THE MOTIVATIONAL BASIS OF SEX DIFFERENCES IN THE PRISONER'S DILEMMA GAME

Thesis for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

E. ALAN HARTMAN

1972

This is to certify that the

thesis entitled

THE MOTIVATIONAL BASIS OF SEX DIFFERENCES
IN THE PRISONER'S DILEMMA GAME

presented by

E. Alan Hartman

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Psychology

James L Phillips
Major professor

Date August 17, 1972


A153

ABSTRACT

THE MOTIVATIONAL BASIS OF SEX DIFFERENCES
IN THE PRISONER'S DILEMMA GAME

By

E. Alan Hartman

A consistent finding in the research on the prisoner's dilemma game has been that males cooperate more than females when playing against a responsive other participant, while the reverse relationship has been found when playing against an unresponsive other. A theory based on the exploitative-accommodative theory of Edgar Vinacke was developed to account for these results. The basis of this theory was that males and females enter game situations with different motivations: males try to maximize their own gain, while females try to maximize the joint gain and to be fair. The theory also makes different predictions for males and females with regard to their responses to the frustration of these motives: males respond by bargaining with the other participant to gain a satisfactory outcome, while females simply try to leave the situation.

Four different styles of play were developed for a simulated opponent to play against the subjects in this study. These four styles of play or strategies were: 1) contingent (responsive) exploitative; 2) noncontingent (unresponsive) exploitative; 3) contingent accommodative; and 4) noncontingent accommodative. The revised exploitative-accommodative theory makes differential predictions for males and females playing against these four different strategies. Against a noncontingent cooperative strategy males should exploit the other,

while females should cooperate; while against any contingent strategy males should respond to the exploitativeness of the strategy, and females should try to leave the situation.

An examination of the payoff matrix of the prisoner's dilemma game indicated at least five different motives for choosing the "defect" alternative in the matrix. These five motivations were: 1) maximize absolute gain; 2) minimize other's payoff; 3) minimize the risk involved in making a choice; 4) maximize relative gain with respect to the other participant; and 5) attempt to control the other's choices using the payoff matrix. A six alternative matrix was developed to differentiate between these five different motivations for choosing "defect" in the prisoner's dilemma.

This study was designed to test the revised accommodative theory and to determine the motivations for choosing "defect" in a prisoner's dilemma. To accomplish this four factors were varied: 1) the exploitativeness of the simulated other participant; 2) the responsiveness (contingency) of the simulated other; 3) the sex of the subjects; and 4) the size of the matrix.

The results of the study gave only partial support for the revised exploitative-accommodative theory. Several of the predictions were borne out. However, a nonsupportive result was that the females did not respond differentially to contingency of response but only to the exploitativeness of the response, with males continually preferring that alternative which maximized their own gain.

In the six alternative matrix different "defect" alternatives were chosen by males and females under different strategies. The most

prominent difference occurred for the "maximize absolute gain" alternative with females choosing it more under exploitative strategies regardless of contingency than under accommodative strategies. Males, however, chose this alternative as a function of both the contingency and exploitativeness of strategy with more of these choices made under noncontingent cooperative than contingent and fewer made under a contingent accommodative strategy than a contingent exploitative strategy.

THE MOTIVATIONAL BASIS OF SEX DIFFERENCES IN THE PRISONER'S DILEMMA GAME

By

E. Alan Hartman

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Psychology

1972

ACKNOWLEDGMENTS

The author would like to express his appreciation to Dr. James L. Phillips for his help in the preparation of this dissertation and for his guidance over the preceding four years of study. Thanks is also due to Dr. Lawrence Messé for his consistently generous help and suggestions before and during this study. Dr. Thomas Conner, Dr. Leighton Price, and Dr. William Crano also made significant contributions to the design and writing of this study.

Special recognition goes to Bruce Currie and Lawrence (Kip) Burgoyne for their help in running subjects. Mrs. Pat Spellicy, Miss Sue Eareckson, and Mrs. Peggy Smith typed and corrected the entire volume. Without these five people this dissertation would not have been completed in 1972.

Behind every piece of work of this nature there is a woman whose patience and encouragement make it all possible and worthwhile; this dissertation is no exception. The author would like to thank his wife for her faith and understanding during the preparation and completion of this piece of work.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The bases upon which people make their day to day decisions, in general, are not available to the researcher of decision making. This situation is most evident in the political arena where few public officials candidly discuss their reasons for choosing a particular course of action. Because the basis of most decisions is hidden from the researcher, it has been necessary to bring the decision making process into the laboratory.

A great deal of the laboratory research on decision making has employed a situation which commonly has been called a game. One of the most consistent findings in these game situations has been the difference between males and females in the types of decisions made. Although results that indicate sex differences are frequently obtained, the forms that these differences take are often puzzling and inconsistent. However, attempts to unravel this puzzle can best be dealt with in terms of two distinct theoretical frameworks. These two frameworks are the game theory of Luce and Raiffa (1957) and the social interaction theory of Thibaut and Kelley (1967). Game theory focuses on the utilities of outcomes to the participants in decision making situations, while the theory of Thibaut and Kelley focuses on the interaction between the participants within the context of these utilities. The game theory approach is primarily concerned with individual choice in single decision situations, while the interaction theory is primarily concerned with the sequence of decisions made over many decision points and the effect

of previous choices on the decision process.

Theoretical Approaches

Game Theory

The major impetus for the use of the laboratory in the study of decision making in game theory by Von Neumann and Morgenstern (1947) and by Luce and Raiffa (1957). Particularly it was the work of Luce and Raiffa that demonstrated clearly the usefulness of mathematical game theory in the empirical study of decision making.

Luce and Raiffa's theory of games involves the concepts of conflict of interest and partial control over one's own outcomes. These concepts are the integral part of many interpersonal situations which, therefore, can be viewed as "games." This theory of games is based on three assumptions: 1) that each outcome has a certain utility for each participant; 2) the utility of each outcome for each participant is known by all participants; and, 3) the participants in the situation are rational. These assumptions define a situation in which each participant knows the outcomes for each decision he might make and he prefers the outcome which has the highest utility. This means that the externally defined outcomes are related to the (internal) utilities.

One of the most useful concepts presented by Luce and Raiffa was that of the normal form of the game. This manner of presenting the structure of the game defines the outcome to each participant for each of the possible combinations of choices. The normal form of the game is produced by assuming that each participant has a set of strategies. These strategies are defined as rules which determine the entire sequence of decisions that each of the participants would make during the game. The participants, instead of being presented with a choice of one move

or another within the context of the game, are given a choice of all of their possible strategies. From this concept, Luce and Raiffa reduce games of many moves and decision points into a single move, in which all of the participants choose one of their strategies. These combinations of strategy selections define how the game is played and define the outcomes for each of the participants.

To present a game in normal form it is necessary that: 1) the participants do not know the strategy choices of the other participants; and, 2) the outcome for each participant for each combination of choices is defined and known to the participants. One of the simplest situations that the normal form can represent is that of a two participant game. Each combination of simultaneous choices by the pair results in particular outcomes for each participant and these outcomes have a utility to each participant.

Through the normal form of the game a matrix can be constructed with participant one's possible choices defining the columns and participant two's possible choices defining the rows of the matrix. Within each cell of the matrix are the outcomes to each participant for the combination of choices defined by the column and row. This particular representation of a game is called the payoff matrix. The normal form of the game thus makes clear the dependence that each participant's outcomes have on his own choices and those of the other participant.

The normal form of the game also offers a framework within which to evaluate the degree to which participants are in a conflict of interest. One way to determine the degree of conflict of interest is to rank order the combinations of choices for each participant in terms of their utility. For the two person situation this means two such orderings will

be generated, one for each participant. These orderings of combinations of choices are called preference orderings. A conflict of interest exists to the extent that the preference orderings differ. The highest degree of conflict of interest is the situation in which the preference orderings are completely reversed; conversely, no conflict of interest exists whenever the most preferred combination is the same for both participants.

Since decision making in interpersonal situations is a very complex process, most studies of it have been limited to examinations of two person interactions. However, even with just two participants, the the decision making process is still too complex to study effectively if each person has a large number of choices. One approach to the problem has been to reduce the number of choices to two. Thus the basic situation with which game theory has been concerned is that of a two person, two choice situation. Table 1 displays the general two person, two choice situation. Matrix 1 in this table presents the symbols designating the four combinations of choices, with each symbol composed of a two letter combination (A and/or B). The first letter in the symbol represents the choice of participant one and the second letter the choice of participant two. Matrix 2 in Table 1 presents the general payoffs for the two participants. Each payoff is also symbolized by a two letter combination (a and/or b) with the first letter representing the choice of the participant receiving the payoff and the second letter the choice of the other participant.

A two person, two choice game results in a payoff matrix with four cells. A particular class of games defined by these two by two payoff matrices has been called mixed motive games. These games are

Table 1.

The general two person, two choice situation.

Matrix 1: Cell designations

		Participant 1	
		A	B
Participant 2	A	AA	BA
	B	AB	BB

Matrix 2: Payoff designations

		Participant 1	
		A	B
Participant 2	A	aa / aa	ba / ab
	B	ab / ba	bb / bb

characterized by two conflicting motives: The motive to cooperate and the motive to compete. These conflicting motives are apparent in the preference orderings of the outcomes for each participant for the four cells. The preference orderings show the competitive aspect of the game in that the most preferred outcome for one participant is one of the less preferred outcomes for the other participant. The cooperative aspect of the game is derived from the convergence of the preference orderings with respect to intermediate outcomes.

The mixed motive game which has been used primarily in the research on decision making has been the prisoner's dilemma game. This game is defined by the preference orderings of the payoffs in the matrix. For a prisoner's dilemma to exist, each participant must prefer the payoffs in the order ba, aa, bb, ab. This means that participant one prefers the cells in the order of BA, AA, BB, AB, while participant two prefers the cells in the order of AB, AA, BB, BA. A prisoner's dilemma also exists if the preference orderings for both participants are reversed. An added requirement is needed if the game is to be played for many trials. If a prisoner's dilemma is to exist over many trials the following restrictions also must hold $2aa > ab + ba > 2bb$. As the preference orderings indicate, the most preferred combination of choices for each participant is the least preferred combination of the other. The second most preferred combination for both participants is the AA cell.

Another concept that game theorists have introduced, which is of use in the exploration of sex differences, is that of a strategy. Strategies have been defined as complete specifications of what choice to make in any situation. Game theorists have traditionally used the concept of strategy to reduce many move games to a single move. This

move then consisted of multiple alternatives where each alternative was a specific strategy. Throughout the remainder of this paper, however, the term strategy is used in a slightly different manner. When subjects must choose between the same set of alternatives (strategies) many times, the rules by which they make their choices are also called a strategy in the present discussion. In a sense, these rules constitute a super strategy that governs the selection of strategies (as defined traditionally).

In the prisoner's dilemma game participants may enter the situation with different goals and the manner in which they go about reaching their goals is their strategy. It is the concept of strategy that allows the investigation of game playing behavior in more complex and theoretical terms. Motives generally are not accessible directly, since participants typically are not aware of the reasons underlying their behavior or, if aware of the reasons, they cannot articulate them very well. While their motives are not observable, their choices are, and from these choices their strategies can be inferred. Game theory, however, offers only normative solutions to games: it is the participants who offer the practical solutions of cooperation or defection within the interactive process of the game.

Behavior Theory

While the game theorists have developed an extensive theory of how games should be played, based on the utilities involved for a single decision game, they seldom have addressed themselves to the behavioral aspects of repeated plays of the same game. In general, they have treated the situation as a single decision for one individual, an approach which ignores the interaction between participants in a repeated

game s

each p

and Ch

the pr

ences

males

repeat

interp

the ga

choice

were p

Th

is the

since,

tions o

Thibaut

particip

activiti

and to s

dilemma

below.

Each

tween two

for the c

is defined

Within the

defined by

game situation, where previous decisions were likely to have affected each participant's decision on subsequent plays of the game. Rapoport and Chammah (1965) have pointed out this aspect of choice behavior in the prisoner's dilemma game during their discussion of the sex differences which they found in their study. They found that males and females did not differ in their choices on the first few trials of a repeated prisoner's dilemma game but did so after 200 trials. They interpreted this finding to mean that males and females did not enter the game with different tendencies to make the cooperative or defect choices, but that in the process of playing the game the differences were produced.

Thibaut and Kelley (1959) have formulated the behavior theory that is the most relevant to decision making in interpersonal situations since, like game theory, it uses a payoff matrix to describe combinations of behaviors for the various participants in a relationship. Thibaut and Kelley define matrices within which the utility to each participant in the relationship is presented for each combination of activities in which the group may engage. To simplify the discussion and to show the applicability of their theory to the prisoner's dilemma game only a two choice, two person relationship is outlined below.

Each of the two participants in the relationship has a choice between two behaviors. There is a payoff or gain for each participant for the combined activities chosen. Thus, a two by two payoff matrix is defined over the two possible behaviors for each of the participants. Within these dyadic relationships, these matrices of utilities have been defined by Thibaut and Kelley as possessing particular qualities. Two

matrix forms of particular interest are those which involve what Thibaut and Kelley have called behavior control and fate control.

A matrix in which participant A has behavior control over participant B is presented in matrix 1, Table 2. Participant A is able to induce participant B to choose the behavior that A prefers. In matrix 1, presented in Table 2, participant A prefers that participant B chooses behavior B2, so that A can choose A1 which gives him his highest payoff in the matrix. Participant A is able to induce participant B to choose B2 by choosing A1, since B will receive a payoff of 4 if he chooses B2 and he receives a payoff of 1 if he chooses B1. This type of matrix allows participant A to receive his highest payoff because B receives very low payoffs for not choosing A's most preferred cell.

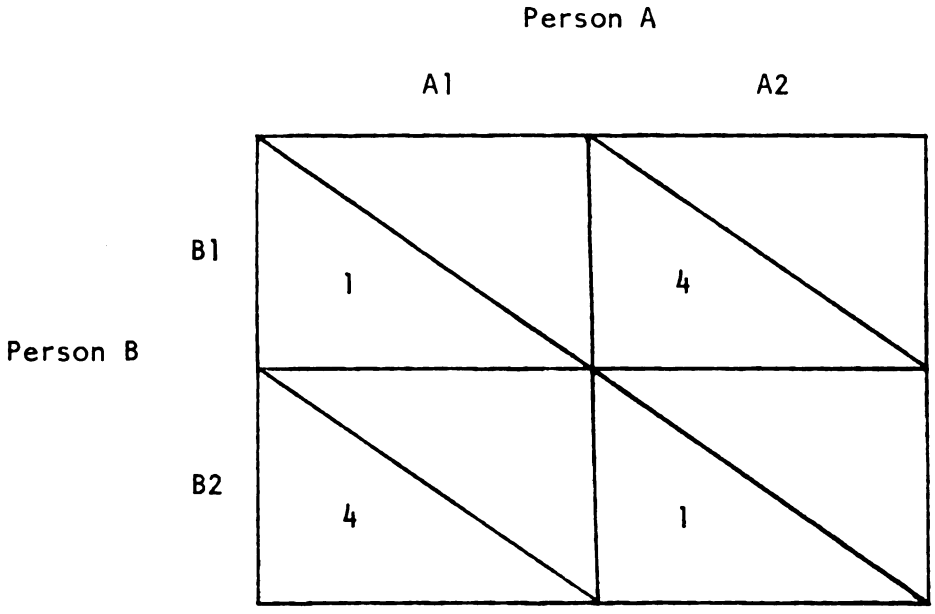
An example of fate control is presented in matrix 2, Table 1. In this type of matrix, participant A determines B's gains by his own choice. If participant A chooses A1, he guarantees that participant B will receive a payoff of 4 while if A chooses A2, he guarantees that B will receive a payoff of 1. Participant B has no control over his own payoffs; they are completely determined by participant A's choice. In this situation, B has no preference between his choices since his payoffs are only determined by A's choice. Participant A, however, can give B a reason for preferring one behavior over another by responding on the next trial to one behavior by giving B a payoff of 4 and responding to the other behavior by giving B a payoff of 1. Participant A in effect can reward and punish B for his choices. It is in this way that fate control can be converted to behavior control.

The crucial difference between behavior control and fate control employed as behavior control is that in the former, participant B

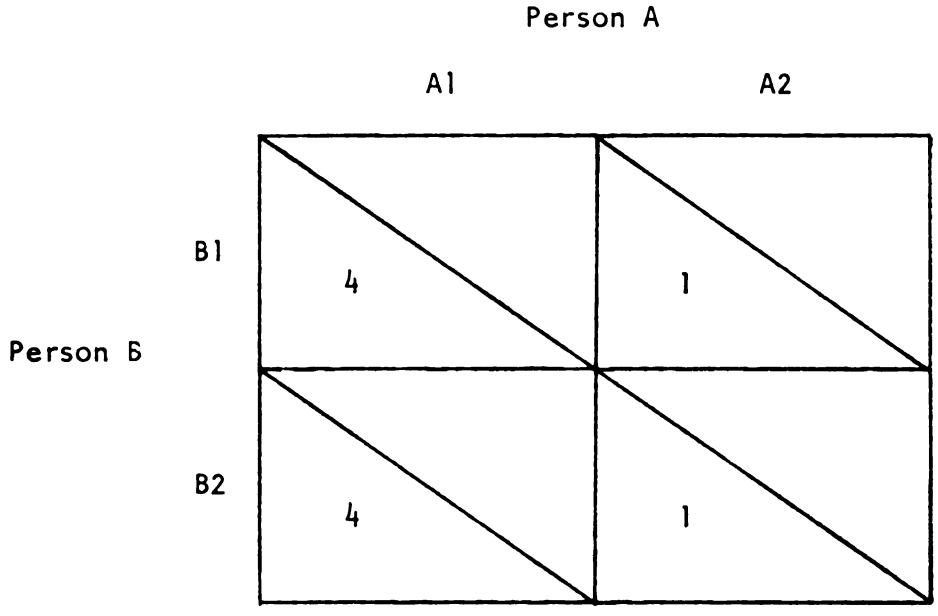
Table 2.

Examples of behavior control and fate control situations.

Matrix 1: Behavior control



Matrix 2: Fate control



punishes himself on that trial for not choosing the behavior that A desires, while in the latter situation, participant B can only be punished on the next trial for not choosing correctly in an earlier trial.

This approach to decision making situations takes on particular significance when considering the prisoner's dilemma game. In this game, the payoff matrix is of the form presented in matrix 1, Table 3. In matrix 2 of this table, the payoffs to participant B are presented to emphasize the fate control aspects of the situation. In terms of matrix 2 in Table 3 this means that if participant B chooses to cooperate, he receives 4 if A cooperates and 0 if A defects and if B chooses to defect, he receives 6 if A cooperates and 2 if A defects. Whether participant B cooperates or defects, he will receive a worse outcome if A defects than if A cooperates. This shows that each player, by choosing to defect, can guarantee that the other participant will receive the lowest outcome for whatever choice he makes. This is a condition of mutual fate control.

Application of the Theories to the Prisoner's Dilemma

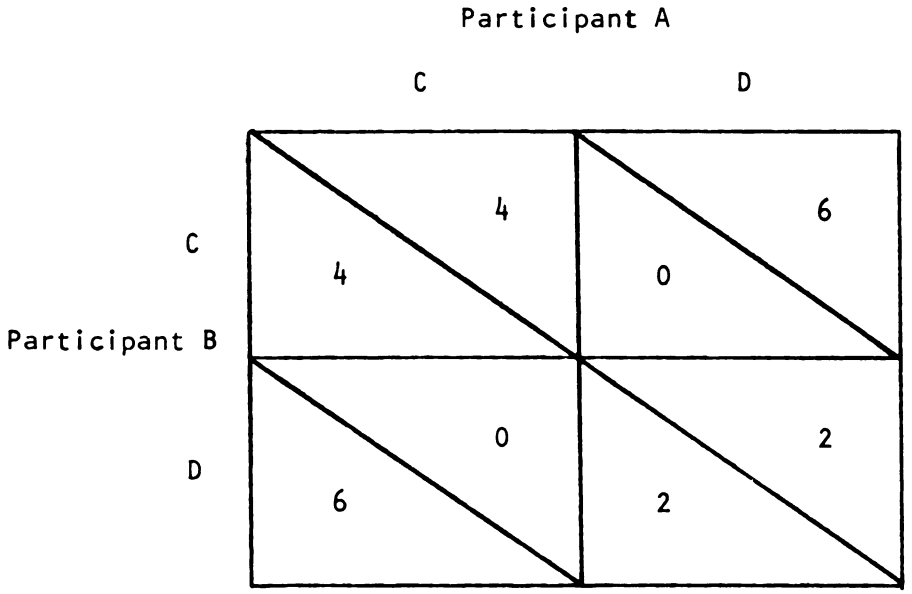
The two theoretical approaches presented above, while both employing the payoff matrix, focus on two different aspects of decision making. Game theory focuses on the payoff matrix and rational behavior with respect to the payoffs in that matrix. The theory of Thibaut and Kelley focuses on the behavioral aspects of the decision making situation within the context of the payoff matrix.

Each of the above theories suggests a different approach to the study of choice behavior in the laboratory. Game theory suggests an approach that focuses on the payoffs to the chooser and the other participant in a single decision situation. The theory of Thibaut and

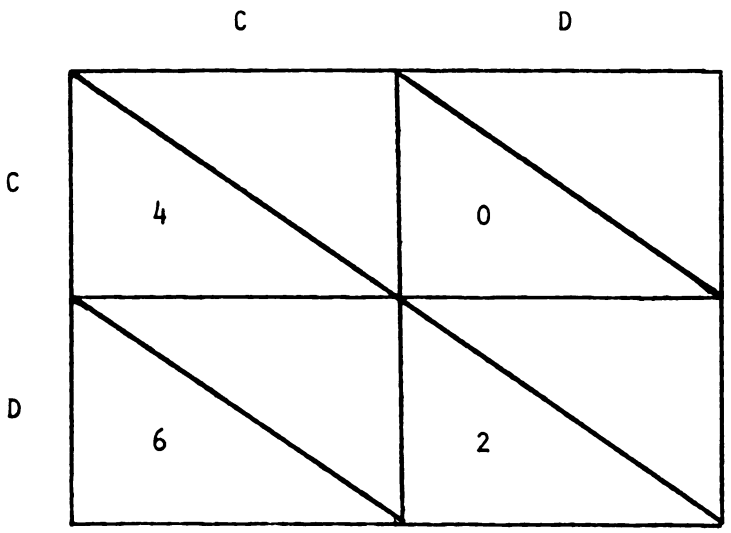
Table 3.

A complete and partial prisoner's dilemma game payoff matrix.

Matrix 1: Complete payoff matrix



Matrix 2: Participant B's payoff only



Kelley focuses on the process involved in making repeated decisions and thus directs research toward the mechanisms of decision making.

Payoff Matrix Characteristics

Within a payoff matrix, there are three aspects to the payoffs for any choice that is made: 1) the payoffs to the chooser; 2) the payoffs to the other participant; and, 3) the relationship between these two payoffs. Whichever choice is made implies particular motivations to the chooser depending on the three aspects of the payoffs for that choice.

The "cooperate" alternative in the prisoner's dilemma game gives the chooser either his worst or second best outcome. This alternative also gives the other participant the best outcome that he can receive, no matter his own choice, and it also guarantees that the other participant will do at least as well as the chooser. These outcomes suggest only one motivational determinant, that of maximizing joint gain. By choosing cooperatively both players combined will do better than they would if one or both chose the "defect" alternative.

As opposed to the "cooperate" alternative the "defect" alternative suggests many motivations for its choice. The "defect" alternative in the prisoner's dilemma results in the following outcomes: 1) the chooser avoids his maximum loss and gains more despite what the other chooses; 2) the other participant is guaranteed his worst outcome despite what he chooses; and, 3) the chooser is guaranteed as much or more than the other participant.

The first outcome suggests a motive to maximize own absolute gain. By choosing to defect the chooser is guaranteed a better outcome, despite what the other chooses, than if he had chosen to cooperate.

The second motivational determinant of the defect choice, suggested

by the outcomes of that alternative, could be called vindictive. This choice guarantees that the other participant will receive less despite his choice than if the chooser had chosen to cooperate. Bixenstine and Wilson (1963) have indicated just such a motive may have been salient for some of their subjects. In their study, females were more cooperative than males but punished any noncooperation by the other participant.

The third motivational determinant is that of maximizing differences because the chooser is guaranteed at least as large a payoff as the other. Minas, Scodel, Marlowe, and Rawson (1960) indicated that this motivation was employed by their subjects in a two person non-zero-sum game.

