3	4*	5*	5*	5	3	2
10-U	1	4	2	3	4*	4*	1	2	3	2	4	1
10-V	3	4	3	5*	2	1	4*	5	4	2	4	3
10-W	1	3*	4*	1	2*	2*	1	4*	2	2*	2*	1
10-X	1	2	1	1	2	3	2	A*	A*	A*	A*	A*
10-Y	1	2	1	4*	4*	3*	1	2	4*	5*	3*	3*
10-Z	3*	2*	2	1	3	2	1	1*	2	2	3	1
11-U	4*	1	1	5*	1	4*	1	5*	1	5*	2	
11-V	2	2*	2	1	2*	3*	1	5*	2	1	2*	
11-W	2	2	3*	4*	2*	2	3*	5*	3*	2	2	
11-X	2	1	2	5*	3	2	4*	5*	4*	2	2	
11-Y	2	1	4*	4	2	2	1	4*	2	3	2	
11-Z	3*	1	2	A	2	2*	2	3	2	3	2	
12-U	2	3*	1	1	2	3	1	2				
12-V	1	A	1	1	1	1	A	A*				
12-W	1	3*	1	2	1	3	3	3*				
12-X	2	3*	1	1	3*	3*	3*	2				
12-Y	3*	4*	1	1	2	3*	1	1				
12-Z	A	A*	A*	A	A*	A	A	A*				
13-U	2	2	3*	1	2	2*	1	2	2	3*	2	2
13-V	2	4*	3	1	2	3*	1	3*	4*	4*	2	3
13-W	1	2*	1	1	3*	3	1	3*	3*	4*	2	1
13-X	1	A*	1	1	3	1	3	1	A*	1	A*	A*
13-Y	2	3	4	1	3	2	1	5	4	5*	2	2
13-Z	1	4*	4*	4*	3*	1	1	5*	2	3	1	1

APPENDIX TABLE C-6

CONFIDENCE IN THEIR OWN DISSENTING OPINIONS EXPRESSED BY GROUP MEMBERS WHO DISAGREED WITH THE GROUP DECISION

1 = very sure
2 = quite sure
3 = moderately sure
4 = slightly sure
5 = not sure at all

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
1-U	A	A				A				A	A	
1-V		3	4			1	5					3
1-W								3		1		1
1-X												
1-Y					2			3	3			2
1-Z		A				A		A	A			
2-U												3
2-V	4		3		2					3		2
2-W		2							4			
2-X				2	3	3		3	2			
2-Y		2								3		
2-Z		1						1			2	1
3-U	3		2	2				3	3			
3-V	A		2	2				3				3
3-W				1				5				
3-X	4			3	3						3	
3-Y			3	1				4	5			
3-Z	2	1	2						4		3	

A = Apparently misunderstood the instructions.

(table continued on following page)

APPENDIX TABLE C-6 (continued)

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
4-U	2		1			2	3	1	3		2	
4-V	2	1		2		2		2		2		3
4-W	3	3	3				3	2	3	2	3	
4-X	5		3				5	4				
4-Y		1	2	1	2			4		2		
4-Z	2	4	3		2			3	2	3	2	
5-U					2	2			3		2	2
5-V										A		
5-W		3		3			4		3		3	
5-X					5		4					
5-Y				1	1	2		2	2		2	
5-Z				1		3						1
6-U												
6-V		2							5	3		
6-W		2	1	3			2		2		3	2
6-X	3		5									
6-Y	1	2		1	1		1	3			1	
6-Z	3	3	3		3			3	3			
7-U												
7-V												
7-W												
7-X												
7-Y												
7-Z												
8-U	3			2		3			3		4	
8-V	2		2	2	2		2		2	2	2	
8-W			4			2						
8-X	1		2	1	2					1		
8-Y	3		1	3	2						3	
8-Z				2	4				5	4	3	

(table continued on following page)

APPENDIX TABLE C-6 (continued)

Subject Number	Question Number 1	2	3	4	5	6	7	8	9	10	11	12
9-U		3	2	4	3			4	A			
9-V		3	2								2	A
9-W			2		2	3	3		2	2		
9-X			3	4					2			
9-Y			2		4			4	3		2	
9-Z			3	4	2		4	1	2			
10-U					3	2						
10-V				4			3					
10-W		2	2		1	1		3		1	1	
10-X								A	A	A	A	A
10-Y				4	3	2			2	4	3	2
10-Z	2	2						2				
11-U	3			2		2		4		2		
11-V		2			3	1		2			5	
11-W			3	2	4		3	3	2			
11-X				2			3	2	3			
11-Y			3					3				
11-Z	3					3						
12-U		2										
12-V								A				
12-W		2						2				
12-X		1			2	1	3					
12-Y	2	2				2						
12-Z		A	A		A			A				
13-U		2				2				2		
13-V		3				2		2	3	2		
13-W		4			3			3	2	2		
13-X		A							A		A	A
13-Y										4		
13-Z		3	1	2	2			1				

APPENDIX TABLE C-7

SATISFACTION OF THE GROUP MEMBERS

WITH THEIR PARTICIPATION IN THE EXPERIMENT

1st session	2nd session
1 = Enjoyed very much filling it out	1 = Enjoyed it very much
2 = Rather enjoyable to fill out	2 = Rather enjoyed it
3 = Neither enjoyed nor disliked filling it out	3 = Neither enjoyed nor disliked it
4 = Rather disliked filling it out	4 = Rather disliked it
5 = Disliked very much filling it out	5 = Disliked it very much