Table 4 presents a summary of the motivational determinants for each of the choices in the prisoner's dilemma game. It must be emphasized that these motivational determinants apply only to single choice games in which repeated choices by the other will not affect the choices made. In games of repeated choices the interaction between the participants affect the choices made.

It is assumed that all subjects entering a prisoner's dilemma game play the game with a particular motivation, whether this motivation is to maximize absolute gain, relative gain, joint gain, or to minimize loss. If the other participant in a prisoner's dilemma game always chooses cooperatively or always chooses competitively, the subject would be able to choose that alternative which will best satisfy his particular goal. If the other participant does not choose one alternative 100% of the time, the subject is faced with the problem of satisfying his desires when he does not know with certainty what the other will choose

Table 4.

Motivational determinants of each choice in a prisoner's dilemma game.

C	Maximize joint gain
D	Maximize absolute gain Maximize relative gain Minimize other's payoffs (vindictive)

on the next trial of the game. It is in the response to this non-100% choice of the other that sex differences tend to emerge. Following is a theory that addresses itself to the problem of repeated interactions in a many choice game.

Mechanisms of Decision Making

Vinacke's Original Theory. The theory to be presented was originally developed by Edgar Vinacke in several different studies (Bond and Vinacke, 1960; Uesugi and Vinacke, 1963; Vinacke and Gullicksen, 1964; Vinacke, Lichtman, and Cherulnik, 1967; and Vinacke and Arkoff, 1959) of coalition games. Vinacke asserts that males are exploitative in their goal seeking behavior because they try to maximize absolute gain at any cost to the other participant. Females, on the other hand, are accommodative since they try to give an equal payoff to all participants. Females attempt to maximize their gain, but they do so within a prescribed set of behaviors. Although this theory appears adequate for the results from coalition studies, it has been less predictive of the results from the prisoner's dilemma studies. This theory would predict that females would be more cooperative than males in a prisoner's dilemma game; however, several studies have found females to be more competitive than males.

In response to this contrary evidence Vinacke (1969) revised his theory. Vinacke claimed that females were accommodating to the experimenter because they perceived that the experimenter wanted them to compete and thus did so. This revision is no more tenable than the original version, since several studies also have shown that females are more cooperative than males (Tedeschi, Bonoma, and Novinson, 1970; Schlemker, Bonoma, Tedeschi, and Pivnik, 1970; and Komorita, 1965).

It is the study by Komorita that most clearly refutes the revision. Komorita found that females cooperated more than males when playing against a simulated opponent who cooperated on a 50% or 75% random basis. Males, on the other hand, cooperated more than females when playing against a simulated opponent who responded with the subject's last choice. It is not at all clear why the demand characteristics of competition should be more evident to the females in one situation than in the other. This is particularly puzzling considering that the percent of cooperation by the simulated other participant in the 50% random cooperate and the contingent conditions was essentially the same.

Revised Exploitative-Accommodative Theory. A possibly more realistic revision of this theory consists of the following premises. Males and females enter the situation with different goals; males try to maximize absolute gain while females try to maximize social welfare (joint gain) and to make an equal division of the payoff. When males and females are confronted with an opponent who does not cooperate or defect 100% of the time, they are both frustrated in their respective goal strivings. Males, in response to this frustration of their goal, attempt to convert their fate control over their opponent into behavior control. This conversion is essentially bargaining with the other participant by indicating that the subject will compete if the other competes and he will cooperate if the other cooperates. Females on the other hand respond to this frustration by trying to withdraw from the situation. In a prisoner's dilemma game, choosing defect can be considered a form of withdrawal. The defect chooser need not consider the choice of the other participant since he is guaranteed of not receiving his lowest payoff.

By choosing defect the other has less control over the chooser's outcomes.

Some research that offers evidence for this approach is that of Shomer, Davis, and Kelly (1966). They indicated that males used threat as a means of communication more often than did females, a result which supports the position that males bargain after goal frustration.

Review of Sex Differences

Although many studies have indicated significant differences between males and females, the direction of these differences has not always been the same. In the studies to be reviewed there are some consistencies that bear mentioning before the review is presented.

In most studies in which males are found to be more cooperative than females, the subjects were playing against a responsive opponent. That is, they were playing against a strategy which was contingent in some manner on what the subject chose. These contingent strategies have been produced either by a simulated opponent playing a strategy which required a particular response for each choice made by the subject or by a real opponent who tended to make responses systematically as a function of the other's behavior.

In most of the studies in which females were more cooperative than males, the strategy of the other participant was a noncontingent strategy. A noncontingent strategy is characterized by a simulated other who responds according to some preset probability of random choice or with some preset sequence of choices, regardless of the choices of the subject.

These results are consistent with the theoretical positions

presented previously. The accommodative-exploitative theory predicts these differences since females are frustrated in their attempt to maximize social welfare and thus respond with defection. Males use the situation to bargain with the other participant. In the contingent situation the other participant responds to him and thus the bargaining is successful. If the other is responding to the subject's choices, the subject chooses cooperatively since that is the optimum strategy against a contingent other. The female is less concerned with determining the other's strategy so she chooses as a function of the payoff matrix and the number of times the other has cooperated. In summary: the exploitative-accommodative theory predicts bargaining behavior by the male which, in the contingent situation, leads to cooperation; females in this situation, try to withdraw and are reinforced for this withdrawal by the continued defection of the other participant.

Several studies have indicated that females are more cooperative than males. Most of these studies employed a simulated opponent who played a noncontingent strategy. These strategies varied the percent cooperation from the simulated other from 25 - 90%.

For those situations in which the simulated other cooperates a high percentage of the time, the accommodative-exploitative theory predicts that both males and females will be able to achieve their respective goals. A high amount of cooperation results in females cooperating to maximize social welfare and to give an equal division of the payoffs. Males in this situation also are able to maximize gain since the simulated other cooperates despite the choice made by the subject.

In those situations in which percent of cooperation is low, the accommodative-exploitative theory predicts that both males and females

will be frustrated. Females trying to maximize social welfare and equal division of payoffs are frustrated by the simulated other who cooperates on only 50% or fewer of the trials. This frustration should lead to defection as a withdrawal from the situation. Males also are frustrated by the low level of cooperation. When males try to bargain with the opponent they again are frustrated because the other participant does not respond. This nonresponse by the simulated other forces the males to defect as the only solution to maximizing gain.

The following review of the sex differences literature within the prisoner's dilemma game will be separated into three sections: 1) males found to cooperate more than females; 2) females found to cooperate more than males; and, 3) conflicting results within the same study.

Males Cooperate More than Females

Bixenstine, Chambers, and Wilson (1964) used an asymmetrical prisoner's dilemma game with males and females playing in same sex pairs against a simulated other who played an 80% matching strategy. This means that the other participant was playing a strategy contingent on the choice of the subject. The subjects were in the powerful position for one series of trials and in the weak position for one series of trials. The results indicated that males were more cooperative than females, and that females were more likely to retaliate to exploitation with defection while males were more tolerant of exploitation and to employ it more often.

Since males enter the situation with the motivation to maximize gain they would less resent this strategy in someone else and therefore be more tolerant of it. If females entered the situation with the motivation to maximize social welfare, they would be less tolerant of

exploitative behavior that frustrated this motive. Thus this study seems to support the exploitative-accommodative approach. Another possibility however, is that males and females were just following their pattern which is consistent for contingent play and that the researchers inferred a vindictive style on the part of the females. Whichever approach is taken this study alone is not a refutation of the theory presented.

A study performed by Bixenstine and O'Reilly (1966) used males and females in same sex pairs with electric shock as well as money as payoffs. Shock increased cooperative behavior for both sexes but much less so for females. The general findings of this study indicated that females were less trusting and they respond more resentfully, conservatively, and competitively than did males. Females also did not understand as well as males what the optimum strategy was in the game.

This study seems to offer support for the theory in that the authors indicate that females are less understanding of the situation, play a conservative or less risky strategy, and that they respond vindictively and competitively.

Oskamp and Perlamn (1965) used males and females in same sex dyads for 30 trials. These subjects were drawn from a small college population. The results, which indicated that males were more cooperative than females, added support to the theory in that the other two studies were performed at Kent State University, a much larger university.

A very interesting study performed by Sampson and Kardush (1965) used children in a summer camp. These subjects played a prisoner's dilemma game for candy during their game period at camp. They competed in same sex dyads with the age of the children, race and socio-economic

status of parents used as independent variables. Because of the low frequency of Black children particularly in the high socio-economic category, the analyses performed were on collapsed cells, systematically ignoring certain of the independent variables. The results of this study indicated that for White children there was an interaction between age and sex with respect to percent of cooperation; younger males were less cooperative than older males and younger females were more cooperative than older females. Thus, if the accommodative-exploitative distinction is valid, this study seems to indicate an increasing conformity to appropriate sex roles with increasing age.

After the experiment the authors questioned the children to determine the motivation for the choices made. The results of the questioning were categorized by type of response: 1) risk taking; 2) competitive; or, 3) polite collaboration. Again a sex interaction appeared. With respect to risk taking, younger females indicated concern 22% of the time while older females were concerned with the risk involved 71% of the time. Regardless of age males seldom mentioned this aspect of the game. Competitive responses were similar for both sexes but decreased from younger to older with males decreasing from 32% to 28% and females decreasing from 33% to 14%. The category "polite collaboration" again produced a sex by age interaction with males increasing their percent in this category from 26% to 43% with an increase in age while females showed just the opposite trend in that they decreased from 44% to 14% with an increase in age.

This study points out most clearly the relevance of the risk involved in the prisoner's dilemma and the differential attention that males and females pay to it. The results of the questioning also seem

to be of relevance for the accommodative theory since females seem to be no more interested in the cooperative aspects of the game than were males. This may have been due to the fact that females in the older bracket were 10 and 11 years old and just entering adolescence. What effect adolescence might have on game playing behavior certainly isn't clear but this negative result is not enough to discount the accommodative-exploitative theory.

In all of the above studies males and females have played in same sex dyads with the result that females were found to be more competitive than males. A study which did an extensive analysis of same sex and mixed sex dyads was done by Rapoport and Chammah (1965). In this study males and females played either another male or a female for 200 trials. The subjects actually played the game and no simulated other was employed. The general findings were that female dyads were more competitive than male dyads and mixed dyads were between these two. Female dyads started out at nonsignificantly more cooperative than males but showed a decrease in cooperation over the 200 trials. The authors indicate that in mixed sex dyads males bring females up in cooperative responding and females bring males down in percent cooperative responding. The authors also indicate that it is the process of playing the game that differentiates between males and females and not any preplay preferences for one response or another. The differences that did appear did not do so until after trial 50, which seems to indicate some minimum number of trials necessary for the emergence of sex differences in contingent situations.

Females Cooperate More than Males

In contrast to the studies presented previously there are several studies which indicate that females are more cooperative than males. Aranoff and Tedeschi (1968) used two matrices; one of high and one of low conflict. The subjects played in same sex pairs with females producing more cooperative-cooperative choices than males in the low conflict matrix. The subjects were given an original stake and then played the game for 200 trials. The authors claim that sex differences occur only in low conflict situations. The result from this study is at odds with much of the previous research using contingent situations. However, even though the cooperate-cooperate responses differentiated between males and females there was no overall difference in the amount of cooperation.

Schlenker, Bonoma, Tedeschi, and Pivnick (1970) found that in a prisoner's dilemma game a noncontingent 50% cooperative strategy produced more cooperation in females than in males. An interesting interaction between sex of subject and exploitative behavior by the simulated other was found. The simulated other sent two messages containing threats to the subjects: 1) a compellence threat, "If you do not choose cooperatively on the next trial, I will take 10 points away;" or, 2) a deterrence threat, "If you choose competitively on the next trial, I will take 10 points away." After the threat was sent the simulated other was either exploitative or cooperative on the next trial. If the other was exploitative, females had the lowest percent cooperation of all conditions and sexes. Females in the compellence-exploitative condition had significantly fewer cooperative choices than females in the other three conditions or males in the compellence condition.

The finding that females defect more in an exploitative-compellence condition is quite interesting. In the compellence condition the exploitative behavior is the most obvious since the emphasis is placed on cooperating not competing. This would offer support for the accommodative-exploitative theory since females seem to be responding to the exploitative behavior in a negative way. It does seem that while females choose defect in this situation it may not be a withdrawal choice but a choice to punish the other for his exploitative behavior which females do not accept. The general results of this study offer support for the theory that females were more cooperative in a noncontingent situation than were the males.

Tedeschi, Powell, Lindskold, and Gahagan (1969) had males and females in same sex dyads play against a preprogrammed 25% cooperative strategy for 110 trials. This situation was similar to the previous study in that the simulated other could send threats. However, in this study the subjects were able to reply to this threat with a note that indicated cooperation on the next trial, competition on the next trial or did not indicate what they were going to do. The only sex differences found were that females were more cooperative over the last 20 trials than males and females were more truthful in their responses than were males. In this situation, where the subjects are playing against a noncontingent strategy, the theory predicts that females will cooperate more than males. The fact that this difference does not appear until the last 20 trials may be due to the very low percentage of cooperative responses.

Tedeschi, Lesnick, and Gahagan (1968) used the same procedure as in the above two studies for 100 trials against a preset 50% cooperative

strategy. Females were more cooperative on trials 2, 5, and 10 but the differences disappeared by the end of the 100 trials. This finding is at odds with the finding of Komorita (1965) which found that in over 80 trials females were more cooperative than males playing against a strategy which responded to a cooperative choice with cooperation on 50% of the trials. This study again employed note sending and this may have produced the inconsistent result, or it may be that 50% cooperate is too low to produce any sex differences, with males and females both defecting.

Tedeschi, Bonoma, and Novinson (1970) used the same experimental design as in the previous studies with the difference that subjects could send threats and impose fines for noncompliance. If the subjects imposed a fine they could either lose 5 points themselves (fixed cost condition) or the simulated other could retaliate by taking 5 points away. These two conditions were called the fixed cost and retaliation conditions and the study was run for 150 trials. The results indicated an interaction between sex and condition with females sending fewer threats than males in the fixed cost condition but sending almost the same number in the retaliation condition. The percent of cooperation indicated that females were more likely to cooperate in the retaliation condition while males cooperated 85% of the time in the fixed cost condition and 20% of the time in the retaliation condition. There was an overall sex difference with females more cooperative than males.

The last study to be presented in this section is that of Tedeschi, Bonoma, and Lindskold (1970). These researchers used the same procedure as the above studies and again found that females were more cooperative after threats and over all.

All the studies presented in this section used some form of communication and rather low percentage of cooperation by the simulated other. While the results have been to some extent consistent it would certainly seem that both of these factors would tend to mitigate any differences that might be present. The process of sending notes may make the interpersonal aspect of the situation more salient to both males and females but it may affect females more than males. What seems to be a plausible hypothesis is that females only attend to the interpersonal nature of the situation when it becomes apparent and only then do they respond by vindictive behavior.

Definitive Studies

Three studies have made direct comparisons between the contingent and noncontingent strategies. Komorita (1965) used males and females in an 80 trial prisoner's dilemma game. In the noncontingent situation the probability of cooperation from the simulated other given cooperation by the subject on that trial was varied, using values of .25, .50, and .75 for this probability. Also in the noncontingent situation the probability of defect by the simulated other given a defection from the subject was varied over the same values. These two factors of three levels each were combined in a factorial design producing nine different combinations of cooperation given cooperation and defection given defection. In the contingent situation the simulated other played a tit for tat strategy in which he echoed on trial n the response of the subject on trial n-1. The results of the study showed that females increased cooperation over the values of noncontingent cooperation given cooperation while males consistently played a 10% cooperation over all values. In the tit for tat situation the males cooperated more than the females

with the probability of cooperation in that situation being .48 for males and .23 for females. These results add to the evidence presented previously with respect to the contingent-noncontingent dimension. Males cooperate more in a contingent situation while females cooperate more in a noncontingent situation.

There are some problems in interpreting Komorita's results due to the design used in the study. Each level of probability of cooperation given cooperation was combined with each level of defect given defection. These combinations meant that the subjects in some conditions received inconsistent information. An example of this inconsistency is the situation in which the other participant responded to cooperation with cooperation on 25% of the trials and responded to defection with cooperation on 50% of the trials. This, in effect, appeared as a contingent strategy to the subject since the other responded differentially to cooperation and defection. This confusion causes problems for the direct comparison of contingent versus noncontingent strategies.

In an attempt to solve some of the problems of the Komorita study and to make a more accurate comparison between contingent and noncontingent situations O'Grady (1970) performed a study using males and females in a 90% noncontingent cooperate or a 90% tit for tat condition. Again males cooperated more than females in the contingent situation and females cooperated more than males in the noncontingent situation. An interesting result of this study was that females in the contingent situation cooperated less than the females in the noncontingent situation and males in the contingent situation cooperated more than males in the noncontingent situation. This result indicates that males and females are responding differentially to each condition and that the

previously found interaction between sex and strategy was not due to differential responding by one sex or the other.

Kahn, Hottes, and Davis (1971) also varied the contingency of response. They found both males and females were more cooperative with a contingent strategy than with a noncontingent strategy. A trial by strategy by sex interaction did appear. Males in the contingent situation increased cooperation over trials while males in the noncontingent situation did not. Females in the noncontingent situation decreased cooperation over trials while females in the contingent situation did not. On the later trials in the game males discriminated between contingent and noncontingent strategies while females did not. However, on a questionnaire males and females showed no differences in understanding contingent versus noncontingent play.

One of the most extensive studies with mixed-motive games was performed by Sermat (1967). Four separate experiments were performed with males and females. Three of these studies followed the same format and design: thirty trials of 100% noncontingent choices were followed by a trial on which the other either cooperated or defected and then this was followed by 200 trials of tit for tat choices by the simulated other.

Experiment 1 indicated no sex differences. Experiment 2, however, indicated that males who received 30 trials of competition were more cooperative than any other sex or condition while females who received the competitive 30 trials were half as cooperative as the females who had received the cooperative 30 trial pretreatment. A very interesting result of the pretreatment was that <u>both</u> sexes exploited the other participant. It was indicated to the subjects that the other participant would not know which choice they had made so the anonymity of the situation may

have caused this effect. Despite the cause, the fact that females exploited the other, i.e., chose competitively in the 100% cooperative situation, is a very interesting result and seems contrary to most of the previous results presented.

Experiments 3 and 4 were designed to test differences between the prisoner's dilemma game and a chicken game. In the fourth experiment the simulated other played a tit for tat strategy over all 232 trials while experiment 3 followed the same design as experiments 1 and 2. As opposed to the prisoner's dilemma game a competitive strategy by the other produced more cooperation than the prisoner's dilemma game. The reason is rather obvious; in a chicken game playing against a defect strategy the optimum strategy is to cooperate. The interesting aspect is that no sex differences were reported for these situations.

All of the studies presented above offer support to the revised exploitative-accommodative theory. As was pointed out earlier, the sex by strategy interaction is predicted by the theory. The results from the Kahn, Hottes, and Davis study indicate that males increase cooperation over a contingent situation which is predicted by the accommodative-exploitative theory. In a contingent situation males successfully bargain for mutual cooperation. One anomalous result was that females decreased the amount of cooperation over trials in the noncontingent situation. However, females were shown at the end of the game not to discriminate between contingent and noncontingent strategies while males did make the discrimination.

The results of the Sermat study with respect to the exploitative behavior of males and females indicated that females as well as males were willing to exploit the other if he cooperated 100% of the time.

The accommodative-exploitative theory, however, predicts that females would cooperate more with a 100% cooperative strategy because this maximizes social welfare as well as equalizes payoffs. This is not conclusive evidence against the exploitative-accommodative theory since the game was played for only 30 trials and the differences between males and females may not have had time to develop. There certainly are problems of subject suspicion with a 100% cooperative strategy. Sermat does not address himself to this problem which leaves one to wonder about the validity of the data.

No Sex Differences Found

Several studies have reported no sex differences in the mixed-motive game. Of these studies a few have involved less than 50 trials. Lutzker (1961) used a chicken game with mixed sex and same sex dyads for 30 trials and found no differences. Kanouse and Wiest (1967) found no differences in one trial paper and pencil prisoner's dilemma. Komorita and Mechling (1965) had males and females play against a simulated other. The experiment was only terminated after the subject had responded with five consecutive cooperative responses following a defection. The largest mean number of trials for any condition was 30. The final study using less than 50 trials was performed by Miller (1967) and again no sex differences were found. These results lend support to the finding by Rapoport and Chammah (1965) that sex differences do not emerge until later trials.

Bixenstine, Potash, and Kellogg (1963) conducted a study in which the first 30 trials were 83% random cooperation or 83% random defection, after which there were 60 trials of 83% matching. The results for the last 60 trials were the same as for the first 30; no differences between

the sexes in the percent of cooperation. Also no differences were found between the 83% random cooperation and the 83% random defection. The results of the Rapoport and Chammah study again come to bear. These authors have indicated that at least 60 trials are necessary for any sex differences to appear. The intrusion of the 60 trials of contingent strategy may have suppressed any sex differences that were about to emerge. The conflicting sex differences may have cancelled each other out.

Hurst (1969) used males and females in a mixed-motive game after they had been given drugs. The author reported no sex differences but he had only a few females in the study. Despite the small number of females the author indicated that females approached the game in a cooperative spirit but responded to defection strongly. Again this is an inference about the motivation for choosing the defect alternative.

A rather interesting study was performed by Evans and Crumbaugh (1966) in which males and females played a prisoner's dilemma in same sex dyads. They played a nonmatrix form of the game for 100 trials and no significant differences were found. It might be that the nonmatrix form of the game eliminates any sex differences. The exact reason for this is not immediately obvious.

Horai and Tedeschi (1969) had males and females play a simulated other for 150 trials with a 50% random cooperation strategy. The 54 trials on which threats were sent to the subject to coerce him into cooperation were always defection trials. No difference was found in this situation in percent cooperation but they did find that males lied significantly more often when replying to the threat than did females. The authors explain the difference in terms of the relevance of the game

playing sit

males. The

that the se

and the ver

Pruitt

forms of a

These four

between male

prising cons

form resulte

vious soluti

readily expl

of sex diffe

situations ma

Def

From th

theory adequa

seems that ma

for particula

aspects to th

the choice to

There ar

problem. One

discriminate

native and a

the four moti

tivational de

playing situation for the male role and the relative irrelevance for females. The reason for the lack of difference between the sexes may be that the sending and receiving of notes in some way alters the situation and the very low percent cooperation by the other.

Pruitt (1967) used males and females in same sex dyads playing three forms of a decomposed prisoner's dilemma and one matrix form of the game. These four games can be seen in Table 5. Pruitt reports no differences between males and females in this study. This result is extremely surprising considering the payoffs in form 1 of the decomposed game. This form resulted in the least amount of cooperation despite the rather obvious solution of A for both males and females. These results are not readily explainable; however, the large amount of evidence in support of sex differences indicates that the absence of differences in these situations may be due to the procedure used rather than real.

Definition of Problem and A Proposed Solution

From this review, it is clear that the accommodative-exploitative theory adequately accounts for the prisoner's dilemma data. Also it seems that males and females may be choosing the "defect" alternative for particular characteristics of the payoff matrix. Thus there are two aspects to the problem: 1) what aspects of the payoff matrix influence the choice to defect; and, 2) can the theory withstand a rigorous test.

There are at least two approaches to the solution of the first problem. One approach is to construct various two by two matrices which discriminate between the various motives for choosing the "defect" alternative and a second is to construct a matrix which differentiates between the four motivations within the matrix. Because at least two of the motivational determinants depend on reactions to a defect choice, two

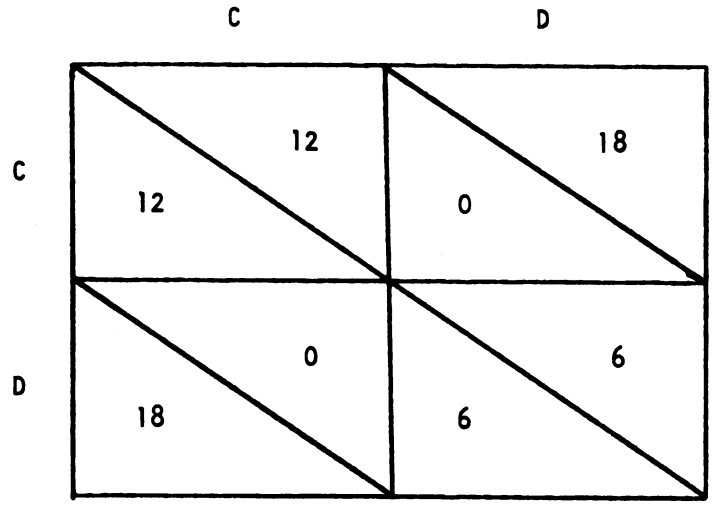
Table 5.

Pruitt's 1967 decomposed and matrix games.

	Your Gains	Other's Gains
C	6	6
D	12	-6

	Your Gains	Other's Gains
C	0	12
D	6	0

	Your Gains	Other's Gains
C	-6	18
D	0	6



choice matrices are not a feasible solution to the problem.

Payoff Matrix

Because males and females may be using the same strategy choice for different reasons in different situations, two expanded payoff matrices have been designed. Although several researchers have used matrices with more than two choices (Pilisuk, Potter, Rapoport, and Winter, 1965; and Gallo, Funk, and Levine, 1969) the present matrices differ from those in that they are not progressions of more extreme prisoner's dilemmas. The present matrices involve several types of games and strategies.

4x4 Payoff Matrix. The first payoff matrix to be presented separates the three motivations for choosing to defect and the one motivation for choosing cooperatively in the prisoner's dilemma game. Table 6 presents the 4x4 payoff matrix with symbols for the payoffs. Each payoff of the matrix is represented by a two letter combination. The first letter in the combination corresponds to the choice made by the participant receiving the payoff while the second letter corresponds to the choice made by the other. The ai's represent the payoffs for choosing maximum absolute gain where the i's represent the choice of the other (a, v, c, or d). The vi's represent the payoff for choosing vindictively while di represents payoffs for choosing to maximize relative gain and ci, the payoffs for choosing cooperatively.

"Maximizing absolute gain" is defined as receiving the greatest payoff for that choice despite what the other participant chooses. This means that the parameter ai must be larger than any other parameter for a given choice of the other or ai > xi where x = (v, c, d) and i = (a, v, c, d).

Cooperation is defined as maximizing joint gain or social welfare

Table 6.

The two person, four choice payoff matrix in general form.

	A	V	C	D
A	aa / aa	va / av	ca / ac	da / ad
V	av / va	vv / vv	cv / vc	dv / vd
C	ac / ca	vc / cv	cc / cv	dc / cd
D	ad / da	vd / dv	cd / dc	dd / dd

A = maximize absolute gain

V = vindictive--minimize other's gain

C = cooperate--maximize joint gain

D = maximize difference (relative gain)

and is op

participa

payoffs f

symbols,

and d.

The n

having the

other payo

rameters t

connote gi

another re

be lower th

the other p

and d).

"Maxim

For this ch

participant

yi - xj, whe

participants

pant chooses

These f

ters or payo

inequalities

restriction

low payoffs a

than ci shou

ai > di > ci

and is operationalized by having the sum of the payoffs for the two participants for the cooperative choice be greater than the sum of the payoffs for the two participants for any other choice. In terms of the symbols, this means that ci + xc > xj + yi, where i, j, x, y = a, v, c, and d.

The minimizing of other's gain (vindictive) is operationalized by having the payoff to the other for any choice he makes smaller than any other payoff for any other choice of the chooser. In terms of the parameters this means that xv < xi. Also since vindictiveness seems to connote giving the other his worst despite what it does to the chooser, another restriction on the parameters is that the chooser's payoff must be lower than for any other choice he might make despite the choice of the other participant. This means that vi < xi with x, i = (a, v, c, and d).

"Maximizing relative gain" is really "maximizing differences." For this choice the chooser must do at least as well as the other participant. In terms of the parameters this means that di - xd > yi - xj, where x, y, j, i = (a, v, c, d). The difference between the participants is greater for this choice despite what the other participant chooses than for any other choice that he may make.

These four inequalities put restrictions on the size of the parameters or payoffs. From these equations alone the following two general inequalities hold: ai > di, ci > vi; and, xc > xa > xd > xv. If the restriction is made that cooperation should be a choice in which very low payoffs are obtained if the other does not also choose cooperatively than ci should be less than di. This changes the first inequality to ai > di > ci > vi. Although these equations do specify very particular

ranges

parame

vc and

4x4 pa

Table

T

six di

the ch

definit

can be

ings gi

specifi

prefere

game, a

althoug

6x6 Pay

the thr

there a

defect c

males pl

involved

and Novi

eration;

havior co

"behavior

with two

tiveness"

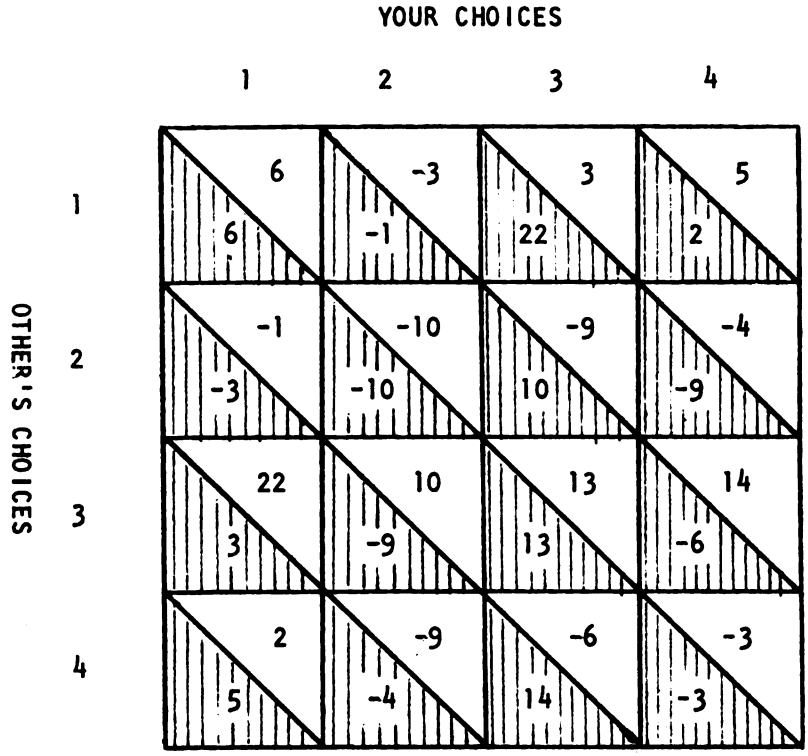
ranges, they do not specify completely all of the relationships between parameters. For example, it does not specify the relationship between vc and aa and this decision is arbitrary. From these inequalities, a 4x4 payoff matrix was developed. This payoff matrix is presented in Table 7.

These four choices, when combined in two choice matrices, produce six different games. Table 1, matrix 2 presents a general 2x2 game with the choices being A or B and the payoffs aa, ab, ba, and bb. Given the definitions of the motivational determinants of choices these payoffs can be formed into preference orderings. Five of the preference orderings give strict inequalities for the four payoffs while the sixth only specifies that aa and ba are greater than ab and bb. The five complete preference orderings include one chicken game, one prisoner's dilemma game, and three games in which vindictiveness is one of the motivations although vindictiveness was not always one of the original motivations.

6x6 Payoff Matrix. Although these four motivational determinants specify the three different motives for choosing defect on a one trial basis, there are two other determinants that have been mentioned for making the defect choice. Sampson and Kardush (1966) found that 11 year old females playing a prisoner's dilemma game indicated a concern for the risk involved while males did not. Several other studies (Tedeschi, Bonoma, and Novinson, 1970) have indicated that defect was used to induce cooperation; that is, as an attempt to convert limited fate control into behavior control. The two additional motivations are "minimize risk" and "behavior control." These two additional motivations are intertwined with two previous motivations, "maximizing absolute gain" and "vindictiveness" respectively.

Table 7.

The four choice payoff matrix.



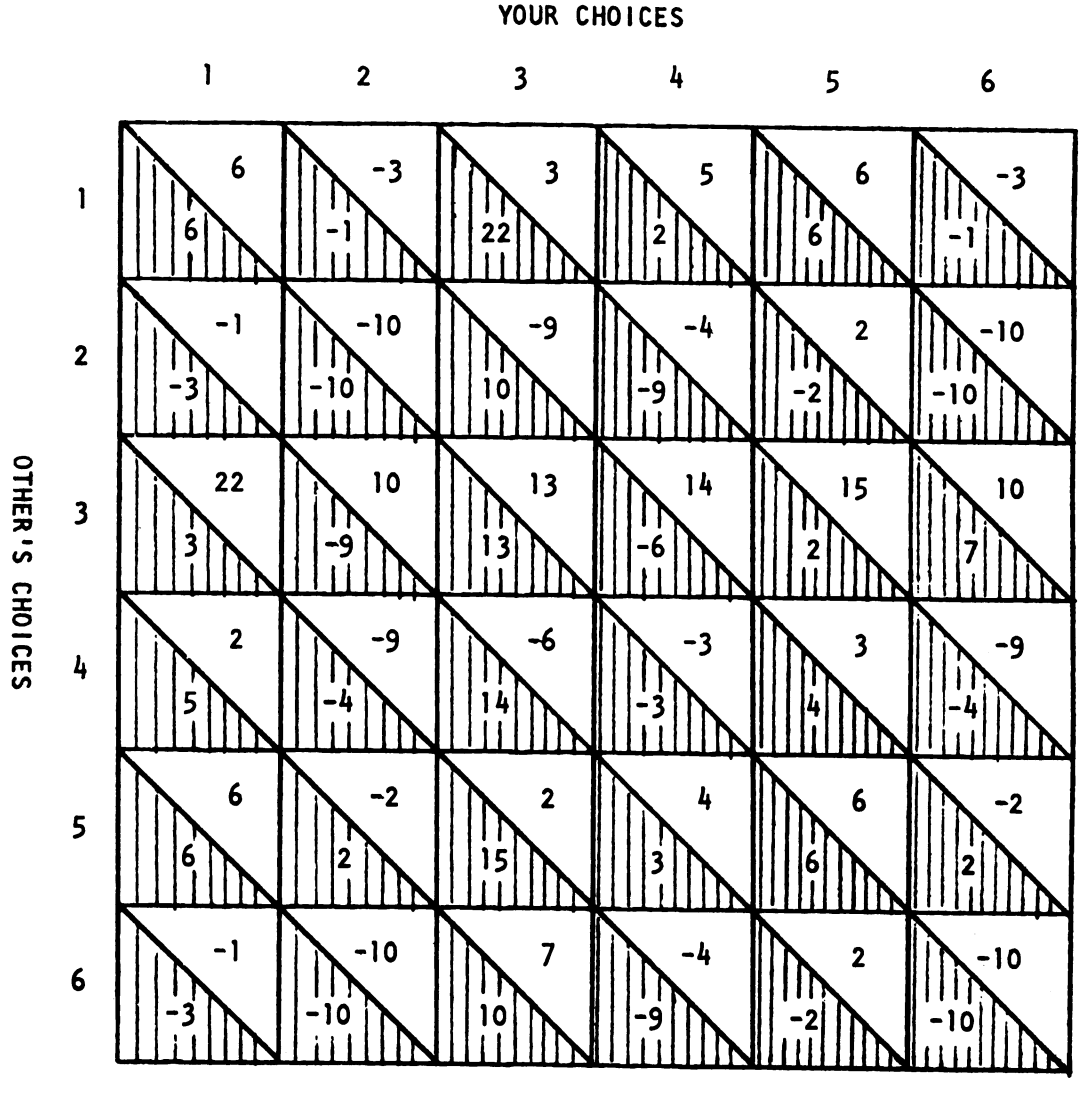
"Minimizing risk" is also "maximizing absolute gain" since the least risk is taken by choosing an alternative that gives the highest payoff despite what the other chooses. To solve this problem, the "maximize absolute gain" alternative was split into two separate alternatives. Table 8 presents the 6x6 payoff matrix. Both alternatives give greater payoffs than any other alternative despite the choice of the other participant. The relationship between the alternatives is such that each gives a greater payoff than the other for two of the choices the other participant could make and for the two remaining choices, the mean payoffs for the two alternatives are equal. The difference between the two alternatives is that the "maximizing absolute gain" has a much larger variance between the payoffs than does the "minimizing risk" alternative. To eliminate any effect of payoffs, the mean payoff to the other participant for the two alternatives has the same mean value and approximately equal variances.

The second new motivational determinant is that of communicating with the other participant by punishing noncooperation. This is an attempt to use fate control as behavior control. The new alternative has all of the aspects of vindictiveness except that it gives a high payoff for cooperation and low payoffs for any other choice. All of the other payoffs are identical to the "vindictive" payoffs. Although two more alternatives have been added there is not an increased number of 2x2 games because of the duplication of some of the 2x2 games from the 4x4. This is so because each of the added alternatives has all of the characteristics of one of the alternatives in the 4x4 matrix.

The matrix presented in Table 8 is the 6x6 matrix that will be used in the study. Choice "1" (A) is the "maximizing absolute gain"

Table 8.

The six choice payoff matrix.



alternative since the chooser gains more than he does for any other choice except if the other participant chooses alternative "2" or alternative "6." If the other chooses either of these alternatives, the subject receives very low payoffs. The chooser generally receives very high payoffs if the other participant chooses either of the first, third, fourth, or fifth alternatives. He receives very low payoffs if the other chooses either of the first two alternatives. This indicates a high risk situation but offers the largest gain.

The second choice in this matrix is called the vindictive choice (V) since it guarantees that the other participant will receive his worst payoff for each choice that he may make. While this gives the other participant his lowest payoffs it also incurs losses for the chooser. Only if the other participant chooses alternative "3" does the chooser get a positive payoff.

The third alternative in the matrix is the cooperative choice (C) since the combined payoff for this choice is greater than the combined payoff for any other choice. If both participants choose cooperatively on every trial, they will each receive more than if they try to maximize absolute or relative gain or if they try to minimize risk. If one participant chooses cooperatively and the other chooses alternative "1," "2," "4," or "5," the participant who chose cooperatively will get a very low payoff.

The fourth choice in the matrix is a low risk choice (R) since it avoids the largest loss and has no cell in which the chooser receives a negative payoff. Although all cells give the chooser a positive payoff, these payoffs are rather small compared to the payoffs for choice "1." The standard deviation between the payoffs for this choice is much less

than the standard deviation between the payoffs for choice "1." The mean payoff per cell, however, for choice "3" is equal to the mean payoff per cell for choice "1." This indicates that the third choice involves less risk than choice "1" while giving the same payoff per cell.

Alternative "5" maximizes differences (D) or relative gain. While the amount won for each choice is less than that won for the maximize absolute gain the difference between the participants in the amount they each receive is greater than for any other choice the chooser could have made. This alternative also presents the chooser with low outcomes if the other participant chooses alternative "2," "4," or "6." While the differences between participants is maximized, the loss incurred by the chooser can be great.

Alternative "6" is called behavior control (B) since the other participant is forced to choose cooperatively if his opponent chooses B consistently. The other participant receives large negative payoffs for all choices he makes except for cooperation and minimizing risk. The payoff for choosing minimizing risk is much smaller than that for choosing to cooperate.

Summary. This payoff matrix allows the differentiation of the choices of minimizing risk, maximizing absolute gain, vindictiveness, cooperation, and maximizing differences. The matrix differentiates the competitive choice of the prisoner's dilemma into five different choices which reflect five different motivations for choosing the competitive choice in the prisoner's dilemma game. If males are optimizing gain, they will choose the maximize absolute gain alternative if the other plays noncontingently and the cooperative choice if the other plays contingently. Males also may choose behavior control against an opponent who does not

play cooperatively and plays contingently. For whatever reason females are choosing defect, to minimize risk as the accommodative-exploitative theory predicts or vindictiveness or maximize absolute gain, this matrix should differentiate between these motivations.

Test of the Theory

To test the viability of the revised exploitative-accommodative theory, four different strategies were developed. These strategies were then employed in a prisoner's dilemma game as well as in the six choice game.

Strategies. The strategy of the other participant has a great effect on the responses of the subject. As has been consistently shown, males and females respond differentially to contingent and noncontingent strategies. In the prisoner's dilemma game these strategies are quite well defined. An unconditional strategy is some fixed percent of the trials on which a cooperative choice will be made, with the defect choice made on the remaining trials. Of the many contingent strategies that could be employed the tit for tat strategy of echoing the choice of the subject on the preceding trial has been used almost exclusively.

The "tit for tat" strategy consists of the simulated other participant choosing on trial n the alternative chosen by subject on trial n-1. There have been several modifications of this strategy involving increasing the number of trials between the choice and the echo of the choice, by having the simulated other echo on only a certain percent of the trials. These modifications only serve to confuse the situation since they make the possibility of ascertaining the type of strategy played by the other very difficult.

Given a six alternative game there are over 100,000 different

strategies, where strategy is defined as choosing alternative "x" if the other participant has chosen alternative "a" on the previous trial. However, of the more than 100,000 strategies only a few are rational in the sense that they are consistent. An example of a nonrational strategy is one which responds to maximizing relative gain and vindictiveness by cooperation and responds to the remaining alternatives with vindictiveness.

Of the consistent (though possibly not rational) strategies for a 6x6 matrix only six are unconditional. These strategies are of the form choose alternative x on trial n if the other has chosen a, b, c, d, e, or f on trial n-1. The remainder of the rational strategies consist of some form of contingent strategy, or choose x on trial n if the other has chosen a, b, or c on trial n-1 and choose y if he has chosen d, e, or f.

Contingency of Strategy. While both the contingent and noncontingent strategies are well defined for the prisoner's dilemma game, they are not nearly so well specified for the six choice game. For the noncontingent strategy specifying a certain percent of the trials as cooperative does not completely determine the responses to be made on the remaining trials as it does for the prisoner's dilemma game. In a prisoner's dilemma game a 90% cooperative strategy determines that defect will be chosen on the other 10% of the trials. In the larger matrices an 85% cooperative strategy leaves the problem of how to respond on the other 15% of the trials. The simplest solution is to divide the remaining percent of the trials equally between the remaining alternatives.

The implementation of the typical "tit for tat" or contingent strategy for a six choice game would certainly cause the subjects to

become suspicious. This problem is particularly acute for the six choice game because the behavior control alternative requires a particular response. Against a player who chooses behavior control consistently only two alternatives are rational choices for the simulated opponent: 1) cooperation; or, 2) low risk. A more realistic class of contingent strategies than tit for tat is indicated by the division of the defect choice. This class of contingent strategies consists of the following five strategies: 1) choose "maximize absolute gain" in response to all choices except cooperation and then cooperate; 2) choose "vindictiveness" in response to all choices except cooperation and then cooperate; 3) choose "minimizing risk" in response to all choices except cooperation and then cooperate; 4) choose "maximizing relative gain" for all choices of the other except cooperation and then cooperate; and, 5) choose "behavior control" in response to all choices except cooperation and then cooperate. These strategies are just forms of the tit for tat simulated strategy employed in many of the studies reviewed. The strategy responds to cooperation with cooperation but to defection in its various forms by defection of one form.

Exploitativeness of Strategy. Contingent and noncontingent strategies can vary in their degree of cooperation and defection. Given the expected differential responses of males and females to defection and cooperation, two different types of strategies will be developed. These strategies represent two classes of strategies that might be called accommodative and exploitative.

The type of person characterized by the accommodative theory presented previously implies a strategy of cooperation until the other defects for several trials, after which withdrawal from the situation is

attempted. The purpose of the accommodative strategy is to make the simulated other appear to be cooperative. The simulated other must appear to be a trusting person interested in the dyad's joint gain.

A person playing an exploitative strategy implies a type of person who is interested in his own gain and not interested in what the other person receives. This person is characterized by exploiting any cooperation. An exploitative strategy must give the impression of an inconsiderate, self-interested person. This strategy when confronted with an uncooperative other will try to bargain with the other participant to induce cooperation. Once the other cooperates, the exploitative strategy will exploit again.

Hypotheses

The four strategies presented (contingent accommodative, noncontingent accommodative, contingent exploitative, and noncontingent exploitative) anchor two different dimensions of strategies: 1) contingent-noncontingent; and, 2) accommodative-exploitative. The exploitative-accommodative theory makes particular predictions for the relationship between number of defections of males and females in the prisoner's dilemma game for these four strategies. There also are some predictions as to the effect that each of the strategies has on all subjects.

Hypothesis 1. Females will defect more than males under contingent strategies while males will defect more under noncontingent strategies.

Hypothesis 2. Against an exploitative strategy the variance of choices for females should be less than the variance of choices for males during the first several trials.

These hypotheses follow directly from the exploitative-

accommodative theory assumptions as to the differential response to frustration by males and females. The rationale for Hypothesis 1 was that males will originally try to bargain while females will defect in response to conditional responding of the other participant. The second hypothesis follows from males trying to bargain and thus will vary their choices to try to get the other participant to choose cooperatively. Females, however, will not bargain and will simply choose to defect against an exploitative strategy. In later trials males and females should both be defecting.

Hypothesis 3. Against a noncontingent accommodative strategy males should choose the "maximize absolute gain" alternative while against a contingent strategy females should choose the "minimize risk" alternative.

Hypothesis 4. Against a noncontingent accommodative strategy males should choose to defect while females should choose to cooperate.

The third hypothesis was derived from males' original motivation to maximize their own gain despite the cost to the other participant, and also from females' response to frustration. Females respond to the frustration of their goals by attempting to leave the situation. The "minimize risk" alternative clearly satisfies this desire since the other participant has little ability, in this situation, to affect the payoffs to the chooser of "low risk".

The fourth hypothesis was also generated by males' desire to maximize gain since against a noncontingent accommodative strategy the alternative which maximizes gain is the defect alternative. Females will cooperate with a noncontingent accommodative strategy since the theory predicts that females try to be fair and divide the payoff equally.

The last two hypotheses deal with the general effect of the strategies on all of the subjects regardless of sex.

Hypothesis 5. There should be more defection under an exploitative strategy than an accommodative strategy.

Hypothesis 6. There should be more cooperative responses under a contingent strategy than under a noncontingent strategy.

METHOD

Subjects

The subjects who participated in this study were a sample from a larger pool of subjects maintained by the Cooperation/Conflict Research Group at Michigan State University. All of the subjects in the pool were recruited for money to participate in "motivational research." The recruitment of subjects took place during the first week of the term and included a newspaper advertisement and personal appeals in each of the introductory psychology classes. Twelve hundred subjects were recruited for the pool and of these, 196 subjects participated in the study. Although 196 subjects participated in the study only 128 were actually used in the analyses. Sixty-eight subjects had to be discarded: 1) 48 subjects indicated they felt they were not playing against a real person; 2) 4 subjects played against someone of a different race; and, 3) machine failure occurred for 16 subjects.

Setting

Four 6'x8' rooms served as the experimental rooms. Subjects were isolated from one another. One subject was placed in each of the rooms with the door closed. Figure 1 shows the experimental setting. As the figure indicates, there were two large rooms directly behind the larger center room. The first of these rooms was used as a storage room and a noise buffer for the computer. The second of the rooms housed the computer that controlled the experiment.

Figure 2 shows the layout of the experimental rooms. The subject

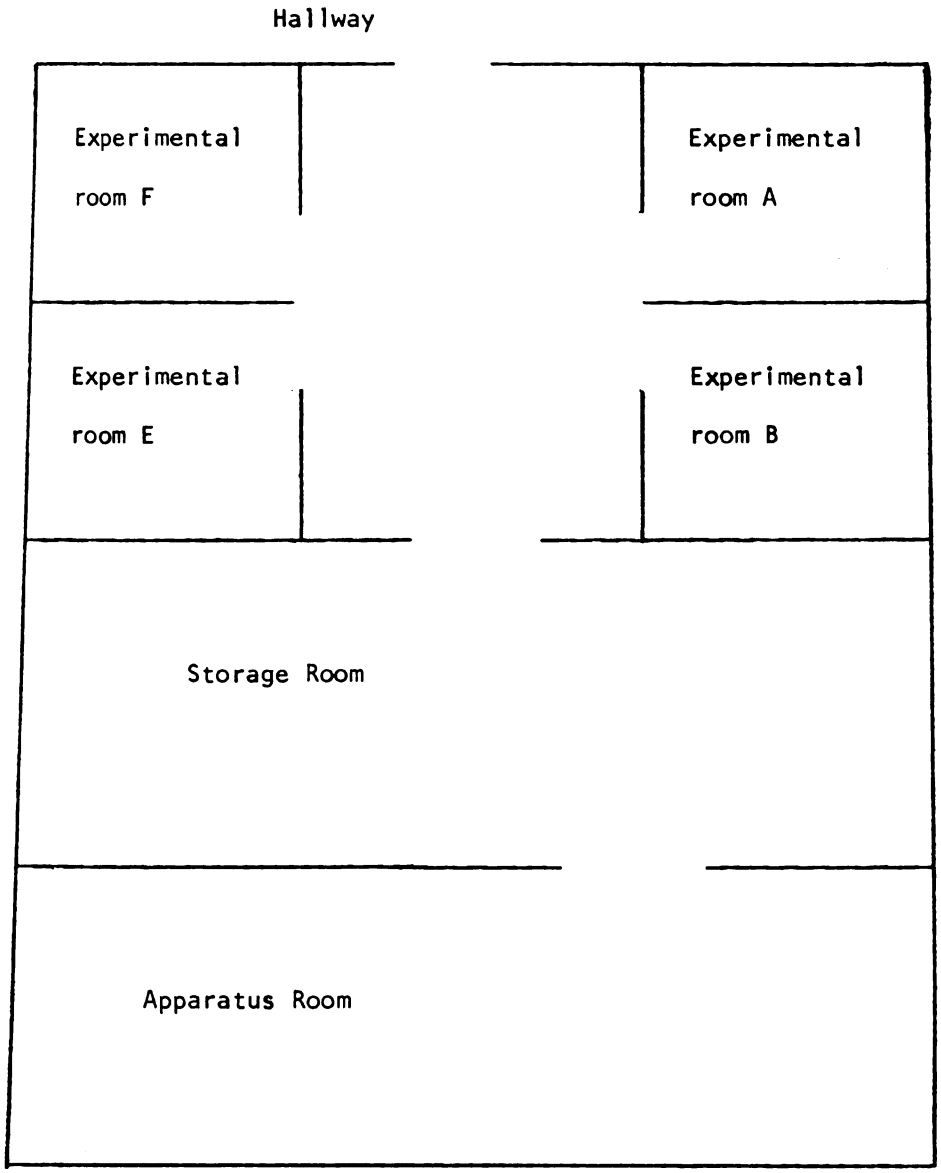


Figure 1.