Subject Number	1st Session	2nd Session
1-U	2	2
1-V	3	3
1-W	3	1
1-X	2	1
1-Y	1	1
1-Z	2	2
2-U	2	1
2-V	2	1
2-W	4	3
2-X	2	2
2-Y	2	2
2-Z	4	2
3-U	X	X
3-V	2	3
3-W	3	1
3-X	2	2
3-Y	2	2
3-Z	2	1
4-U	2	1
4-V	2	2
4-W	3	2
4-X	2	2
4-Y	3	2
4-Z	2	2

(table continued on following page)

APPENDIX TABLE C-7 (continued)

Subject Number	1st Session	2nd Session
5-U	2	1
5-V	2	2
5-W	3	2
5-X	4	2
5-Y	3	2
5-Z	2	2
6-U	2	2
6-V	3	2
6-W	2	1
6-X	2	2
6-Y	1	2
6-Z	3	2
7-U	1	1
7-V	3	2
7-W	2	3
7-X	2	1
7-Y	1	2
7-Z	3	2
8-U	2	2
8-V	3	3
8-W	2	2
8-X	2	1
8-Y	2	2
8-Z	2	1
9-U	2	1
9-V	2	1
9-W	2	2
9-X	2	1
9-Y	2	2
9-Z	3	1

(table continued on following page)

APPENDIX TABLE C-7 (continued)

Subject Number	1st Session	2nd Session
10-U	3	2
10-V	3	2
10-W	2	1
10-X	2	1
10-Y	2	2
10-Z	1	1
11-U	1	1
11-V	1	3
11-W	2	1
11-X	X	X
11-Y	2	2
11-Z	3	3
12-U	2	1
12-V	2	2
12-W	2	1
12-X	2	1
12-Y	2	2
12-Z	1	1
13-U	2	2
13-V	2	1
13-W	2	2
13-X	1	1
13-Y	2	2
13-Z	2	1

APPENDIX D

ANALYSIS OF THE DATA FOR QUESTIONS 4 AND 7 WITH ALLOWANCES FOR THE NON-SIGNIFICANT SHIFTS OF THE CONTROL SUBJECTS

In Chapter III it is shown that the control subjects did not shift significantly on any of the questions or on the questionnaire as a whole. However, the shifts on questions 4 and 7 do approach significance ($p=.07$ and .18, respectively) and are in the same direction as the group shifts. Therefore, briefly, and without many details, the result of allowing, in one way or another, for these non-significant control shifts will be reported.

The key data from the control subjects is as follows:

For question 4, 7 controls shifted in the risky direction; 1 subject shifted in the cautious direction; 15 subjects did not shift.

Only three shifts were of more than 0.2 units on the questionnaire scale. C-5 and C-7 shifted from 0.5 to 0.1, and C-9 shifted from 0.3 to 0.7.

The net mean number of control subjects who shifted in the risky direction is:

$$\frac{7 - 1}{7 + 1 + 15} = \frac{6}{23} = 0.261$$

For the 23 controls the difference between the first and second session mean riskiness scores on the fourth question is $\frac{106}{23} - \frac{92}{23} = 0.0609$ (lower in the second session).

For question 7 the corresponding data is: 7 risky shifts, 2 cautious shifts, 14 non-shifts. One subject, C-22, shifted more than 0.2 units - from 0.7 to 0.3. The mean number of subjects who shifted is $(7 - 2)/(7 + 2 + 14) = 5/23 = 0.217$. The mean difference in the probability of success demanded is: $\frac{8.0}{23} - \frac{6.8}{23} = 0.0521$.

For the first method of analysis it is assumed that 2 of the group members at the time of the group meeting held positions 0.2 units more risky than they indicated on their first questionnaires. Then the data are rescored. In each case the 2 subjects who, on a scoring basis, would be most likely to cause a cautious shift are the ones for whom the data are "adjusted" in this manner. Two is not a small number to use because with this reasoning the mean number of subjects in a group likely to have shifted between sessions would be ($6 \times 0.261 = 1.6$ for question 4, and $6 \times 0.217 = 1.3$ for question 7).

These adjustments make some slight changes in the significance level of the results. Question 4 shows eight risky shifts and two cautious shifts ($p=.11$). Question 7 shows twelve risky shifts and one cautious shift ($p=.004$). The thirteen groups show one cautious shift and twelve risky shifts ($p=.004$).

For the second method, the means for the subjects are decreased by 6 X 0.0609 = 0.365 for question 4 and by 6 X 0.0521 = 0.313 for question 7. These adjustments do not change any of the data shown in Table III-7.

For the third method, the grand mean for the individual subjects in each group is decreased by (0.365 + 0.313)/12 = 0.0565. With this adjustment eleven groups show risky shifts and two groups show cautious shifts (p=.02).

For the fourth method, the means for the subjects are decreased as they were in the adjustment of the second method. Then new "predictions" are made on the basis of the reduced means. The results for the groups are not changed. The effect upon the individual question analysis is to shift all of the previously starred questions in a cautious direction (e.g., from +* to 0). For question 4 there are nine risky shifts and one cautious shift (p=.02) and for question 7 eleven risky shifts and no cautious shifts (p=.001).