The experimental setting was separated into the above seven rooms.

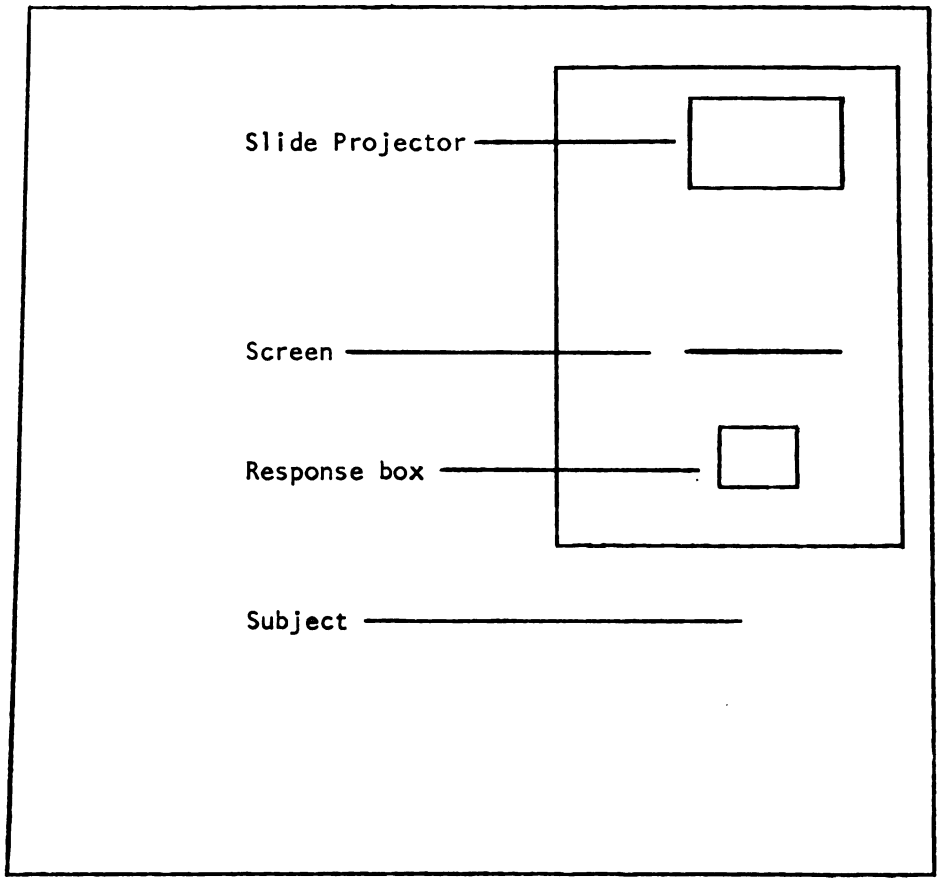


Figure 2.

Typical experimental room, with the slide projector, screen, response box, and subject position labeled.

sat at one end of a table facing a screen placed approximately 18 inches from the subject. Also on the table were instruction booklets, a slide projector and response box. The earphones were hung on the wall next to the subject.

Design

Figure 3 is a visual representation of the design used in the study. There were four independent factors in the study: 1) sex of subject; 2) contingency of strategy; 3) exploitativeness of strategy; and, 4) order in which the two matrices were presented. The 128 subjects were divided evenly into the resulting 16 cells produced by the four independent factors of two levels each. In addition to the four independent factors, each subject was presented with both the 2x2 and 6x6 matrices. The resulting five factors of sex, contingency, exploitativeness, order of presentation and matrix size produced a 2x2x2x2x2 design with repeated measures on the last factor and eight subjects per cell.

Strategies

Noncontingent. The contingency of the other's choices and the type of strategy, either exploitative or accommodative, produced four different simulated other strategies. For the two choice matrix the unconditional strategies were easy to define. Alternative 1 was the cooperative choice and the unconditional accommodative strategy was composed of that alternative on 85% of the trials. The exploitative strategy, however, was composed of alternative 1 on 15% of the trials.

The six choice matrix was somewhat more complex since the defect choice was split into five different alternatives. For the six choice matrix the unconditional accommodative simulated other consisted of the cooperative alternative on 85% of the trials. The remaining 15%

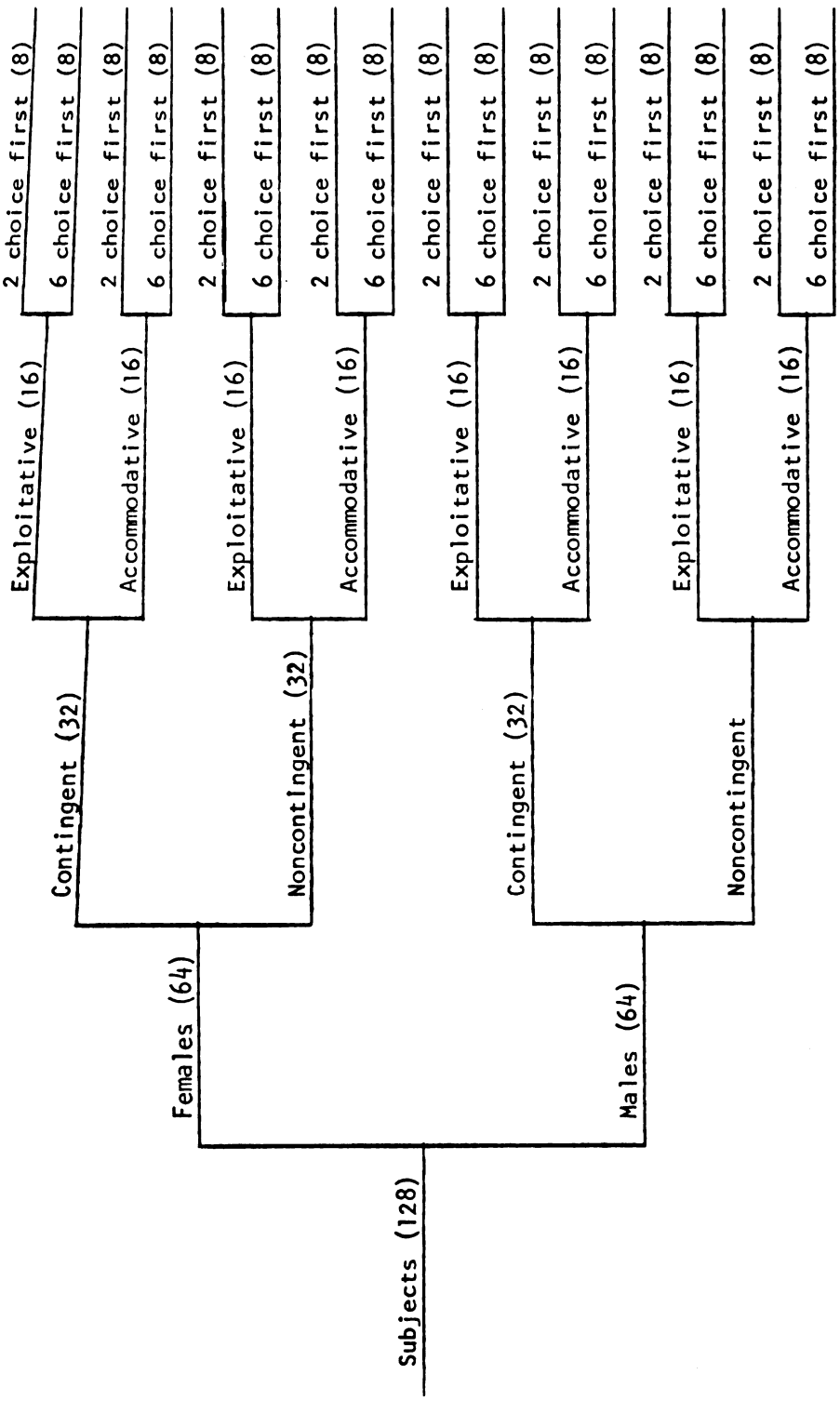


Figure 3.

Display of the design of the study with number of subjects in parentheses.

were spread equally over the five defect choices. Thus each alternative was approved on 3% of the 100 trials.

The unconditional exploitative strategy was operationalized, not by splitting the 85% of the trials of defect choice over all five of the defect alternatives, but by choosing alternative "1," the "maximize absolute gain" alternative, on 85% of the trials. The other 15% of the trials had each of the other five alternatives equally represented.

Contingent. The conditional strategy for the two choice matrix was more complex than the unconditional strategy. In all previous studies a contingent strategy was operationalized by giving to the subject on trial n the response he made on some previous trial. Because a contingent accommodative and contingent exploitative strategy were needed the tit for tat approach was not feasible. The contingent accommodative strategy for the two choice matrix was defined in the following manner: 1) play alternative "1," the cooperative alternative, until the subject defects for two consecutive trials; and, 2) after two consecutive defects choose alternative "2," the defect alternative, for two consecutive trials and then return to the cooperative response. This strategy was devised to give the impression of a cooperative other, but one who would defect if the subject defected for two or more consecutive trials.

The contingent exploitative strategy for the two alternative matrix was, in a sense, a trapping strategy. The simulated other played alternative "2," the defect choice, until the subject chose the defect alternative for two consecutive trials. When the subject had defected for two consecutive trials, the simulated other cooperated for two consecutive trials, and then defected again.

In summary the contingent accommodative simulated other responded

to consistent cooperation with consistent cooperation and to defection with defection. The contingent exploitative simulated other responded to consistent cooperation with defection and to defection with cooperation.

The contingent strategies for the six alternative matrix were similar to those for the two alternative matrix. The exploitative and accommodative strategies were programmed to respond differently to the cooperative alternative. The contingent accommodative strategy responded to the "cooperative" choice by the subject with the cooperative alternative while the exploitative strategy responded with the "maximize absolute gain" alternative. Both the exploitative and accommodative strategies responded to the cooperative choice by the subject on the trial immediately following the choice.

The accommodative and exploitative strategies also responded differently to the "maximize absolute gain" and "minimize risk" alternatives. The accommodative strategy responded to the "maximize absolute gain" and "minimize risk" choices with the absolute gain alternative. If the subject chose either of these alternatives for two consecutive trials the simulated other chose the "cooperative" alternative for two consecutive trials. After the simulated other had responded with cooperation for two consecutive trials it then returned to responding according to the choice made by the subject on the previous trial.

The exploitative strategy responded to the "maximize absolute gain" and "minimize risk" choices in the same manner. If the subject chose either alternative, the simulated other responded with the "cooperative" alternative on the very next trial. If the subject chose either of these alternatives for two consecutive trials, the simulated other chose the

"maximize absolute gain" alternative for two consecutive trials. After choosing the "maximize absolute gain" alternative for two trials the simulated other again responded to the choice made by the subject on the previous trial.

The accommodative and exploitative strategies responded to the "vindictive" and "maximize absolute gain" choices by the subject with the low risk alternative. Each time the subject chose the "vindictive" alternative or the "maximize relative gain" alternative the simulated other chose the minimize risk alternative on the following trial. Both the exploitative and accommodative strategies responded to a "behavior control" choice by the subject with the "cooperative" alternative on the following trial.

In summary the exploitative and accommodative strategies responded on the next trial to the "vindictive," "maximizing relative gain" and "behavior control" choices in the same manner. It was in response to the "cooperative," "maximize absolute gain" and "minimize risk" choices that the two strategies differed. The accommodative strategy cooperated with a cooperative subject while the exploitative strategy exploited a cooperative subject. When the subject began choosing either the "maximize absolute gain" or "minimize risk" alternatives the exploitative strategy tried to induce cooperation while the accommodative strategy punished defection. If the subject persisted in his choice, the exploitative strategy returned to choosing the "maximize absolute gain" alternative and the accommodative strategy returned to making the "cooperative" choice.

The exploitative and accommodative strategies were designed to present two completely different images to the subject. The exploitative

strategy exploited cooperation but appeared to repent every time the subject chose the "maximize absolute gain" or "minimize risk" alternatives, only to return to choosing the "maximize absolute gain" alternative. The accommodative strategy cooperated until the subject chose a defect alternative. When the subject chose the "maximize absolute gain" or "minimize risk" alternative the simulated other punished for one trial and then returned to the cooperative alternative.

Apparatus and Materials

A PDP 8 I computer served as the major control apparatus for the experiment. Along with the computer, an interface device of logic circuits and teletype were used as laboratory control devices. Communication devices included a tape recorder, earphones, response boxes, slide projectors, and viewing screen.

Each subject had a response box identical to the one shown in Figure 4. The box had twelve buttons on it with the digits 0 to 9 and the symbols # and *. It was with this box that the subjects indicated their choices by pushing the appropriate button and communicated with the experimenter during the presentation of instructions.

As Figure 4 indicates there were two digital displays on the front of the response box. On each trial of the game the left display would show the response made by the subject while the display on the right would show the response of the other subject. Located directly below the two displays was the ready light. This light indicated when a response could be made by the subject.

Each subject had a set of instruction booklets. The booklets for the two choice matrix are presented in Appendix B and the booklets for the six choice in Appendix C. Slides instructing the subjects to read

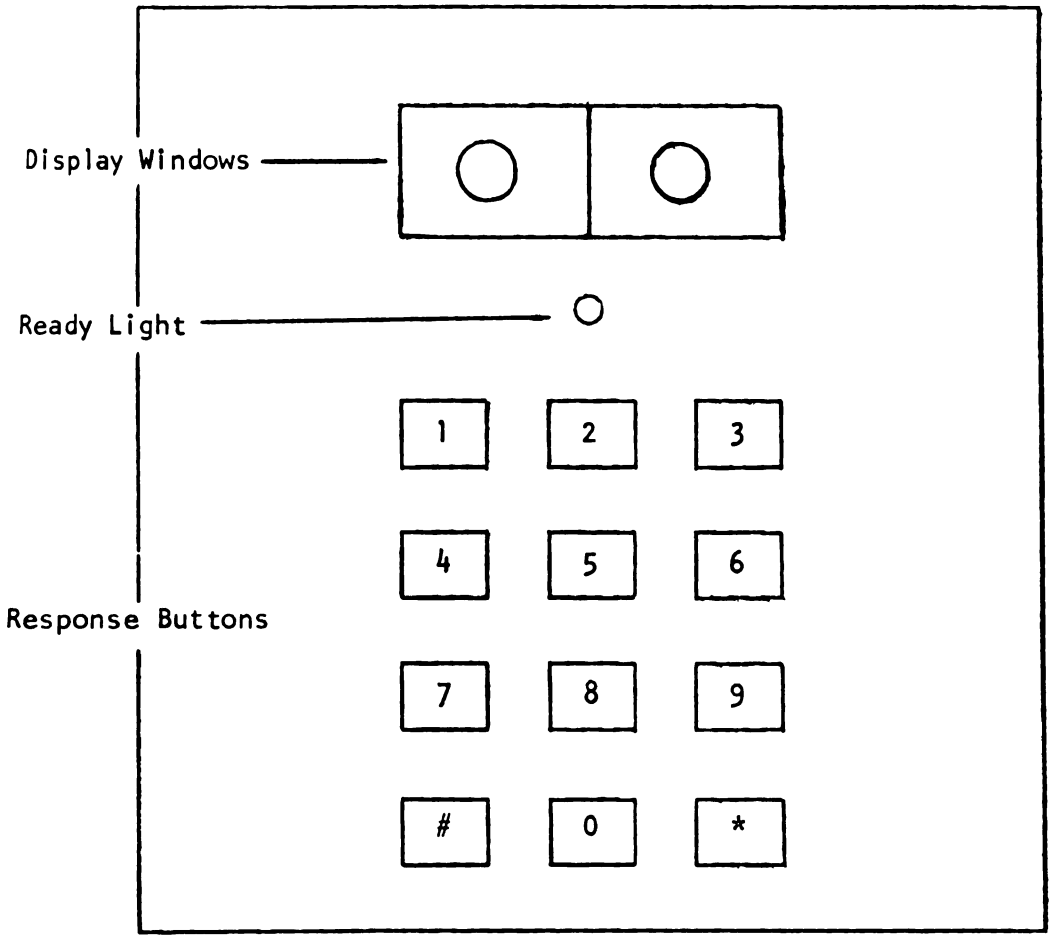


Figure 4.

Drawing of the response box used in the study.

each of the instruction booklets and slides of the matrices presented in Tables 7 to 10 were placed in a carousel slide projector. These slides were projected on a screen. Figure 5 shows the viewing screen used in the study. This screen consisted of a 4"x6" piece of paper surrounded by a dark brown 20"x30" board. The paper was light weight, allowing images to be projected through it.

The auditory communication devices included a tape recorder located in the apparatus room, and earphones in each room connected to the tape recorder.

The PDP 8 I computer determined the response of the other subject, recorded and stored the responses of each subject, and displayed the two choices on each subject's response box. The computer was also connected to a teletype which printed out the responses of each subject during the game and the room number of the subjects who had questions during the instruction periods.

Procedure

Three experimenters were used in the study. Each subject had to participate in two separate sessions that were to appear to be separate studies and thus a different experimenter was needed for each session. Two of the three experimenters shared the duties of running the session with the six alternative matrix, while the third experimenter was responsible for the sessions with the two alternative matrix.

The two choice and six choice games were made as different as possible during the instruction phase of the study; however, the actual game playing procedure was identical in the two sessions. After the instructions the ready light came on for all of the subjects. When the subject responded with a legal choice the ready light went off. When

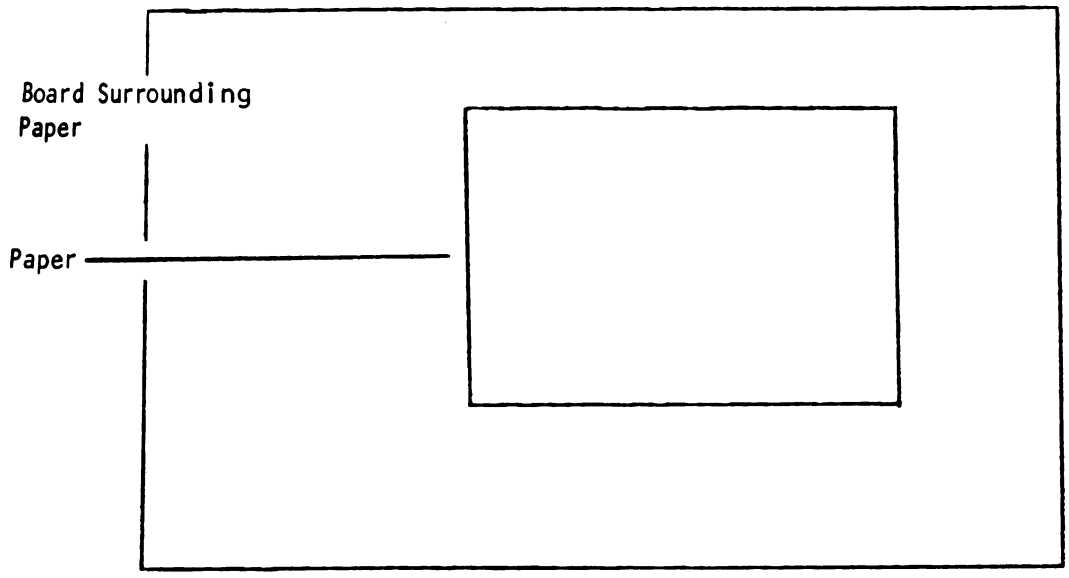


Figure 5.

The viewing screen used in the study.

every subject had responded the computer calculated the correct response based on the strategy for that condition. After the computer had made these calculations the choice of the subject and the choice of the simulated other were displayed on the response box of each of the subjects. These numbers were displayed for approximately 3.7 seconds, after which the windows again read "0" and the ready light came back on, indicating the start of another trial.

After each session had been completed each subject was interviewed separately by the experimenter. The experimenter asked what the subject thought about the study in general and what he thought about the person he was paired with. These two questions acted as guides for the relatively unstructured interview. The interview was used to detect those subjects who were suspicious about the person with whom they were paired.

Session One

After the first session in which a subject participated he was introduced to one of the other two experimenters. The second experimenter told the subject the following:

> "I am running a study using this same apparatus and since you are already familiar with the equipment it would save me time if you could participate in my study. Could you participate in my study later this week?"

Each subject was approached separately and left the experimental rooms alone. The only visual contact the subjects had with each other was at the beginning of the session.

Session Two

The second session was handled somewhat differently. After each subject had been interviewed they each were asked to fill out the questionnaire presented in Appendix A. The subjects were allowed to leave

whenever they had finished the questionnaire. This procedure meant that the subjects might have contact with each other after the study but only after they had filled out the questionnaire.

Subjects Per Session

In both the first and second session every effort was made to have four subjects present but occasionally this was not possible. Whenever there were three subjects they were put in the experimental rooms and told that the fourth subject was on his way but to save time they would go through the instructions. They were told that the late subject would catch up after he arrived. After the subjects had gone through the instructions, the arrival of the fourth subject was staged by using one of the other experimenters. Because the subjects had their doors closed at this time they were able to hear the arrival but unable to see the subject.

Two Choice Session

The subjects were brought into the large room from the hall. If not all of the subjects were there for the session, the session was delayed until five minutes after the scheduled starting time. At this time the subjects were put into separate experimental rooms. The subjects were then read the following instructions:

> "In front of you is a response box with 12 buttons on it. It is with this box that you will communicate with me and the subject with whom you are paired. On this box you will see two windows with zero's in them. The window on the left will show which response you have made and the window on the right will show the response of the subject you are paired with.
>
> The light below the two windows, that is presently not lit, is the ready light. When this light is lit it indicates that you may make a response. If the light is out your response will not be recorded. If the light does not go out immediately after you have pushed

a button your response has not been recorded, so push the button again. Do not hold the button down for more than a second or two.

In front of you is a screen and slide projector. The screen is now blank. You will be given information by way of this screen and slide projector. Follow the instructions that are presented on the screen.

On the table in front of you are several instruction booklets. Please read each booklet as the slide projector directs you to. We are now ready to start the study. Do you have any questions about the use of the equipment?"

The study then began with the projector lamps being turned on and the slide projector advanced to the slide which read:

PLEASE READ

INSTRUCTION

BOOKLET 1

and delayed at this slide for twenty seconds before advancing to the slide with the payoff matrix presented in Table 9.

Appendix B presents instruction booklet 1 for the two choice session. The subjects read instruction booklet 1 and when they were finished, pushed button 8 if they had no question about the experiment and button 9 if they did have a question. When all questions had been answered the study began with the ready light coming on to indicate the start of the first of the 100 trials.

After 100 trials had been completed the slide projector advanced to the slide which read:

PLEASE READ

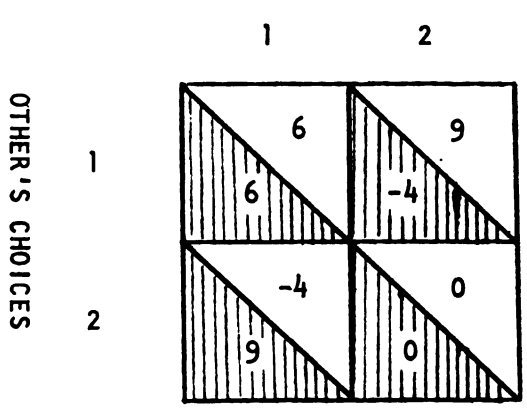
INSTRUCTION

BOOKLET 2

and delayed there for twenty seconds before the projector lamp went off.

Table 9.

The two choice matrix that was used in the study.



Instruction Booklet 2 is also presented in Appendix B.

The Six Choice Session

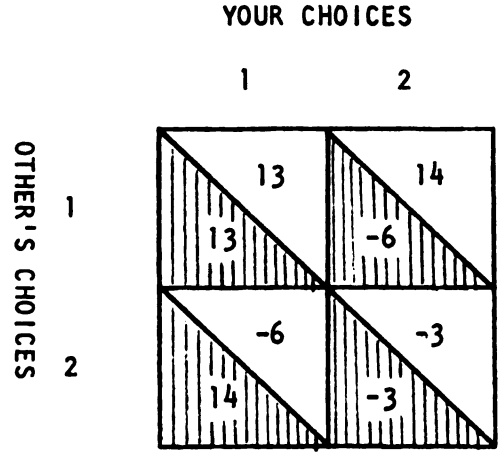
The same initial procedure was used for the six choice session as was used for the two choice session. The subjects were put into separate rooms and told to close their doors and put on the earphones. The tape recorder then played the following instructions:

> "If this is too loud there is a volume control on your earphone cord. There is a box with numbered buttons on it in front of you. You will use this box to communicate with me and the subject you are paired with. There are two windows in the box which now show zero's. The left window will show you your response and the right window will show the response of the subject you are paired with. The ready light located below the two windows goes on only when you are to make a response. Your response has not been recorded until the ready light goes out. Do not hold the button down for more than a second.
>
> Instructions will be presented on the screen in front of you. Follow them when they appear.
>
> There are some instruction booklets in front of you. Read each booklet when the instructions on the screen tell you to.
>
> We are now ready to start the study. When the ready light comes on if you have any questions about the use of the equipment, push button 9. If you do not have a question at this time, push button 8. You must push button 8 or 9 before we can go on.
>
> You may now take your earphones off.

After the subjects had heard the instructions they pushed an 8 if they had no questions and a 9 if they did. After all of the questions had been answered the projector lamp was turned on and the projector advanced to the slide asking them to read instruction booklet 1 and delayed on that slide for twenty seconds before advancing to the payoff matrix presented in Table 10. All of the instruction booklets for the six choice session are presented in Appendix C.

Table 10.

The two choice matrix that was used during the instruction phase of the six choice session.



To make sure that the six choice matrix was understood by the subjects, extensive instructions were presented in a programmed learning context. After the first page of instructions there were two pages of questions based on the two choice payoff matrix presented on the screen. Each page contained eight questions based on a hypothetical situation presented at the top of the page. Both of these sets of questions for the two choice matrix are presented in Appendix C.

The hypothetical situations were always of the form presented below and the questions similar to those following the example below.

> The other participant has chosen alternative _ on the first five trials and it looks as if he will do so again on trial six. If he does choose alternative _ on trial six what choice by you on trial six will

1. Give you the most money?
2. Give the other participant the most money?
3. Give you the least money?
4. Give him the least money?
5. Give you less money than the other participant?
6. Give you more money than the other participant?
7. Give the two of you combined the most money?
8. Give the two of you combined the least money?

After all subjects had answered the sixteen questions about the two choice matrix the experimenter entered each room in turn and checked the answers. If there were mistakes the experimenter went over the questions with the subject until he understood.

At this point the slide projector advanced to the slide instructing the subjects to read instruction booklet 2, and delayed on that slide for twenty seconds before advancing to the four choice matrix presented in

Table 7. Instruction booklet 2 is in Appendix C. After the first two pages of instructions there were four pages of questions similar to those asked of the subject on the two choice matrix. After these 32 questions were answered the experimenter again entered each experimental room and checked the answers. Again if there were mistakes the experimenter went over the questions with the subject.

When all of the subject's questions had been answered and their answers had been checked the slide projector advanced to the slide instructing them to read instruction booklet 3 (see Appendix C). After a twenty second delay the projector advanced to the six choice matrix presented in Table 8.

The subjects then read the third instruction booklet and pushed button 8 if they didn't have a question about the study and button 9 if they did. After all of the questions had been answered the first of the 100 trials began with the ready light coming on.

RESULTS

The basic design of the present experiment consisted of five independent factors: 1) exploitativeness-accommodativeness of the strategy (EA); 2) contingency of the strategy (CT); 3) sex of the subject (SX); 4) the order in which the matrices were presented (OD); and, 5) the size of the matrix (MT). The independent variable of session number, first or second, was confounded with the order and matrix factors. The two choice matrix for order one appeared in session one; however, the six choice matrix for order one appeared in session two.

Analyses Performed

When the six alternative and two alternative matrices were analyzed within the same design, the dependent variable was the percent of cooperation. The dependent variable that was used when the two alternative matrix was analyzed separately was also the percent cooperation. However, when the six alternative matrix was analyzed separately the percentage for each of the alternatives was used as a dependent variable for six different analyses of variance.

Preliminary Results

Several analyses were performed on the first trial choices of the subjects. The general findings of these analyses were a significant main effect for matrix size, and no significant interactions. The mean probability of choosing cooperatively for the six alternative matrix was .43 while the two alternative matrix had a probability of .64. When interpreting this result it must be remembered that the six alternative

had many more "defect" choices than the two alternative matrix. The most prominent first trial result was the absence of the sex factor as a main effect or within a significant interaction.

An analysis was performed on two dimensions in the rating scale of the other subject. These analyses were performed on the responsiveness and exploitative-accommodative dimensions. The results of these analyses indicated significant main effects on the responsiveness dimension for the contingency of response with the contingent strategies rated more responsive than the noncontingent strategies. The exploitative strategies were rated more exploitative than the accommodative strategies. There were no interaction effects for these analyses; however, there was a main effect for sex on the responsiveness dimension with males rating both strategies less responsive than females. The contingent strategies were also rated less exploitative than the noncontingent strategy. For a more thorough presentation of the first trial analyses and the analyses on the responsiveness and exploitative-accommodative rating scales see Appendix D.

General Analysis

Four major analyses were performed on the percent of cooperation, and percent of choosing each of the alternatives in the six alternative matrix. All of the analyses were based on the design having the independent factors: 1) exploitativeness of strategy; 2) contingency of strategy; 3) sex of subject; 4) order of presentation of matrices; 5) matrix size; and, 6) four blocks of 25 trials each. This resulted in a 2x2x2x2x2x4 design with repeated measures on the last two factors.

The first analysis was performed on the percent of cooperation for each of the matrices over the four blocks of trials. A summary of this

analysis is presented in Table 11. There were four significant main effects ($p < .0005$), with order of presentation and sex the only non-significant results. There were three significant interactions between trial blocks: 1) exploitativeness; 2) contingency; and, 3) sex. There also was a significant three way interaction between the factors exploitativeness, contingency and trial blocks.

The second analysis was performed on the variance of cooperative choices. The design of this analysis was identical to that of the analysis of the percent of cooperation. Table 12 presents the summary of this analysis. For this analysis there were significant main effects for exploitativeness, matrix size and trial blocks. There were significant interactions between exploitativeness and contingency, contingency and matrix size, and exploitativeness and trial blocks. Higher order interactions included exploitativeness by contingency by sex by matrix, exploitativeness by contingency by trial blocks, and exploitativeness by matrix by trial blocks.

The third set of analyses contained six different analyses of variance, one for each of the six alternatives in the large matrix. The dependent variable in each analysis was the proportion of responses of one of the alternatives. In an attempt to simplify the presentation those effects which do not bear directly upon the theory or are marginal in significance are not discussed.

The final analysis was a simple effects analysis of the percentage of each alternative being chosen within the last block of 25 trials for the sex by contingency by exploitativeness interaction.

Table 11.

The analysis of variance on the probability of cooperation over trial blocks for the EA, CT, SX, OD, and MT factors.

SOURCE	df	MS	F
Between			
Exploitation (A)	1	34.1786	86.69*
Contingency (B)	1	7.3102	18.54*
Sex (C)	1	0.2151	
Order (D)	1	0.0017	
AB	1	1.2516	
AC	1	0.1165	
AD	1	0.0038	
BC	1	1.1691	
BD	1	0.0000	
CD	1	0.0017	
ABC	1	1.1476	
ABD	1	1.3954	
ACD	1	0.0000	
BCD	1	0.0285	
ABCD	1	0.0479	
Error	112	0.3942	
Within			
Matrix (E)	1	3.6529	22.21*
AE	1	0.1817	
BE	1	0.1775	

Table 11 (cont'd.)

SOURCE	df	MS	F
CE	1	0.0385	
DE	1	0.4144	
ABE	1	1.1422	6.95***
ACE	1	0.0129	
ADE	1	0.0166	
BCE	1	0.0436	
BDE	1	0.3235	
CDE	1	0.0015	
ABCE	1	0.0040	
ABDE	1	0.3829	
ACDE	1	0.1671	
BCDE	1	0.0582	
ABCDE	1	0.0606	
E X Subjects	112	0.1645	
Blocks (F)	3	0.1018	9.11*
AF	3	0.0697	6.24*
BF	3	0.0630	5.64**
CF	3	0.0308	2.75****
DF	3	0.0048	
ABF	3	0.0401	3.59***
ACF	3	0.0053	
ADF	3	0.0162	
BCF	3	0.0030	

Table 11 (cont'd.)

SOURCE	df	MS	F
BDF	3	0.0027	
CDF	3	0.0130	
ABCF	3	0.0265	
ABDF	3	0.0171	
ACDF	3	0.0117	
BCDF	3	0.0167	
ABCDF	3	0.0051	
F X Subjects	336	0.0112	
EF	3	0.0074	
AEF	3	0.0138	
BEF	3	0.0155	
CEF	3	0.0278	
DEF	3	0.0073	
ABEF	3	0.0115	
ACEF	3	0.0104	
ADEF	3	0.0145	
BCEF	3	0.0227	
BDEF	3	0.0064	
CDEF	3	0.0061	
ABCEF	3	0.0011	
ABDEF	3	0.0020	
ACDEF	3	0.0064	
BCDEF	3	0.0017	

Table 11 (cont'd.)

SOURCE	df	MS	F
ABCDEF	3	0.0105	
E X F X Subjects	336	0.0120	

*p < .0005

**p < .001

***p < .02

****p < .05

Table 12.

The analysis of variance for the variance over trial blocks.

SOURCE	df	MS	F
Between			
Exploitation (A)	1	0.2344	7.93***
Contingency (B)	1	0.0098	
Sex (C)	1	0.0713	
Order (D)	1	0.0098	
AB	1	0.7889	26.68*
AC	1	0.0118	
AD	1	0.0890	
BC	1	0.0000	
BD	1	0.0066	
CD	1	0.0022	
ABC	1	0.0059	
ABD	1	0.0138	
ACD	1	0.0433	
BCD	1	0.0260	
ABCD	1	0.0286	
Error	112	0.0296	
Within			
Matrix (E)	1	0.6500	44.25*
AE	1	0.0504	
BE	1	0.0847	5.77***
CE	1	0.0375	

Table 12 (cont'd.)

SOURCE	df	MS	F
DE	1	0.0001	
ABE	1	0.0107	
ACE	1	0.0005	
ADE	1	0.0095	
BCE	1	0.0094	
BDE	1	0.0018	
CDE	1	0.0056	
ABCE	1	0.1766	12.02**
ABDE	1	0.0024	
ACDE	1	0.0099	
BCDE	1	0.0125	
ABCDE	1	0.0155	
E X Subjects	112	0.0147	
Blocks (F)	3	0.0283	12.14*
AF	3	0.0256	11.00*
BF	3	0.0032	
CF	3	0.0054	
DF	3	0.0014	
ABF	3	0.0069	2.97****
ACF	3	0.0052	
ADF	3	0.0017	
BCF	3	0.0004	
BDF	3	0.0040	

Table 12 (cont'd.)

SOURCE	df	MS	F
CDF	3	0.0034	
ABCF	3	0.0016	
ABDF	3	0.0009	
ACDF	3	0.0019	
BCDF	3	0.0013	
ABCDF	3	0.0007	
F X Subjects	336	0.0023	
EF	3	0.0007	
AEF	3	0.0066	3.43***
BEF	3	0.0016	
CEF	3	0.0027	
DEF	3	0.0017	
ABEF	3	0.0034	
ACEF	3	0.0035	
ADEF	3	0.0036	
BCEF	3	0.0026	
BDEF	3	0.0011	
CDEF	3	0.0003	
ABCEF	3	0.0003	
ABDEF	3	0.0026	
ACDEF	3	0.0021	
BCDEF	3	0.0043	
ABCDEF	3	0.0009	

Table 12 (cont'd.)

SOURCE	df	MS	F
E X F X Subjects	336	0.0019	

*p < .0005

**p < .001

***p < .02

****p < .05

Results of Test of Theory

Sex Differences

Hypothesis 1. The exploitative-accommodative theory predicts significant interaction between sex and contingency of strategy for the proportion of cooperative responses. As the analysis of the proportion of cooperative responses indicated, there were no significant interactions between sex and contingency nor was there a significant exploitativeness by contingency by sex interaction. This result is nonsupportive of the theory since it predicts that females will defect more against a contingent strategy than a noncontingent strategy.

A simple effects analysis was performed on the contingency by sex interaction for the accommodative and exploitative strategies separately. For the exploitative strategy there was no significant interaction; however, there was a significant interaction for the accommodative strategy. Table 13 presents the means and simple effects analysis for the sex by contingency interaction. The only difference that was significant was for males between the contingent and noncontingent strategies. For the contingent accommodative strategy males had 80% cooperative responses while in the noncontingent situation they had 43%.

Table 14 shows the means for the EA by CT by SX interaction for the two alternative matrix over the last block of 25 trials. A simple effects analysis indicated that the only significant difference between means was between contingent and noncontingent accommodative strategies for males. Although these results were consistent with the previous results for both matrices over all 100 trials, the difference between contingent and noncontingent accommodative strategies for females was more pronounced here than for the entire data set. The F ratio was also

Table 13.

The means and simple effects analysis for the proportion of cooperation responses in the sex by contingent interaction for the accommodative strategy.

	C	NC
M	.80	.43
F	.66	.55

SOURCE	df	MS	F
CT for males	1	4.40	11.2*
CT for females	1	.46	1.16
Sex at contingent	1	.64	1.62
Sex at noncontingent	1	.64	1.62
Error	112	.2416	

*p < .005

Table 14.

The means for the exploitativeness by contingency by sex interaction for the two alternative matrix on the last 25 trials.

	E		A	
	C	NC	C	NC
M	.28	.2767	.91	.427
F	.267	.213	.76	.55

SOURCE	df	MS	F
Sex at A-C	1	.1792	1.67
Sex at A-NC	1	.1216	1.13
Contingent at A-M	1	1.87	17.37*
Noncontingent at A-F	1	.352	3.27
Error (pooled)	112	.1075	

*$p < .001$

larger and had a probability of occurrence less than .10. The interesting aspect of the contingent-noncontingent difference was that it was in a direction opposite to that predicted and opposite to all previous findings.

There were no differences between males and females for making the cooperative response. The unexpected result of this interaction was that females cooperated more with a contingent strategy than with a noncontingent strategy. This result is contrary to the prediction for this situation.

Previous studies have found that males and females did not differ with respect to their initial preferences for the cooperative or defect alternatives. The first trial analyses supported these findings; however, a significant blocks by sex interaction, the CF interaction in Table 11, appeared for the proportion of cooperative responses. The means and simple effects analysis are presented in Table 15. The analyses indicated that the only significant difference between males and females occurred within the first trial block and that there were significant differences between trial blocks for males.

A paired comparisons analysis was performed on the trial block means for males. A summary of this analysis is presented in Table 16, and it indicates that only the first trial block was significantly different from any other. The first trial had a significantly larger mean proportion of cooperative responses than the last two trial blocks.

Hypothesis 2. The exploitative-accommodative theory predicted that males would show a larger variance of responses than females in the earlier blocks of trials against an exploitative strategy. There was no significant interaction between trial blocks and sex for variance

Table 15.

The means and simple effects analysis for the sex by blocks interaction.

	Blocks 1	2	3	4
Males	.48	.45	.42	.42
Females	.42	.42	.41	.40

SOURCE	df	MS	F
M-F at block 1	1	.94012	8.79
M-F at block 2	1	.1894	1.77
M-F at block 3	1	.0502	0.47
M-F at block 4	1	.0576	0.54
Error (pooled)	112	.1070	
Blocks for males	3	.1056	9.43
Blocks for females	3	.0235	2.10
Error	336	.01119	

Table 16.

The paired comparisons analysis between blocks for the percent cooperation for males.

	Blocks			
	1 (.48)	2 (.45)	3 (.42)	4 (.42)
.48	----	3.22	6.45*	6.45*
.45			3.22	3.22
.42				0.00

*p < .01

of ch
signi
fects
strat
and f
cant
the re
males
trial
blocks
last t
A
female
tions.
choice
tingen
analys
was ge
six alt
analys
betwee
a large
was a s
strateg
varianc
Th
Overall

of choices; however, for the exploitative strategy alone there was a significant interaction. Table 17 displays the means and simple effects analysis for the sex by blocks interaction for the exploitative strategy. The results indicate that the only difference between males and females occurred for the third trial block while there were significant differences between trial blocks for both sexes. Table 18 indicates the results of the paired comparisons analysis over trial blocks for males and females. The results of the analysis showed that the first trial block for males was significantly different from all other trial blocks, while the first block for females was only different from the last two.

An implication of the exploitative-accommodative theory was that females should have a rather stable variance of choices over all situations. There appeared, however, in the analysis of the variance of choices a significant interaction between sex, exploitativeness, contingency and matrix, the ABCE interaction in Table 12. Subsequent analyses of this interaction indicated that the significant interaction was generated by a significant sex by contingency interaction for the six alternative matrix for the accommodative strategy. The means and analysis are presented in Table 19, which shows a significant difference between males and females for the noncontingent strategy. Females had a larger variance than males for the noncontingent strategy. There also was a significant difference between contingent and noncontingent strategies for females with the contingent strategy producing much less variance with the noncontingent.

This result partially supports the theory since it predicts that, overall, against a noncontingent accommodative strategy males will stop

Table 17.

The mean variances and simple effects analysis for the sex by trial blocks interaction for the exploitative strategy.

	Blocks			
	1	2	3	4
Males	.17	.13	.11	.12
Females	.16	.14	.13	.13

SOURCE	df	MS	F
Sex at block 1	1	0.0128	1.40
Sex at block 2	1	0.0128	1.40
Sex at block 3	1	0.0512	5.60
Sex at block 4	1	0.0128	1.40
Error (pooled)	112	0.009139	
Blocks for males	3	0.0443	19.00
Blocks for females	3	0.0128	5.49
Error	336	0.00233	

Table 18.

The paired comparisons analysis for trial blocks for males and females for the exploitative strategy.

Males

Blocks

	1 (.17)	2 (.13)	3 (.12)	4 (.11)
.17		6.63*	8.29*	9.94*
.13			1.66	3.32
.12				1.66

Females

Blocks

	1 (.16)	2 (.14)	3 (.13)	4 (.13)
.16		3.32	4.97*	4.97*
.14			1.66	1.66
.13				0.00

*$p < .01$

va

Sex f

Sex f

CT fo

CT fo

Error

*

Table 19.

The means and simple effects analysis on the variance of responses for the sex by contingency interaction for the accommodative strategy.

	C	NC
M	.083	.082
F	.058	.132

SOURCE	df	MS	F
Sex for contingent	1	0.02	1.08
Sex for noncontingent	1	0.08	4.35*
CT for males	1	0.00	0.00
CT for females	1	0.175	9.52**
Error	112	.01841	

*p < .05

**p < .001

responding to the strategy while females will not. Females, however, were expected to have a relatively stable variance but this result shows females discriminate between contingent and noncontingent strategies under an accommodative strategy.

Hypothesis 3. The analysis of the "maximize relative gain" alternative produced a significant sex by contingency interaction. The results of the simple effects analysis and interaction means are presented in Table 20. As these results indicate males chose the alternative more often against a noncontingent strategy than against a contingent strategy. Also males chose the alternative more often than females against a noncontingent strategy. The theory did not predict differences with respect to the "maximize relative gain" alternative.

The theory hypothesized that males and females would have differential response preferences for the six alternative matrix under various combinations of strategies. Table 21 presents the mean probability of choosing each of the alternatives within the sex by contingency by exploitativeness interaction. Because there was evidence that the later trials were played differently than the earlier trials and because the theory was concerned with asymptotic choices, only the last 25 trials were used to calculate the means in this table. An analysis of variance had been performed on the six alternatives on the last 25 trials over the independent factors of sex, contingency, exploitativeness, and session. The numbers at the bottom of the table indicate for each alternative the difference between factor levels necessary for the difference to be significant at the .05 and .01 levels. This table displays quite clearly the various differences between males and females.

Table 20.

The simple effects analysis and the mean proportion of MD responses for the sex by contingency interaction.

	M	F
C	.045	.078
NC	.15	.063

SOURCE	df	MS	F
Contingency for males	1	.7056	8.31*
Contingency for females	1	.0144	0.17
Sex for contingent	1	.0697	0.82
Sex for noncontingent	1	.4844	5.70**
Error	112	.08495	

*p < .01

**p < .05

Table 21.

Summary table for the sex by contingency by exploitativeness by alternative interaction for trial block four on the proportion of each response and the minimum difference necessary for significance.

			AB	V	C	MD	LR	BC
E	C	M	.48	.007	.29	.12	.103	.00
		F	.46	.023	.23	.08	.20	.0125
	NC	M	.20	.005	.122	.22	.44	.01
		F	.53	.003	.067	.13	.265	.0125
A	C	M	.18	.00	.712	.003	.103	.0025
		F	.22	.00	.59	.08	.0925	.0025
	NC	M	.49	.02	.305	.055	.115	.0125
		F	.28	.0125	.535	.02	.14	.0175
	p < .01		.24	.024	.286	.156	.20	.622
	p < .05		.1827	.0173	.216	.1178	.152	.0173

Hypoth

gain c

differ

strate

would

mlaes

tingen

one of

Males

this s

tive s

contin

Ma

strateg

gain ch

more th

also ch

strateg

against

Within

ference

of abso

Th

a conti

type of

ternati

opposed

Hypothesis 4. The theory predicts that males will try to maximize their gain during the course of the game. For the four different strategies different choices accomplish this goal. For the contingent exploitative strategy no alternative maximizes gain very well. The "A" alternative would produce the larger payoff over the long run. For males and femlaes this is the dominant choice in this situation. For the noncontingent exploitative strategy the simulated other has randomly chosen one of the six alternatives with "A" being chosen on 85% of the trials. Males chose the minimize risk alternative more often than females in this situation and also more often than males in the contingent exploitative situation. Females did not differ in their responses between the contingent and noncontingent exploitative strategies.

Males were predicted to exploit a noncontingent accommodative strategy. The most exploitative of choices is the maximize absolute gain choice. As the table indicates, males choose the "A" alternative more than females under the noncontingent accommodative strategy, and also choose it more than females under a contingent accommodative strategy. Also females should choose the low risk alternative more often against a contingent strategy than against a noncontingent strategy. Within the exploitative and accommodative strategies there were no differences between contingent and noncontingent females in the proportion of absolute low risk alternatives chosen.

The theory also predicts that males will be more cooperative with a contingent strategy than a noncontingent strategy for the accommodative type of strategy. As the table shows, males choose the cooperative alternative 71% of the time for the contingent accommodative strategy as opposed to 30.5% for the noncontingent strategy. Females did not differ

in their responses between contingent and noncontingent accommodative strategies. Also males and females did not differ for the contingent strategy in percent cooperation or any other alternative selection. This was also the case for the contingent exploitative strategies.

General Results

Hypothesis 5. It was hypothesized that the exploitative strategy would be responded to in a manner different from the accommodative strategy. The analysis performed on the percent of cooperation for both matrices indicated that the percent of cooperation was significantly less for the exploitative strategy than for the accommodative strategy. The mean percent of cooperation for the exploitative strategy was 25% while the accommodative strategy was 61%.

The variance of the cooperative choice also indicated differences in responding to the two types of strategies. The variance for the exploitative strategy was .137 as opposed to the variance for the accommodative strategy of .107. This difference was significant with an F ratio having a probability less than .0005.

The probability of choosing the "maximize absolute gain" alternative was also affected by the exploitativeness of the strategy. The exploitative strategy produced a probability of choosing the "maximize absolute gain" alternative of .39 as opposed to the accommodative strategy which produced a probability of .28. The more cooperative the strategy, the less likely the "maximize absolute gain" alternative is chosen.

The analysis of the proportion of cooperative responses for the six alternative matrix followed the pattern of the analysis for both matrices together. The exploitative strategy produced much less cooperation than the accommodative strategy. For the "maximizing differences"

alternative there also was a significant difference between the exploitative and accommodative strategies with the former producing more "maximizing differences" choices than the latter.

The analysis of the "minimizing risk" alternative also showed that the exploitative strategy produced more "low risk" choices under the exploitative strategy than under the accommodative strategy. The behavior control alternative showed no significant differences between the exploitative and accommodative strategies.

The analyses on the last 25 trials indicated that the differences between the exploitative and accommodative strategies were even more pronounced than for all 100 trials for the "maximizing absolute gain," "cooperative," "maximizing differences" and "minimizing risk" alternatives. All of the alternatives were chosen more often against an exploitative strategy than an accommodative strategy, with the exception of the cooperative alternative which was chosen less often under the exploitative strategy.

The last set of results are further supported by the significant interaction between exploitativeness and trial blocks, the AF interaction, for the percent of cooperation. The means and simple effects analysis for this interaction are presented in Table 22. As the analysis shows the proportion of cooperative responses decreased from trial block one to block four for the exploitative strategy while there was little difference for the accommodative strategy.

The exploitative-accommodative factor had a definite effect on the choices made by the subjects as well as the variance of the choices. The analysis of the variance of choices for the "cooperative" choice in both matrices indicated a significant interaction between exploitativeness

Table 22.

The means for the probability of cooperation for the exploitative-accommodative by blocks interaction and the simple effects test.

	Blocks 1	2	3	4
E	.294	.247	.222	.218
A	.611	.625	.61	.592

SOURCE	df	MS	F
EA at block 1	1	6.4312	31.73*
EA at block 2	1	9.145	45.12*
EA at block 3	1	9.638	47.55*
EA at block 4	1	9.2416	45.592*
Error	112	0.20269	
Blocks at E	3	0.3121	27.99
Blocks at A	3	0.0312	2.63
Error (pooled)	336	0.0112	

*p < .001

and trial blocks, the AF interaction in Table 12. Table 23 presents the means and simple effects analysis for this interaction and as the table indicates the exploitative strategy had a consistently larger variance, but it was only significantly larger for the first two trial blocks. The exploitative strategy also shows a decrease in variance from the first two trial blocks to the second two trial blocks. The accommodative strategy shows no such decrease. A paired comparisons analysis was performed on the mean variances for the exploitative strategy. The results of this analysis, presented in Table 24, showed that the first trial block was significantly different from all others.

Hypothesis 6. The sixth hypothesis concerned the effect of the contingency of the strategy. Here it was assumed that the contingent strategy would produce more cooperative responses. There was a main effect for contingency of strategy in the analysis on the percent of cooperation for both matrices. The contingent strategy produced 51% cooperative choices while the noncontingent strategy produced 34% cooperative responses.

The analysis on the variance of choices showed no main effects for contingency nor did any of the analyses on the six alternatives within the larger matrix separately. The low risk alternative was an exception with more "minimizing risk" choices being made for the noncontingent strategy than for the contingent strategy.

Although there were significant main effects for contingency there also were interactions between contingency, exploitativeness and trial blocks, the ABF interaction in Table 11. For the probability of cooperation for both matrices there was a significant interaction between contingency and trial blocks, the BF interaction in Table 11. Table 25

Table 23.

The mean variance and simple effects analysis for the exploitativeness by blocks interaction.

	Blocks				
	1	2	3	4	
E	.167	.135	.123	.124	.137
A	.108	.107	.105	.108	.107

SOURCE	df	MS	F
Blocks at E	3	.0541	23.234*
Blocks at A	3	.0000	.000
Error	336	.00233	
EA at block 1	1	.223	24.40*
EA at block 2	1	.05	5.50**
EA at block 3	1	.027	2.96
EA at block 4	1	.016	1.75
Error (pooled)	112	.00914	

*p < .001

**p < .025

Table 24.

Paired comparisons of variance for the four blocks of trials for the exploitative strategy.

	Blocks			
	1 (.167)	2 (.135)	4 (.124)	3 (.123)
1	----	7.50*	10.02*	10.32*
2		----	2.58	2.81
4			----	0.00

$MS_e = .546$

$df = 336$

*$p < .01$

Table 25.

The simple effects analysis of the contingency by trial blocks interaction.

	Blocks 1	2	3	4
C	.515	.519	.518	.505
NC	.39	.35	.321	.31

SOURCE	df	MS	F
Blocks at C	3	.00452	.423
Blocks at NC	3	.16350	15.30
Error	336	.0112	
CT at block 1	1	1.00	9.35
CT at block 2	1	1.83	17.10
CT at block 3	1	1.92	17.96
CT at block 4	1	2.44	22.83
Error (pooled)	112	.1068	

shows the means and simple effects analysis for this interaction. As the table shows there were consistent differences between the contingent and noncontingent strategies with the former having a higher proportion of cooperative responses. There was a significant effect for trial blocks for the noncontingent strategy. The proportion of cooperative responses decreased from block one to block four. A paired comparisons analysis was performed on the means for the noncontingent strategy and the results of this analysis are presented in Table 26. As the table indicates, the first two trial blocks were significantly different from each other and the last two trial blocks.

For the proportion of cooperative responses for both matrices there was a significant interaction between exploitativeness, contingency and trial blocks, interaction ABF in Table 11. A simple effects analysis indicated that there was no interaction between contingency and trial blocks for the exploitative strategy, but there were for the accommodative strategy. Table 27 presents the results of the simple effects analysis on the contingency by trial blocks interaction for the accommodative strategy. There were consistent differences between the contingent and noncontingent strategies with the former generating the larger proportion of cooperative responses. For both strategies there were significant differences between trial blocks. For the contingent strategy the proportion of cooperative responses increased from trial block one to four while for the noncontingent strategy the trend was reversed. Table 28 presents the summary of the paired comparisons analysis for the contingent and noncontingent strategies over trial blocks. As the table indicates, there were significant differences between trial block one and all other trial blocks for the contingent

Table 26.

Paired comparisons analysis of the proportion of cooperative responses for trial blocks for the noncontingent strategy.

	Blocks			
	1 (.39)	2 (.35)	3 (.321)	4 (.31)
1	----	4.276*	7.376*	8.55*
2		----	3.10**	4.276*
3			----	1.176

$MS_e = .0112$

df = 336

*p < .01

**p < .05

Table 27.

The means and simple effects analysis of the probability of choosing cooperatively for the accommodative strategy for the contingency by trial blocks interaction.

	Blocks 1	2	3	4
C	.69	.75	.74	.74
NC	.53	.50	.48	.45

SOURCE	df	MS	F
CT at block 1	1	.82	7.67*
CT at block 2	1	2.00	18.73**
CT at block 3	1	2.16	20.25**
CT at block 4	1	2.69	25.20**
Error (pooled)	112	.1068	
Blocks at contingent	3	.0469	4.19***
Blocks at noncontingent	3	.0725	6.476****
Error	336	.0112	

*p < .01

**p < .001

***p < .05

****p < .025

Table 28A.

Paired comparisons for the contingent accommodative strategy for the probability of choosing cooperatively over blocks.

	Blocks			
	2 (.75)	4 (.74)	3 (.74)	1 (.69)
.75		.76	.76	4.54*
.74			0.00	3.78*
.69				

Table 28B.

Paired comparisons for the noncontingent accommodative strategy for the probability of choosing cooperatively over blocks.

	Blocks			
	1 (.53)	2 (.50)	3 (.48)	4 (.45)
.53		2.27	3.78*	6.05*
.50			2.27	3.78*
.48				2.27

$MS_e = 0.112$

*p < .05

**p < .01

strategy. For the noncontingent strategy the first and second trial blocks were significantly different from the last two blocks but not different from each other.

The analysis of the variance of the choices indicated a significant interaction between contingency and exploitativeness, the AB interaction in Table 12. The simple effects analysis is presented in Table 29. As the analysis indicates, there was a significant difference between contingent and noncontingent strategies for the exploitative and accommodative strategies and a significant difference between the exploitative and accommodative strategies for the contingent strategy.

The exploitative strategy generated a larger variance in choice than the accommodative strategy under contingent conditions. In fact, the variance for the contingent exploitative strategy was the largest and the contingent accommodative variance the smallest in the table. There were no differences between exploitative and accommodative strategies under noncontingent conditions.

There was a significant interaction between matrix size, exploitativeness, and contingency of strategy for proportion of cooperative responses. A simple effects analysis of the three way interaction, the ABE interaction in Table 11, revealed that only the contingency by matrix size interaction for the exploitative strategy was significant. A simple effects analysis of the contingency by matrix interaction was performed and is presented in Table 30. As the results indicate, the noncontingent strategy for the six alternative matrix produced the smallest proportion of cooperative responses. The proportion of cooperative responses for the other three cells were almost identical.

There also was a significant interaction between contingency and

Table 29.

The mean variance and simple effects for the exploitative by contingent interaction.

	E	A
C	.162	.076
NC	.113	.138

SOURCE	df	MS	F
CT at E	1	.3073	10.39*
CT at A	1	.492	16.64**
EA at C	1	.9468	32.02**
EA at NC	1	.08013	2.71
Error	112	.0296	

*p < .005

**p < .001

Table 30.

The means and simple effects analysis for the contingency by matrix interaction for the exploitative strategy.

	C	NC
2	.295	.29
6	.295	.10

SOURCE	df	MS	F
CT at two alternative matrix	1	0.0032	0.01
CT at six alternative matrix	1	2.31	9.57**
Error (pooled)	112	0.2416	
Matrix at contingent	1	0.00	0.00
Matrix at noncontingent	1	2.4336	14.79*
Error	112	0.1645	

*p < .005

**p < .001

matrix size for the variance of the choices made. The simple effects analysis presented in Table 31 shows significant differences for all comparisons except for the matrix size for the contingent strategy. For the noncontingent strategy the two alternative matrix had a variance of .17 while the six alternative matrix had a variance of .11.

Table 31.

The means for the variance of choices and simple effects analysis for the contingency by matrix interaction.

	C	NC
2	.13	.16
6	.105	.09

SOURCE	df	MS	F
CT two choice	1	.0288	1.30
CT six choice	1	.00705	.32
Error (pooled)	112	.0221	
Matrix for contingent	1	.031	2.10
Matrix for noncontingent	1	.153	10.40*
Error	112	.0147	

*p < .01

DISCUSSION

Sex Differences

This chapter is divided into two distinct sections. The first section deals only with the sex differences found in the study. The second section of the chapter deals with the general findings of the study with respect to matrix size, exploitativeness of strategy, contingency of strategy and over trials differences.

Comparison to Previous Results

The results of the analysis of proportion of cooperative responses for the sex by contingency by exploitativeness interaction were at odds with the findings of O'Grady (1970) and Komorita (1965). For the accommodative strategy alone, however, males discriminated between the contingent and noncontingent strategies by cooperating more with a contingent strategy and exploitating a noncontingent strategy. This result is in line with the findings of O'Grady and Komorita; however, the results for females were not congruent with the findings of these researchers. For the accommodative strategy females did not discriminate between contingent and noncontingent strategies. Previous findings indicated that females cooperated less against a contingent strategy than against a noncontingent strategy.

The analysis of the proportions of each alternative being chosen within the six alternative matrix may indicate why this result was found. Table 21 shows the various percentages for the alternatives.

Direct comparisons between contingent and noncontingent strategies for females within each level of exploitativeness show that females do not respond differentially to contingent and noncontingent strategies. Females only respond to the exploitativeness of the strategy.

The previous results of Komorita and O'Grady may have been due to the exploitativeness of the contingent strategy rather than the contingency itself. For Komorita the contingent strategy played cooperatively on 22% of the trials. When the percent of cooperation for the "noncontingent 25% cooperate" strategy is compared to the percent of cooperation for the contingent strategy, females responded to contingent and noncontingent strategies in the same manner.

Komorita's results for the noncontingent situation are presented in a figure and therefore must be interpolated. For the 25% noncontingent condition the percent of cooperation for females appears to be 10% as opposed to the 22% for the contingent condition. The significance of this result is not known but it is consistent with the result found for females under the accommodative strategy where they produced 55% and 66% cooperative responses for the noncontingent and contingent strategies respectively.

For the O'Grady study direct comparisons between contingent and noncontingent levels of exploitativeness are not possible. O'Grady's contingent strategy for females produced approximately 70% defect while his two noncontingent strategies produced approximately 10% and 30% defect. Although females were playing against a contingent strategy they also were playing against a more exploitative strategy. The present study presents clear evidence for the hypothesis that it was the exploitativeness of the strategy that the females were responding

to, and not the contingency.

Perception of Strategies. The argument can be made that females were unaware of the contingency of the situation. The analyses of the responsive and exploitativeness scale descriptions of the other participant show that this is clearly not the case. Females were as aware of the contingency of the strategy as were males, and both were aware of the exploitative nature of the strategy. Clearly it is not differential awareness of contingency or exloitativeness but differential responding according to different dimensions. Males respond to both exploitativeness and contingency while females respond only to the exploitative dimension.

Implications for Theory

Although the exploitative-accommodative theory predicted differences in the variance of choices over trial blocks for males and females, the differences did not appear. Males did decrease in variance of response from trial block one to four but the differences between males and females for the first trial block was not significant. As predicted, however, the difference was in the direction of males having a larger variance.

Hypothesis 2. An interesting finding for the six alternative matrix under the accommodative strategy showed that females had a much higher variance of choice for the noncontingent strategy than for the contingent strategy. The six alternative matrix allows subjects to choose that alternative which best satisfies their motivation. This means that females could choose that alternative which they felt satisfied their motivations and they could continue to make that choice. Females can lock in on a strategy and play it continually ignoring the choices

of the other.

Hypothesis 3. The results of the last 25 trials analysis of the six alternative matrix did not support the predictions of the exploitative-accommodative theory with respect to differential preferences between males and females under different strategies. Females were predicted to choose low risk under contingent strategies; however, they did not differentiate between contingent and noncontingent strategies. There was a slight tendency for females to prefer the minimize risk alternative when playing against an exploitative strategy.

An examination of Table 21, which displays the mean percentages of each alternative being chosen under each strategy, shows clearly the difference between males and females. Females chose more cooperatively under the accommodative strategy, regardless of contingency, than under the exploitative strategy. They chose the maximize absolute gain and minimize risk alternative more often against an exploitative strategy than against a cooperative strategy.

The most striking effects of strategy upon play of the subjects occurred for males. Males always chose that alternative which maximized their gain. Against a contingent exploitative strategy they chose maximize absolute gain, since the simulated other generally played cooperatively to this strategy and the subject could thus receive positive payoffs on all trials. Against the noncontingent exploitative strategy, the low risk alternative guaranteed a positive payoff while all other choices ran the risk of some loss. Males preferred the low risk alternative to all others in this condition. The accommodative strategy has been discussed previously and the results are consistent with previous findings comparing contingent and noncontingent strategies for males.

Although for the two alternative matrix there were no differences for males between contingent and noncontingent strategies for the exploitative strategy, the six alternative matrix produced some clear differences. Males chose the defect alternative for the same motivation in this situation. They were responding to different aspects of the alternative. Against the contingent exploitative strategy the males choose maximize absolute gain since it satisfies their desire to maximize gain. When playing against a strategy which randomly chooses cooperatively on only 3% of the trials the only alternative which insures positive payoffs is the low risk alternative.

The two alternative matrix did not show any differences between males and females for choosing the defect alternative but again males chose the defect alternative for different reasons than females. Males chose that alternative which would guarantee a positive payoff, while females chose the maximize absolute gain alternative.

General Results

Boundary Conditions

First Trial. The analyses of the first trial data indicated that no differences between males and females existed for initial preferences. This analysis also indicated that there was little if any carry over from the first session to the second. On the first trial the six alternative matrix produced fewer cooperative responses than the two alternative matrix but the difference was much smaller than might be expected. Within the six alternative matrix there were five times as many defect alternatives than in the two alternative matrix, but the actual difference between the percentage of cooperation for the two alternative and six alternative matrices was 21%. This represented a 50% increase from

the two alternative matrix.

Rating Scales. The results of the analyses on the rating scales produced one of the most significant findings of the study. It has been suggested that females fail to understand the game situation and that they do not pay attention to the choices made by the other. The strategies were rated consistent with their intent. The exploitative strategy was rated more exploitative than the accommodative strategy and the contingent strategy was rated more responsive than the noncontingent strategy.

Hypotheses Not Related to Sex

Hypothesis 5. The exploitative-accommodative strategies produced the results they were expected to. More defections occurred under the exploitative strategy than under the accommodative strategy. This factor had an interesting interaction with trial blocks. The exploitative strategy had a decreasing percent of cooperation over the four trial blocks, indicating an increasing awareness on the part of the subjects that mutual cooperation with the exploitative strategy was impossible. The accommodative strategy showed no such decrease in percent cooperation, but when the accommodative strategy was separated with respect to contingency of strategy then significant effects appeared over blocks. For the noncontingent strategy the percent cooperation decreased over trial blocks while the percent cooperation for the contingent strategy increased. This simultaneous increase and decrease for the accommodative strategy cancelled out the effect for trial blocks.

Hypothesis 6. For the accommodative noncontingent strategy, the noncontingency of the situation becomes more and more evident over trials and thus the decrease in cooperation. If the other is not responding to the

choices made, the most rational choice is defect. Against the contingent strategy it becomes increasingly clear to the subject that any defection on his part will result in retaliation and thus he chooses more cooperatively as the game progresses.

The variance of choices was also affected by the exploitativeness of the strategy over trial blocks. The exploitative strategy produced more variance in the first trial blocks than the accommodative strategy. The subjects who were trying to maximize gain were thwarted by the exploitative strategy. Within the first two trial blocks the subjects were apparently trying to find the solution to the exploitative strategy. When it became obvious that the other subject was not going to cooperate, the subjects stopped trying to induce cooperation and defected.

The contingent strategy produced much more cooperation than did the noncontingent strategy. This result was most likely caused by the increased cooperative responses for the contingent exploitative strategy over the noncontingency and the tendency of subjects to exploit a noncontingent accommodative strategy.

Effect of Matrices

There was a significant matrix by contingency by exploitativeness interaction. The interaction was found to be caused by an extremely low probability of choosing cooperatively only in the six alternative matrix against a noncontingent exploitative strategy. Within the six alternative matrix the subject had recourse to an exploitative strategy. The contingent exploitative strategy had the ability to induce some cooperation while the noncontingent strategy only chose cooperatively on 3% of the trials. Against a noncontingent exploitative strategy the rational choice was defection, a choice taken in the six alternative matrix. The

differences between the matrices indicated that within the two alternative matrix the defect choice was not made as readily. In the six alternative matrix the subject could choose either the maximize absolute gain or minimize risk alternatives which almost guaranteed a positive payoff. In the six alternative matrix the subject could continue to defect and still make money, a solution not open to him in the two alternative matrix. If the subject continued to defect in this situation he would have been guaranteed a zero payoff against a consistently defecting strategy. This interaction appears to be a function of the payoffs in the two matrices and the exploitativeness of the strategy.

The general findings of the study indicated that males and females perceive equally well the exploitativeness and contingency of strategies played against them. Males respond to both the contingency and exploitative-accommodative dimensions by choosing consistently that alternative which maximizes their gain in the situation. In general females only respond to the exploitativeness of the strategy played against them by cooperating with a cooperative strategy and not cooperating with a noncooperative strategy.

Although these findings were not consistent with the interpretation of results obtained by Komorita and O'Grady they did prove to be quite consistent with the actual results of these researchers. In the studies performed by O'Grady and Komorita the level of exploitativeness was confounded with contingency. The only direct comparison that was possible between contingent and noncontingent strategies with approximately the same level of exploitativeness indicated that there was no difference between the strategies for females. The comparison in fact indicated that females cooperated more with a contingent strategy than a

noncontingent strategy, a result that was replicated in the present study, but which proved to be only marginally significant.

The exploitative-accommodative theory was supported in general. Females did show a smaller variance of choices under a contingent accommodative strategy than a noncontingent accommodative strategy. However, the females did not respond to the contingency of the strategy as predicted. For males the theory was correct in virtually every prediction. They do in each case choose that alternative which maximizes their own gain. They respond to the contingency and exploitativeness of the strategy in a manner which produces the greatest possibility of maximizing their gain. Males do show a decrease in variance of choices over trial blocks, an indication that they are testing the simulated other to determine the contingency of the strategy played by the other participant.

From this study it is quite clear that the revised exploitative accommodative theory needs at least one more revision. This revision must deal only with the female aspect of the theory since for males the theory seems to predict behavior quite well. Possibly the simplest revision would be that females do enter the situation with the desire to maximize joint gain and to be fair. When females can cooperate with the other participant they will do so. If females are exploited by the other participant or the other participant does not choose cooperatively on a large percentage of the trials, females will defect.

The dimension of the defect choice that females seem to respond to is not the low risk aspect, at least not in the present study. Which aspect of the defect choice females are attending to when choosing defect was not made completely clear by the six alternative payoff matrix,

although it was made clear for males. It may be the case that females are responding to the riskiness of the situation, but that the difference between the "maximize absolute gain" alternative and the "minimize risk" alternative may be too small for females to perceive. If these two alternatives are treated as one, females choose the least risky choice much more often against an exploitative strategy than against an accommodative strategy with no respect to contingency of the situation.

LIST OF REFERENCES

LIST OF REFERENCES

Aranoff, D., & Tedeschi, J. T. Original stakes and behavior in the prisoner's dilemma game. Psychonomic Science, 1968, 12 (2), 79-80.

Bixenstine, V. E., Chambers, N., & Wilson, K. V. Effect of asymmetry in payoff on behavior in a two-person, non-zero-sum game. Journal of Conflict Resolution, 1964, 8, 151-159.

Bixenstine, V. E., & O'Reilly, E. F., Jr. Money versus electric shock in a prisoner's dilemma game. Psychological Record, 1966, 16, 251-264.

Bixenstine, V. E., Potash, H. M., & Wilson, K. V. Effects of level of cooperative choice by the other player on choices in a prisoner's dilemma game: Part I. Journal of Abnormal and Social Psychology, 1963, 4, 308-313.

Bixenstine, V. E., & Wilson, K. V. Effects of level of cooperative choice by the other players in a prisoner's dilemma game: Part II. Journal of Abnormal and Social Psychology, 1963, 67 (2), 139-147.

Bond, J. R., & Vinacke, W. E. Coalitions in mixed-sex triads. Sociometry, 1961, 24, 61-75.

Evans, G. M., & Crumbaugh, C. M. Payment schedule, sequence of choice, and cooperation in the prisoner's dilemma game. Psychonomic Science, 1966, 5 (2), 87-88.

Gallo, P. S., Funk, S. G., & Levine, J. R. Reward size, method of presentation, and number of alternatives in a Prisoner's Dilemma game. Journal of Personality and Social Psychology, 1969, 13, 239-244.

Horai, J., & Tedeschi, J. T. The effects of credibility and magnitude of punishment on compliance to threats. Journal of Personality and Social Psychology, 1969, 12 (2), 164-169.

Hurst, P. M., Radlow, R., Chubb, N. C., & Bagley, S. K. Drug effects upon choice behavior in mixed-motive games. Behavioral Science, 1969, 14, 443-452.

Kahn, A., Hottes, J., & Davis, W. Cooperation and optimal responding in the Prisoner's Dilemma game: The effects of sex and

and physical attractiveness. Journal of Personality and Social Psychology, 1971, 17 (3), 267-279.

Kanouse, D. E., & Wiest, W. M. Some factors affecting choice in the Prisoner's Dilemma. Journal of Conflict Resolution, 1967, 11 (2), 206-213.

Komorita, S. S. Cooperative choice in a Prisoner's Dilemma game. Journal of Personality and Social Psychology, 1965, 2 (5), 741-745.

Komorita, S. S., & Mechling, J. Betrayal and reconciliation in a two-person game. Journal of Personality and Social Psychology, 1967, 6 (3), 349-353.

Luce, R. D., & Raiffa, H. Games and decisions. New York: Wiley, 1957.

Lutzker, D. R. Sex role, cooperation and competition in a two-person, non-zero-sum game. Journal of Conflict Resolution, 1961, 5 (4), 366-368.

Miller, R. R. No play: A means of conflict resolution. Journal of Personality and Social Psychology, 1967, 6 (2), 150-156.

Minas, J. S., Scodel, A., Marlowe, D., & Rawson, J. Some descriptive aspects of two-person non-zero games: II. Journal of Conflict Resolution, 1960, 4 (2), 193-197.

O'Grady, P. J. Attribution of strategies in the prisoner's dilemma game: A symbolic interaction approach. Report 70-7, Cooperation/Conflict Research Group, Michigan State University, East Lansing, Michigan, 1970.

Oskamp, S., & Perlamn, D. Factors affecting cooperation in a Prisoner's Dilemma game. Journal of Conflict Resolution, 1965, 9 (3), 359-374.

Pilisuk, M., Potter, P., Rapoport, A., & Winter, J. A. War hawks and peace doves: Alternate resolutions of experimental conflicts. Journal of Conflict Resolution, 1965, 9 (4), 491-508.

Rapoport, Anatol, & Chammah, A. M. Sex differences in factors contributing to the level of cooperation in the Prisoner's Dilemma Game. Journal of Personality and Social Psychology, 1965, 2, 831-838.

Sampson, E. E., & Kardush, M. Age, sex, class, and race differences in response to a two person non-zero-sum game. Journal of Conflict Resolution, 1965, 9 (2), 212-220.

Schlenker, B. R., Bonoma, T., Tedeschi, J. T., & Pivnick, W. P. Compliance to threats as a function of the wording of the threat and the exploitativeness of the threatener. Sociometry, 1970, 33 (4), 394-408.

Sermat, V. The effect of an initial cooperative or competitive treatment upon a subject's response to conditional cooperation. Behavioral Science, 1967, 12, 301-313.

Shomer, R. W., Davis, A. H., & Kelley, H. H. Threats and the development of coordination: Further studies of the Deutsch and Kraus trucking game. Journal of Personality and Social Psychology, 1966, 4 (2), 119-126.

Tedeschi, J. T., Bonoma, T., & Lindskold, S. Threatener's reactions to prior announcement of behavioral compliance or defiance. Behavioral Science, 1970, 15 (2), 171-179.

Tedeschi, J. T., Bonoma, T., & Novinson, N. Behavior of a threatener: Retaliation versus fixed opportunity costs. Journal of Conflict Resolution, 1970, 14 (1) 70-76.

Tedeschi, J., Lesnick, S., & Gahagan, J. Feedback and "washout" effects in the Prisoner's Dilemma game. Journal of Personality and Social Psychology, 1968, 10 (1), 31-34.

Tedeschi, J. T., Powell, J., Lindskold, S., & Gahagan, J. P. The patterning of "honored" promises and sex differences in social conflicts. Journal of Social Psychology, 1969, 78, 297-298.

Thibaut, J. W., & Kelley, H. H. The social psychology of groups. New York: Wiley, 1959.

Uesugi, T. K., & Vinacke, W. E. Strategy in a feminine game. Sociometry, 1963, 26, 75-88.

Vinacke, W. E. Variables in experimental games: Toward a field theory. Psychological Bulletin, 1969, 71 (4), 293-317.

Vinacke, W. E., & Arkoff, A. An experimental study of coalitions in the triad. American Sociological Review, 1957, 22, 406-414.

Vinacke, W. E., & Gullickson, G. R. Age and sex differences in the formation of coalitions. Child Development, 1964, 35, 1217-1231.

Vinacke, W. E., Lichtman, C. M., & Cherulnik, P. D. Coalition formation under different conditions of play in a three-person competitive game. Journal of General Psychology, 1967, 77, 165-176.

Von Neumann, J., & Morgenstern, O. Theory of games and economic behavior (2nd ed.) Princeton: Princeton University Press, 1947.

APPENDICES

APPENDIX A

APPENDIX A

Questionnaire

The purpose of the following scales is to assess your feelings about a person in a variety of situations. Immediately after these instructions, there are seven sets of 15 scales. You are asked to rate each concept on each of these scales in order. Here is how you are to use these scales.

If you feel that the person is very closely described by one end of the scale, you should place your check mark as follows:

beautiful __x__/____/____/____/____/____/____ ugly

or

beautiful ____/____/____/____/____/____/__x__ ugly

If you feel that the person is closely described by one or the other end of the scale (but not extremely), you should place your check mark as follows:

beautiful ____/__x__/____/____/____/____/____ ugly

or

beautiful ____/____/____/____/____/__x__/____ ugly

If the person seems slightly described by one side as opposed to the other (but is not really neutral), then you should check as follows:

beautiful ____/____/__x__/____/____/____/____ ugly

or

beautiful ____/____/____/____/__x__/____/____ ugly

The direction toward which you check, of course, depends upon which of the two ends of the scale seems most characteristic of the person you are rating.

If you consider the person to be neutral on the scale, both sides of the scale equally describe the person or if the scale is completely irrelevant, unrelated to the person, then you should place a check mark in the center as follows:

beautiful ____/____/____/ x /____/____/____ ugly

If you have any questions, please push button 9. If you have no questions, please push button 8.

The first person you are to rate is the other subject you were paired with in this study.

good _____/_____/_____/_____/_____/_____/_____ bad

competitive _____/_____/_____/_____/_____/_____/_____ uncompetitive

weak _____/_____/_____/_____/_____/_____/_____ strong

dull _____/_____/_____/_____/_____/_____/_____ bright

unresponsive _____/_____/_____/_____/_____/_____/_____ responsive

fair _____/_____/_____/_____/_____/_____/_____ unfair

exploitative _____/_____/_____/_____/_____/_____/_____ accommodative

competent _____/_____/_____/_____/_____/_____/_____ incompetent

unfriendly _____/_____/_____/_____/_____/_____/_____ friendly

moral _____/_____/_____/_____/_____/_____/_____ immoral

risk taker _____/_____/_____/_____/_____/_____/_____ not risk taker

unvindictive _____/_____/_____/_____/_____/_____/_____ vindictive

uncooperative _____/_____/_____/_____/_____/_____/_____ cooperative

manipulative _____/_____/_____/_____/_____/_____/_____ unmanipulative

like me _____/_____/_____/_____/_____/_____/_____ not like me

The following six sets of scales will be concerned with the following basic situations.

Two reporters A and B have been employed by different newspapers for five months. Each paper has a policy of having all new reporters on probation for six months. For both reporters it is their first job.

Both reporters are assigned to the U.N. General Assembly and must report on a speech made by the Russian delegate. Both reporters miss parts of the speech and reporter B suggests that they compare notes. In this situation each reporter can give the other correct or falsified notes or not exchange notes.

Given this basic information evaluate reporter A for each of the following actions taken by him.

Reporter A agrees to compare all notes and gives B the correct notes. He hopes that B will give him correct notes.

good _____/_____/_____/_____/_____/_____/_____ bad

competitive _____/_____/_____/_____/_____/_____/_____ uncompetitive

weak _____/_____/_____/_____/_____/_____/_____ strong

dull _____/_____/_____/_____/_____/_____/_____ bright

unresponsive _____/_____/_____/_____/_____/_____/_____ responsive

fair _____/_____/_____/_____/_____/_____/_____ unfair

exploitative _____/_____/_____/_____/_____/_____/_____ accommodative

competent _____/_____/_____/_____/_____/_____/_____ incompetent

unfriendly _____/_____/_____/_____/_____/_____/_____ friendly

moral _____/_____/_____/_____/_____/_____/_____ immoral

risk taker _____/_____/_____/_____/_____/_____/_____ not risk taker

unvindictive _____/_____/_____/_____/_____/_____/_____ vindictive

uncooperative _____/_____/_____/_____/_____/_____/_____ cooperative

manipulative _____/_____/_____/_____/_____/_____/_____ unmanipulative

like me _____/_____/_____/_____/_____/_____/_____ not like me

Reporter A refuses to compare notes.

good _____/_____/_____/_____/_____/_____/_____ bad

competitive _____/_____/_____/_____/_____/_____/_____ uncompetitive

weak _____/_____/_____/_____/_____/_____/_____ strong

dull _____/_____/_____/_____/_____/_____/_____ bright

unresponsive _____/_____/_____/_____/_____/_____/_____ responsive

fair _____/_____/_____/_____/_____/_____/_____ unfair

exploitative _____/_____/_____/_____/_____/_____/_____ accommodative

competent _____/_____/_____/_____/_____/_____/_____ incompetent

unfriendly _____/_____/_____/_____/_____/_____/_____ friendly

moral _____/_____/_____/_____/_____/_____/_____ immoral

risk taker _____/_____/_____/_____/_____/_____/_____ not risk taker

unvindictive _____/_____/_____/_____/_____/_____/_____ vindictive

uncooperative _____/_____/_____/_____/_____/_____/_____ cooperative

manipulative _____/_____/_____/_____/_____/_____/_____ unmanipulative

like me _____/_____/_____/_____/_____/_____/_____ not like me

Reporter A agrees to compare only a portion of his notes so that B can give him only a small amount of incorrect information. He gives B correct information.

good _____/_____/_____/_____/_____/_____/_____ bad

competitive _____/_____/_____/_____/_____/_____/_____ uncompetitive

weak _____/_____/_____/_____/_____/_____/_____ strong

dull _____/_____/_____/_____/_____/_____/_____ bright

unresponsive _____/_____/_____/_____/_____/_____/_____ responsive

fair _____/_____/_____/_____/_____/_____/_____ unfair

exploitative _____/_____/_____/_____/_____/_____/_____ accommodative

competent _____/_____/_____/_____/_____/_____/_____ incompetent

unfriendly _____/_____/_____/_____/_____/_____/_____ friendly

moral _____/_____/_____/_____/_____/_____/_____ immoral

risk taker _____/_____/_____/_____/_____/_____/_____ not risk taker

unvindictive _____/_____/_____/_____/_____/_____/_____ vindictive

uncooperative _____/_____/_____/_____/_____/_____/_____ cooperative

manipulative _____/_____/_____/_____/_____/_____/_____ unmanipulative

like me _____/_____/_____/_____/_____/_____/_____ not like me

Reporter A agrees to compare notes but gives B incorrect information so that A will have a better story than B.

good _____/_____/_____/_____/_____/_____/_____ bad

competitive _____/_____/_____/_____/_____/_____/_____ uncompetitive

weak _____/_____/_____/_____/_____/_____/_____ strong

dull _____/_____/_____/_____/_____/_____/_____ bright

unresponsive _____/_____/_____/_____/_____/_____/_____ responsive

fair _____/_____/_____/_____/_____/_____/_____ unfair

exploitative _____/_____/_____/_____/_____/_____/_____ accommodative

competent _____/_____/_____/_____/_____/_____/_____ incompetent

unfriendly _____/_____/_____/_____/_____/_____/_____ friendly

moral _____/_____/_____/_____/_____/_____/_____ immoral

risk taker _____/_____/_____/_____/_____/_____/_____ not risk taker

unvindictive _____/_____/_____/_____/_____/_____/_____ vindictive

uncooperative _____/_____/_____/_____/_____/_____/_____ cooperative

manipulative _____/_____/_____/_____/_____/_____/_____ unmanipulative

like me _____/_____/_____/_____/_____/_____/_____ not like me

Reporter A tells B that he has complete notes although he does not. He does agree to compare notes. By telling B he has complete notes, he forces B to give him correct notes since A would know if they were incorrect.

good _____/_____/_____/_____/_____/_____/_____ bad

competitive _____/_____/_____/_____/_____/_____/_____ uncompetitive

weak _____/_____/_____/_____/_____/_____/_____ strong

dull _____/_____/_____/_____/_____/_____/_____ bright

unresponsive _____/_____/_____/_____/_____/_____/_____ responsive

fair _____/_____/_____/_____/_____/_____/_____ unfair

exploitative _____/_____/_____/_____/_____/_____/_____ accommodative

competent _____/_____/_____/_____/_____/_____/_____ incompetent

unfriendly _____/_____/_____/_____/_____/_____/_____ friendly

moral _____/_____/_____/_____/_____/_____/_____ immoral

risk taker _____/_____/_____/_____/_____/_____/_____ not risk taker

unvindictive _____/_____/_____/_____/_____/_____/_____ vindictive

uncooperative _____/_____/_____/_____/_____/_____/_____ cooperative

manipulative _____/_____/_____/_____/_____/_____/_____ unmanipulative

like me _____/_____/_____/_____/_____/_____/_____ not like me

Reporter A gives B incorrect notes in retaliation for B giving A incorrect notes last time they compared.

good	_____/_____/_____/_____/_____/_____/_____	bad
competitive	_____/_____/_____/_____/_____/_____/_____	uncompetitive
weak	_____/_____/_____/_____/_____/_____/_____	strong
dull	_____/_____/_____/_____/_____/_____/_____	bright
unresponsive	_____/_____/_____/_____/_____/_____/_____	responsive
fair	_____/_____/_____/_____/_____/_____/_____	unfair
exploitative	_____/_____/_____/_____/_____/_____/_____	accommodative
competent	_____/_____/_____/_____/_____/_____/_____	incompetent
unfriendly	_____/_____/_____/_____/_____/_____/_____	friendly
moral	_____/_____/_____/_____/_____/_____/_____	immoral
risk taker	_____/_____/_____/_____/_____/_____/_____	not risk taker
unvindictive	_____/_____/_____/_____/_____/_____/_____	vindictive
uncooperative	_____/_____/_____/_____/_____/_____/_____	cooperative
manipulative	_____/_____/_____/_____/_____/_____/_____	unmanipulative
like me	_____/_____/_____/_____/_____/_____/_____	not like me

The study is now completed. Open the door to your room but remain in the room until all subjects have opened their doors.

APPENDIX B

APPENDIX B

Instruction Booklet 1

Read the following instructions. Your ready light will come on while you are reading the instructions, but do not press a button until told to do so. As you see, a dollar bill is on the table. This is yours and you may make more or less than this dollar depending on how you do in the study.

In a few seconds the slide projector will advance to the next slide. Please do not read on until the slide with numbers on it appears.

You now see in front of you a slide which has "your choices" across the top and "other's choices" along the side. The other person involved is one of the other subjects in another room. In this situation, you and the person you are paired with have two alternatives each - alternative 1 and alternative 2. Since each of you has two alternatives, there are four possible combinations. These four combinations are represented by the four smaller squares on your screen.

The study consists of several trials and each trial consists of both of you choosing one of the alternatives. When you have made a choice, press the appropriate button on the response box. After both of you have made your choices, the windows on your response box will light informing you of the choice of the other as well as your own choice. Your choice will be presented in the window at the left and the choice of the other participant will be displayed in the window on

the right. You each will have to make your choice on each trial without the knowledge of what the other person has chosen on that trial. How much money each of you makes depends not only on which alternative you choose, but which alternative the other person chooses. You can make up to $4.50 for the one hour that you will participate, or you can lose all of the money that you have.

To determine how much money you will receive you must find the square in the display where your choice and the choice of the other intersect. You receive the amount in the unshaded portion of each square, while the other participant receives the amount in the shaded portion. For example, if you choose alternative 1 and the other chooses alternative 2, proceed down from the "1" on the top of the display and across from the "2" on the side of the display. These two choices intersect at the lower, left hand square. It is this square that tells you how much you have received. For this example you would lose four points, while the other would gain nine. However, if you choose alternative 1 and the other participant chooses alternative 1, then you each would receive six points. If you choose alternative 2 and the other chooses alternative 2, you would each receive nothing. If you choose alternative 2 and the other chooses alternative 1, you receive nine points while the other loses four.

The numbers in the table do not represent pennies (real money). They are points and after the study you will receive a penny for a certain number of points. Remember, the more points you make, the more money you will receive. You may receive up to $4.50.

In summary, you each have to choose from two alternatives and which choice you make affects not only what you receive but what the

other participant receives also.

If you have a question about the procedure, please push the 9 button; if you have no questions, push the 8 button. The ready light will come on after all of the subjects have indicated whether they have a question. The next time the ready light comes on will mark the beginning of the trials. You must choose between alternative 1 and 2 on each trial.

Instruction Booklet 2

The study is now over. Please push button 8 as soon as the ready light comes on. I will come to your room to pay you and to discuss the study with you. Do not leave your room until told to do so.

APPENDIX C

APPENDIX C

Instruction Booklet 1

Read the following instructions. While you are reading them, your ready light will come on, but do not press a button until told to do so.

You see a dollar on the table. This is yours and you can make more or lose it all.

This study consists of two phases: 1) the first phase consists of you becoming familiar with this situation; 2) the second phase consists of several decision making trials. How much money you make will depend on how you do in the study. You can make as much as $5.40 or as little as nothing. The second phase of the experiment will consist of several trials and each trial will consist of each of you making a choice between several alternatives. You are paired with one of the other subjects who you do not know and these choices will not only affect how much money you make on each trial, but also how much money the other participant will make. You each will make your choice without the knowledge of what the other person has chosen on that trial.

The slide projector will advance in a few seconds. Wait until it presents a slide with numbers on it.

You now see in front of you a picture with "your choices" across the top and "other's choices" along the side. To make this procedure clear, we will begin phase 1 with a simple two choice example. Before each of you is a picture which displays how much each of you will

receive for each combination of choices. How much the other participant makes for the combination of choices is presented in the shaded portion (portion with lines in it) of the square while what you receive is presented in the unshaded portion. For example, if you chose alternative 1 and the other participant chose alternative 1, each would receive 13 points. If you chose alternative 1 and the other chose alternative 2, then you would lose 6 points and the other would gain 14 points. However, if you chose alternative 2 and the other chose alternative 1, then you would receive 14 points and the other would lose 6 points. If you both chose alternative 2, then each of you loses 3 points.

To find the square which determines how much you receive, follow down from the alternative you have chosen and across from the left from the alternative chosen by the other participant. Where these choices intersect is the square which determines how much you each receive. For example, if you choose alternative 1 and the other chose alternative 2, the lower left hand square determines how much you make.

In summary, you each have to choose between two alternatives and which choice you make affects not only what you receive but what the other participant receives.

If you have any questions, push button 9. If you have no questions, push button 8. <u>You must push one of these buttons before we can proceed</u>.

To see if you understand the Table, please answer the following questions. Write the answers on the sheet marked "questions answered".

Although your ready light will come on, do not push a button until told to do so.

Suppose that for the first five trials of the study the other participant has chosen alternative 1 every time and it appears that he

will do so again on trial 6. Assuming that he does choose alternative 1, please answer the following questions.

1. Which choice by you on trial 6 will give the other participant the most money?

2. Which choice by you on trial 6 will give the other participant the least money?

3. Which choice by you on trial 6 will give the two of you combined the most money? (The sum of the amounts in each sqaure.)

4. Which choice by you on trial 6 will give the two of you combined the least money?

5. Which choice by you on trial 6 will give you the least money?

6. Which choice by you on trial 6 will give you the most money?

7. Which choice by you on trial 6 will give you more money than the other participant?

8. Which choice by you on trial 6 will give you as much as the other participant?

Suppose that for the first five trials of the game the other participant chooses alternative 2 on every trial and it appears that he will do so on trial 6. Assuming that he does choose alternative 2 on trial 6, answer the following questions.

9. Which choice by you on trial 6 will give the other participant the least money?

10. Which choice by you on trial 6 will give the other participant the most money?

11. Which choice by you in trial 6 will give you as much as the other participant?

12. Which choice by you on trial 6 will give you the least money?

13. Which choice by you on trial 6 will give the two of you combined the least money?

14. Which choice by you on trial 6 will give you less than the other participant?

15. Which choice by you on trial 6 will give the two of you combined the most money?

16. Which choice by you on trial 6 will give you the most money?

When you have completed answering these questions, please push button 8. You must push button 8 before we can proceed.

Instruction Booklet 2

Read the following instructions. Your ready light will be on while you read but do not press a button until told to do so.

You now see in front of you a more complex situation than the one presented before. In this situation, each of you has four alternatives to choose from. Here again the choices that you make affect not only what you receive but what the other participant receives also. What you receive for each combination of choices is presented in the unshaded portion of each square while what the other participant receives for each combination is presented in the shaded portion (portion with lines in it). To see if you understand this more complex situation, please answer the following questions when told to do so.

Before you answer these questions if you have any questions, please push button 9. If you do not have a question, push button 8. You must push either button 8 or button 9 before we can proceed.

Write the answers on the sheet "questions answered".

Your ready light will come on after you have indicated whether or not you have a question. Do not push a button until told to do so.

Suppose that the other participant has chosen alternative 1 on the first five trials and it appears that he will do so again on trial 6. Assuming that he does choose alternative 1, answer the following questions.

17. Which choice by you on trial 6 will give you much less money than the other participant?

18. Which choice by you on trial 6 will give the two of you combined the least money?

19. Which choice by you on trial 6 will give you the most money?

20. Which choice by you on trial 6 will give the other participant the least money?

21. Which choice by you on trial 6 will give you the least money?

22. Which choice by you on trial 6 will give the two of you combined the most money?

23. Which choice by you on trial 6 will give you more than the other participant?

24. Which choice by you on trial 6 will give the other participant the most money?

Suppose that the other participant has chosen alternative 2 on the first five trials and it appears that he will do so again on trial 6. Assuming that he does choose alternative 2, answer the following questions.

25. Which choice by you on trial 6 will give the two of you combined the most money?

26. Which choice by you on trial 6 will give you the least money?

27. Which choice by you on trial 6 will give the other participant the most money?

28. Which choice by you on trial 6 will give you more than the other participant?

29. Which choice by you on trial 6 will give you as much money as the other participant?

30. Which choice by you on trial 6 will give the other participant the least money?

31. Which choice by you on trial 6 will give the two of you combined the least money?

32. Which choice by you on trial 6 will give you the most money?

Suppose that the other participant has chosen alternative 3 for the first five trials and it appears that he will do so again on trial 6. Assuming that he does choose alternative 3, answer the following questions.

33. Which choice by you on trial 6 will give the other participant the least money?

34. Which choice by you on trial 6 will give you the most money?

35. Which choice by you on trial 6 will give you very much more than the other participant?

36. Which choice by you on trial 6 will give the other participant the most money?

37. Which choice by you on trial 6 will give you the least money?

38. Which choice by you on trial 6 will give you as much as the other participant?

39. Which choice by you on trial 6 will give the two of you combined the least money?

40. Which choice by you on trial 6 will give the two of you combined the most money?

Suppose that the other participant has chosen alternative 4 for the first five trials and it appears that he will do so again on the sixth trial. Assuming that he does choose alternative 4, answer the following questions.

41. Which choice by you on trial 6 will give the other participant the most money?

42. Which choice by you on trial 6 will give the other participant the least money?

43. Which choice by you on trial 6 will give the two of you combined the most money?

44. Which choice by you on trial 6 will give the two of you the least money?

45. Which choice by you on trial 6 will give you the most money?

46. Which choice by you on trial 6 will give you the least money?

47. Which choice by you on trial 6 will give you as much as the other participant?

48. Which choice by you on trial 6 will give you very much less than the other participant?

When you have completed answering these questions, please push button 8. You must push button 8 before we can proceed.

Instruction Booklet 3

We now begin phase two of the study. Your ready light will come on but do not press a button until told to do so.

In this phase of the study you will actually make decisions. This phase consists of several trials and each trial consists of each of you making a decision between one of the six alternatives. You will begin the study with one dollar and you can add to it or subtract from it.

When the ready light comes on for each trial, make your choice by pushing that button on your response box.

In this situation the numbers in the display do not represent pennies (real money). For example, a 6 is not 6 cents. These are points and at the end of the hour you will be given a penny for each certain number of points. Remember the more points you get the more money you will get. You may make up to $5.40 for the one hour that the study will last or you may lose as much as the one dollar you started with.

At this time if you have a question, push button 9. If you do not have a question, push button 8. You must push one of the buttons before we can proceed. After you have pushed either 8 or 9, the ready light will come on, and this indicates the beginning of the decision trials.

Instruction Booklet 4

The study is now over. Please push button 8 as soon as the ready light comes on. I will come to your room to pay you and to discuss the study with you. Do not leave your room until told to do so.

Questions Answered

1. ___	17. ___	33. ___
2. ___	18. ___	34. ___
3. ___	19. ___	35. ___
4. ___	20. ___	36. ___
5. ___	21. ___	37. ___
6. ___	22. ___	38. ___
7. ___	23. ___	39. ___
8. ___	24. ___	40. ___
9. ___	25. ___	41. ___
10. ___	26. ___	42. ___
11. ___	27. ___	43. ___
12. ___	28. ___	44. ___
13. ___	29. ___	45. ___
14. ___	30. ___	46. ___
15. ___	31. ___	47. ___
16. ___	32. ___	48. ___

APPENDIX D

APPENDIX D

Results on Boundary Conditions

This appendix will be organized around three separate analyses. These analyses include: 1) an analysis of the first trial choice comparing the two and six choice matrices, 2) an analysis of the first trial choice of the six alternate matrix; and 3) an analysis of the ratings of the simulated other on the scales of responsiveness and exploitativeness.

An analysis of variance was performed on the choices made on the first trial of each session to determine: 1) if there were any response biases on the part of the subject; and 2) if there were any effects due to the first session. For the six alternative matrix all the choices were categorized as defect except for choice three. This means that the six alternative matrix choices were reduced to cooperate or defect, similar to the two alternative matrix. This analysis was performed over the five independent factors; exploitative-accommodative, contingency, sex, order, and matrix size. This resulted in a 2x2x2x2x2 design with repeated measures on the last factor.

A summary of the results of this analysis are presented in Table 1. As the table indicates there was one significant ($p < .0005$) main effect for matrices and two significant interactions ($p < .02$), one for contingency by matrix and one a five-way interaction of all of the factors.

The significant main effect for matrix size was generated by a .34 probability of choosing defect for the two alternative matrix and a .57

Table D1.

The analysis of variance on the first trial choices on the probability of cooperation.

SOURCE	df	MS	F
Between			
Exploitation (A)	1	0.00352	
Contingency (B)	1	0.00352	
Sex (C)	1	0.4727	1.44
Order (D)	1	0.1914	
AB	1	0.0039	
AC	1	0.8789	2.68
AD	1	0.0977	
BC	1	0.0039	
BD	1	0.1914	
CD	1	0.0352	
ABC	1	0.3164	
ABD	1	0.0039	
ACD	1	0.0352	
BCD	1	0.0039	
ABCD	1	0.0352	
Error	112	0.3276	
Within			
Matrices (E)	1	3.2852	21.10*
AE	1	0.0039	
BE	1	0.8789	5.65**

Table D1 (cont'd.)

SOURCE	df	MS	F
CE	1	0.1914	1.23
DE	1	0.3164	2.03
ABE	1	0.1914	1.23
ACE	1	0.3164	2.03
ADE	1	0.0039	
BCE	1	0.3164	2.03
BDE	1	0.0352	
CDE	1	0.1914	1.23
ABCE	1	0.0352	
ABDE	1	0.1914	1.23
ACDE	1	0.0352	
BCDE	1	0.1914	1.23
ABCDE	1	0.8789	5.65**
Error	112	0.1557	

*p < .0005

**p < .02

probability of choosing defect for the six alternative matrix. Table 2 presents the means for the matrix by contingent interaction. The simple effects test performed on these means indicated no significant differences between contingent and noncontingent strategies for either matrix. There was, however, a significant difference between the two matrices for the noncontingent strategy ($p < .01$), with the six alternative matrix having a lower percentage of cooperation.

The interesting aspect of the five-way interaction was the sex by contingency by exploitative interaction for specific levels of matrix size and order of presentation. The first trial of the first session for each matrix indicated any initial biases, while the first trial of the second session for each matrix tested for the establishment of a response set created during the first session. Table 3 presents a summary of the two analyses for the two alternative matrix for session one and session two.

As the table indicates there were no significant main or interaction effects for either session. The error term for this analysis was the pooled error term from the original first trial analysis. Table 4 presents a summary of the analyses for the first and second sessions for the six alternative matrix. As for the two alternative matrix, there were no significant main effects nor interaction effects.

A peripheral analysis was performed on the session by matrix interaction using the pooled error term used for the simple effect tests on the contingency by matrix interaction. Although there was no significant effect for the order by matrix interaction, the results of the simple effect on the session by matrix interaction produced a very

Table D2.

The probability of cooperative choice for the contingency by matrix interaction.

	2	6
C	.39	.50
NC	.30	.64

SOURCE	df	MS	F
Matrix at C	1	.3840	2.46
Matrix at NC	1	3.69	23.50
Error	112	.1557	
Contingency at matrix 2	1	.256	1.06
Contingency at matrix 6	1	.628	2.60
Error (pooled)	112	.2416	

Table D3.

The analysis of simple effects for the first trial choice of the two choice matrix.

SOURCE	df	MS	F
Session One			
Exploitativeness (A)	1	0.0625	0.26
Contingency (B)	1	0.2500	1.30
Sex (C)	1	0.0625	
AB	1	0.0000	
AC	1	0.5625	2.33
BC	1	0.2500	
ABC	1	0.0000	
Error	112	0.2416	
Session Two			
Exploitativeness (A)	1	0.0000	
Contingency (B)	1	0.0625	
Sex (C)	1	0.0000	
AB	1	0.2500	1.035
AC	1	0.5625	2.33
BC	1	0.0000	
ABC	1	0.5625	2.33
Error	112	0.2416	

Table D4.

The simple effects analysis of the
first trial choice of the six alternative matrix.

SOURCE	df	MS	F
Session One			
Exploitativeness (A)	1	0.0156	
Contingency (B)	1	0.7656	3.17
Sex (C)	1	0.7656	3.17
AB	1	0.1406	
AC	1	0.1406	
BC	1	0.0156	
ABC	1	0.1406	
Error	112	0.2416	
Session Two			
Exploitativeness (A)	1	0.0625	
Contingency (B)	1	0.0625	
Sex (C)	1	0.0625	
AB	1	0.0000	
AC	1	0.0000	
BC	1	0.2500	1.035
ABC	1	0.5625	2.3828
Error	112	0.2416	

significant result.[1] The six alternative matrix had consistently higher proportions of defect but only the difference between the matrices for the second session was significant. No other differences were significant

The second major analysis was focused on the initial choices for the six alternative matrix. The analysis was based on the probability of each of the alternatives for the six alternatives in the matrix. These six probabilities resulted in six different analyses of variance. These analyses were performed over the factors exploitative-accommodative, contingency, sex, and session (order). This resulted in a 2x2x2x2 factorial design.

A summary of the results of the analysis of the maximize difference choice is presented in Table 5. As the summary indicates there was only the one significant interaction. Table 6 shows the results of the simple effects test on this interaction. As the table shows there was only one significant result, a difference between the exploitative and accommodative strategies for session one with the probability of choosing the "maximize difference" alternative being .125 and .00 respectively.

To complete the initial analyses an analysis of variance was performed on two of the rating scales describing the simulated other. The two scales dealt with the exploitative-accommodative and responsiveness dimensions. The analysis was performed over the factors exploitative-accommodative, contingency, sex, and matrix. The factor matrix was the matrix which the subjects played prior to filling out the questionnaire.

---

[1] It should be noted at this point that the order by matrix interaction is not identical to the matrix by session interaction. For this reason a nonsignificant order by matrix interaction does not preclude significant simple effects for a matrix by session interaction.

Table D5.

The first trial analysis for the maximizing differences alternative.

SOURCE	df	MS	F
Between			
Exploitativeness (A)	1	0.03125	
Contingency (B)	1	0.03125	
Sex (C)	1	0.03125	
Session (D)	1	0.00000	
AB	1	0.00000	
AC	1	0.00000	
AD	1	0.28125	4.5000*
BC	1	0.00000	
BD	1	0.03125	
CD	1	0.03125	
ABC	1	0.03125	
ABD	1	0.00000	
ACD	1	0.00000	
BCD	1	0.00000	
ABCD	1	0.03125	
Error	112	7.50000	

*p < .04

Table D6.

The probability of choosing the maximize differences alternative on the first trial for the session by exploitativeness interaction.

	S1	S2
E	.125	.03
A	.000	.094

SOURCE	df	MS	F
EA session 1	1	.256	4.05*
EA session 2	1	.066	1.07
Session at E	1	.1296	2.12
Session at A	1	.141	2.30
Error	112	.0625	

*$p < .05$

This resulted in a 2x2x2x2 factorial design.

A summary of the results of the analysis of the responsive-unresponsive dimension is presented in Table 7. As indicated in the table, there were three significant main effects and no significant interactions. The F for the main effects of exploitative-accommodative, and sex had a probability less than .03, while the F for the contingency had a probability less than .0005. The mean ratings for these three factors are presented in Table 9. These ratings were based on a scale ranging from one at the responsive end to seven at the unresponsive end. The results indicated that the accommodative strategy was rated more responsive than the exploitative strategy and that females more than males tended to rate the other as responsive. The contingent strategy was rated much more responsive than the noncontingent strategy.

A summary of the results of the exploitative-accommodative ratings of the simulated other is presented in Table 8. These results were based on a scale ranging from one on the exploitative end of the dimension and seven on the accommodative end. The results indicate significant main effects for exploitative-accommodative, contingency, and matrix size. The mean ratings are presented in Table 9. The exploitative strategy was rated much more exploitative than the accommodative strategy ($p < .0005$). The noncontingent strategy was rated more exploitative than the contingent strategy and the two choice matrix was rated more exploitative than the six choice.

Discussion of Preliminary Results

This group of analyses was performed to determine: 1) the extent to which response biases existed; 2) the degree to which the first

Table D7.

The analysis of variance on the responsiveness scale.

SOURCE	df	MS	F
Exploitativeness (A)	1	18.0000	5.50**
Contingency (B)	1	60.5000	18.49*
Sex (C)	1	18.0000	5.50**
Matrix (D)	1	0.0000	
AB	1	0.7812	
AC	1	0.2812	
AD	1	5.2812	1.61
BC	1	1.5312	
BD	1	5.2812	
CD	1	0.2812	
ABC	1	2.0000	
ABD	1	2.0000	
ACD	1	0.0000	
BCD	1	2.0000	
ABCD	1	0.2812	
Error	112	3.2723	

*p < .03

**p < .0005

Table D8.

The analysis of the exploitative-accommodative scale.

SOURCE	df	MS	F
Exploitativeness (A)	1	64.6953	31.97*
Contingency (B)	1	9.5703	4.73**
Sex (C)	1	1.7578	
Matrix (D)	1	8.5078	4.20***
AB	1	1.3203	
AC	1	4.8828	
AD	1	4.1328	
BC	1	7.5078	
BD	1	5.6953	
CD	1	0.1953	
ABC	1	3.4453	
ABD	1	4.8828	
ACD	1	7.5078	
BCD	1	2.8203	
ABCD	1	3.4453	
Error	112	2.0234	

*p < .0005

**p < .04

***p < .05

Table D9.

The means for the main effects for the exploitative-accommodative and responsive-unresponsive scales.

Exploitative-accommodative	
Exploitative	4.28
Accommodative	5.70
Contingent	5.27
Noncontingent	4.72
Two alternative	4.73
Six alternative	5.25
Responsive-unresponsive	
Exploitative	4.08
Accommodative	3.33
Contingent	3.02
Noncontingent	4.40
Male	4.08
Female	3.33

session affected the second; and 3) if the subjects were aware of the type of strategy played against them. The first set of results on the first trial choices for the two and six alternative matrix, with the dependent variable of presence or absence of a cooperative choice, indicated more defect choices in the larger matrix. This result is neither surprising nor troublesome since the larger matrix had five times as many defect choices, while the proportions of defect were only twice as large for the six alternative matrix.

The two significant interactions that were found are not nearly so easy to explain. The contingency by matrix interaction was found to be caused mainly by a larger proportion of defects in the noncontingent six alternative matrix than in the noncontingent two alternative matrix. There was no significant contingency by matrix by order interaction which would indicate a response set from the first session. Why there was a significant difference between matrix six under one condition of contingency and not significant in another, is not clear. The contingency of the situation was not known to the subject at trial one and therefore could not affect the choice made.

The last interaction, the five factor interaction, is the most puzzling of the initial results. It would not have been so puzzling if there had been a significant effect for one of the tests in the four ANOVA's over the two matrices and sessions. It would not be surprising if the second session for the two choice and for the six choice matrices had significant effects for strategies and/or sex. Since there were no significant effects for the second session under either matrix, there apparently was no carry over from the first session to the second session. The peripheral analysis performed on the matrix

by session interaction supports this interpretation. There were no differences between the first and second sessions for either matrix. An interesting aspect of the session by matrix interaction was the significant difference between the six alternative matrix and two alternative matrix for session two. Although the difference between sessions for the two alternative matrix was not significant, the two sessions were quite distinct. Those subjects who received the six alternative matrix first appeared to understand the two choice matrix much faster than those subjects who received the smaller matrix first. This would be expected considering the extensive instructions the subjects received in the first session. The significant difference between the matrices for the second session adds support to this interpretation.

The analyses of the probabilities for choosing each of the alternatives in the six alternative matrix produced another puzzling result. For the maximizing difference alternative, there was a significant session by exploitative-accommodative interaction. Contrary to expectations, the difference between the exploitative and accommodative strategies did not occur at session two but at session one. Following the same logic as the explanation for the contingency by matrix interaction, on the first trial of session one the subjects could not know the simulated other was playing exploitatively or accommodatively. The only explanation for the significant difference on trial one of session one is random occurrence. If there were experimenter effects the difference should have been intensified for the second session, however it wasn't. The fact that there were no differences between sessions indicates that there were no response sets created in the first session. If response sets, different from the initial preferences of the subject, had been

created in the first session there would have been differences between the two sessions.

The results of the questions on the responsiveness and exploitativeness of the other subject were designed to test how accurately subjects perceived the other's strategy. Both dimensions of the strategies were quite accurately perceived by the subject. The contingent strategy was rated much more responsive than the noncontingent, while the exploitative strategy was rated more exploitative than the accommodative strategy.

The exploitative strategy was also rated less responsive than the accommodative and females rated all strategies more responsive than did males. The exploitative strategy was rated less responsive because it did not respond to the subjects as they hoped it would. Females consistently rated the contingent and noncontingent strategies as more responsive than males did. Females and males differentiated between the two strategies as evidenced by the lack of a significant interaction between sex and contingency.

The exploitative-accommodative scale indicated that subjects perceived the noncontingent strategies to be more exploitative than the contingent strategy. Whether the strategy was exploitative or accommodative, the noncontingent strategies were perceived more exploitative. This is supported by the fact that there was no significant interaction for contingency by exploitativeness. The noncontingent-exploitative strategies had more defect choices than the contingent strategies since they continually defected, while the contingent strategies responded to defection with cooperation. The case is somewhat similar for the accommodative strategies. The noncontingent strategy randomly defected,

whereas the contingent strategy only defected after the subject had defected. The contingent strategy was perceived as legitimate when it defected, whereas the noncontingent often defected after the subject had cooperated.

The two alternative matrix was perceived to be more exploitative than the six choice. Again this was consistent for all strategies since there were no significant interactions with matrix size. In the smaller matrix a defect choice meant that the subject either lost money or received nothing, as opposed to the larger matrix in which they invariably received a positive-non-zero payoff.

It has been established that: 1) there were no initial response biases nor response sets created; and 2) the subjects accurately perceived the strategies as exploitative or accommodative, and responsive-unresponsive. With the preceding results it is now possible to test the exploitative-accommodative theory.

APPENDIX E

APPENDIX E

The results presented in this appendix are the significant findings which did not bear directly on the theory presented. While all of the results presented were statistically significant, they may not be conceptually significant.

The Analysis on Percent Cooperation

The results presented in this section deal with the significant results from the analysis of the percent of cooperative responses. The summary of this analysis is presented in Table 11 in the text.

The main effect for trial blocks was produced by a consistently decreasing proportion of cooperative responses from block one to block four. A paired comparisons analysis was performed on the four means. A summary of the results appears in Table 1 of this appendix. As the table indicates, blocks one and two differed significantly from blocks three and four.

The second major analysis was performed on the variance of choices. The summary of this ANOVA is presented in Table 12 in the text.

All of the main effects were involved in significant interactions. The six alternative matrix had a variance of choices of .097 as opposed to a variance of .148 for the two alternative matrix. The variances from blocks one to four respectively were .138, .116, .114, and .116. The exploitative strategy produced a variance of .137 compared to a variance of .107 for the accommodative strategy.

Table E1.

The paired comparisons tests on the probability of cooperation over blocks of trials.

	Blocks			
	4 (.45)	3 (.44)	2 (.42)	1 (.41)
.45	----	1.158	4.211**	6.67*
.44		----	3.05	5.51*
.42			----	2.46

*p < .01

**p < .05

There was a significant interaction between EA, CT and trial blocks. A simple effects analysis was performed on the CT by blocks interaction for the exploitative and accommodative strategies separately. The CT by blocks interaction was only significant for the accommodative strategy. Table 2 in this appendix presents the means and simple effects analysis for the CT by blocks interaction for the accommodative strategy. As the table indicates, the contingent strategy had consistently lower variances for all trial blocks. There were no significant effects for trial blocks.

The last analyses to be presented in this chapter were designed to determine which choices in the six alternative matrix were chosen differentially over the factors of exploitativeness, contingency, sex, session and trial blocks. The analysis involves six different independent variables in a 2x2x2x2x4 design with repeated measures on the last factor.

The first set of analyses were performed on the probability of each alternative being chosen within each block of trials for each subject. The design was composed of the factors presented above. The results will be presented in the order in which the alternatives appeared in the matrix or in the order of maximize absolute gain, vindictiveness, maximize relative gain, low risk, and behavior control.

For the maximize absolute gain alternative one significant main effect ($p < .001$) and three significant ($p < .002$) three factor interactions were revealed.

The main effect for the exploitative-accommodative factor was caused by a .39 probability of choosing this alternative for the exploitative strategy and .28 for the accommodative strategy. The maximize absolute gain alternative was chosen on 34% of the trials.

Table E2.

The mean variance for each block of trials for the contingent and noncontingent strategy for the accommodative strategy.

	Blocks			
	1	2	3	4
C	.085	.067	.076	.076
NC	.13	.15	.13	.14

SOURCE	df	MS	F
CT at block 1	1	.0648	7.09
CT at block 2	1	.2200	24.07
CT at block 3	1	.0933	10.21
CT at block 4	1	.131	14.33
Error	112	.009139	
Blocks at contingent	3	.00346	1.49
Blocks at noncontingent	3	.005867	2.52
Error	336	.00233	

The sex by session by trial blocks interaction means are presented in Table 3 of this appendix. The simple effects analyses revealed that there were significant differences between trial blocks for males in session two with the proportion of A responses increasing from block one to block four.

The means of the EA by CT by blocks interaction are presented in Table 4 of this appendix. There were two significant effects for trial blocks. Both the exploitative contingent and accommodative noncontingent produced increasing proportions of A responses. Paired comparisons analysis indicated that the first block differed from the last two blocks.

There were significant differences between exploitative and accommodative for the contingent strategy in blocks two to four. For the noncontingent strategy no differences between exploitative and accommodative strategy were found. The exploitative contingent strategy produced a larger proportion of "A" choices than the accommodative contingent strategy.

The differences between contingent and noncontingent strategies proved to be significant only for the accommodative strategy for blocks three and four. The noncontingent strategy produced significantly more "A" choices than the contingent strategy for these blocks.

The ANOVA performed on the proportion of vindictive responses revealed a significant interaction between trial blocks and sex of subjects and no main effects. Table 5 in this appendix displays the results from the simple effects performed on this interaction. As this summary of results shows there was a significant difference between males and females for trial block three. There also was a simple

Table E3.

The probabilities of choosing alternative "A" for the sex by session by blocks interaction.

		Blocks 1	2	3	4
Session 1	M	.30	.31	.27	.28
	F	.25	.28	.33	.31
Session 2	M	.27	.32	.37	.40
	F	.43	.42	.44	.43

SOURCE	df	MS	F
Blocks for Session 1 Males	3	.01	0.61
Blocks for Session 1 Females	3	.0392	2.253
Blocks for Session 2 Males	3	.1045	6.11***
Blocks for Session 2 Females	3	.002	0.12
Error	336	.0171	
Session for Females Block 1	1	.5184	8.02**
Session for Females Block 2	1	.3136	4.85*
Session for Females Block 3	1	.194	3.00
Session for Females Block 4	1	.2304	3.57
Session for Males Block 1	1	.014	.223

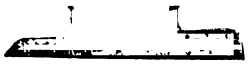


Table E3 (cont'd.)

SOURCE	df	MS	F
Session for Males Block 2	1	.0016	0.02
Session for Males Block 3	1	.16	2.48
Session for Males Block 4	1	.23	3.57
Sex for Session 1 Block 1	1	.04	0.62
Sex for Session 1 Block 2	1	.014	0.223
Sex for Session 1 Block 3	1	.058	0.89
Sex for Session 1 Block 4	1	.014	0.223
Sex for Session 2 Block 1	1	.4096	6.34***
Sex for Session 2 Block 2	1	.16	2.48
Sex for Session 2 Block 3	1	.0078	1.21
Sex for Session 2 Block 4	1	.014	0.223
Error	112	.0628	

*p < .05

**p < .005

***p < .025

Table E4.

The means and simple effects analysis for choosing the "A" alternative for the EA X CT X blocks interaction.

		Blocks			
		1	2	3	4
E	C	.35	.39	.41	.45
	NC	.38	.40	.384	.36
A	C	.24	.21	.22	.20
	NC	.30	.33	.39	.38

SOURCE	df	MS	F
Blocks for E-C	3	.058	3.41*
Blocks for E-NC	3	.0073	0.43
Blocks for A-C	3	.0078	0.46
Blocks for A-NC	3	.061	3.57*
Error	336	.0171	
EA for C-Block 1	1	.199	3.08
EA for C-Block 2	1	.5476	8.48**
EA for C-Block 3	1	.5595	8.66
EA for C-Block 4	1	1.00	15.48
Error	112	.0628	

*p < .005 **p < .001

Table E5.

The means for the sex by blocks interaction for the vindictive alternative.

	Blocks 1	2	3	4
M	.004	.009	.021	.008
F	.011	.011	.009	.009

SOURCE	df	MS	F
M-F at block 1	1	.156	1.80
M-F at block 2	1	.000128	0.14
M-F at block 3	1	.0046	5.30
M-F at block 4	1	.0000	0.00
Error	112	.000869	
Block M	3	.0034	6.36
Block F	3	.000085	0.158
Error	336	.00054	

effect for trial blocks for males. Both of these results occurred because of the relatively large proportion of vindictive choices in the third block of trials for males. A paired comparison analysis showed that the mean in the third block for males was significantly different from all other blocks.

There also was a significant interaction between EA, CT and trial blocks for vindictiveness. The mean proportion of vindictive responses for this interaction are presented in Table 6 in this appendix. As the table shows, the interaction was produced by increasing probability of choosing vindictively for the contingent exploitative and noncontingent accommodative strategies from trial block one to four. The noncontingent exploitative and the contingent accommodative strategies produced a rather stable proportion of vindictive responses.

The analysis of the proportion of cooperative responses for the six alternative matrix exposed significant main effects for exploitativeness and contingency. Exploitative and noncontingent strategies produced lower proportions of cooperation than their obverses. There were two significant interactions ($p < .005$), a blocks by exploitativeness and a sex by blocks. The blocks by exploitativeness interaction was identical to that presented in the analysis comparing the six alternative and two alternative matrices.

In review, there were consistent differences between the exploitative and accommodative strategies and significant differences between blocks of trials for the exploitative strategy. The proportion of cooperative responses decreased from blocks one to four.

The analysis on the proportion of "maximizing differences" choices showed one significant interaction ($p < .03$) between contingency and

Table E6.

The mean probability of choosing the "V" alternative for the exploitative by contingency by blocks interaction.

		Blocks			
		1	2	3	4
E	C	.008	.016	.021	.015
	NC	.014	.003	.014	.011
A	C	.005	.006	.006	.000
	NC	.004	.014	.018	.016

sex and this result was discussed in the text. There was a main effect for exploitativeness with .13 the mean probability of choosing "maximizing differences" under an exploitative strategy and .04 for the accommodative strategy.

The proportion of "low risk" choices ANOVA indicated main effects for exploitativeness and contingency of response and a significant interaction between exploitativeness, contingency and trial blocks. The exploitative strategy produced a higher proportion of low risk responses than the accommodative strategy. Similarly, the noncontingent strategy had a higher percentage of these responses than did the contingent strategy.

These significant main effefts must be viewed in terms of the highly significant interaction ($p < .0005$) between exploitativeness, contingency, and trial blocks. The summary of the simple effects analysis is presented in Table 7 in this appendix. There were two significant simple effects for blocks of trials, one for the exploitative contingent interaction and one for the noncontingent exploitative interaction. Paired comparisons analyses were performed for both of these sets of blocks, and in each instance only one mean differed from the remainder. For the contingent exploitative strategy the first trial block produced the only significant difference with the last trial block, while the third trial block in the noncontingent exploitative strategy was significantly different from all other means.

The percentage of responses that occurred for the behavior control alternative was .013. There were no significant results for this alternative.

Table E7.

Means and simple effects for proportion of LR responses for the exploitative by contingency by blocks interaction.

		Blocks 1	2	3	4
E	C	.24	.21	.18	.15
	NC	.28	.275	.365	.265
A	C	.12	.08	.08	.10
	NC	.18	.15	.11	.13

SOURCE	df	MS	F
Blocks for E-C	3	.048	3.66
Blocks for E-NC	3	.075	5.71
Blocks for A-C	3	.0117	0.90
Blocks for A-NC	3	.028	2.18
Error	336	.0131	

E = Exploitative C = Contingent

A = Accommodative NC = Noncontingent