

THE EFFECTS OF COOPERATION AND COMPETITION  
ON PERSONAL SPACE

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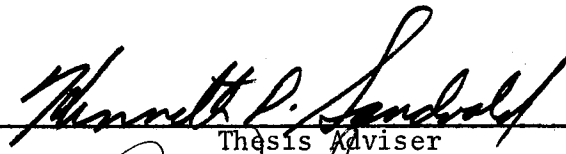
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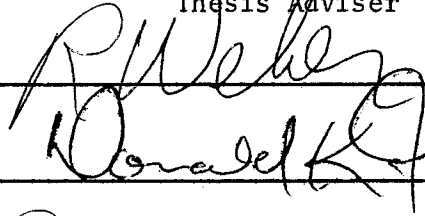
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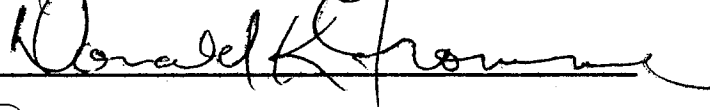
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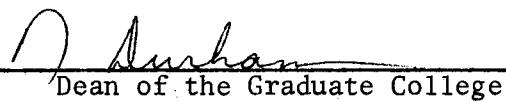
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## PREFACE

Cooperation and competition, in some form, pervade most of the life of mankind. This study was done in an attempt to measure, behaviorally and verbally, human reaction to others in cooperative and competitive situations. Since the present study is the first such attempt, several aspects of it are purely investigative. In particular, comparing physical personal space measures with questionnaire, or verbal correlates of personal space represents pilot work.

Perhaps one of the more difficult aspects of this study was the recruiting of a wide and varied range of naive subjects. My special thanks to Mr. James J. Harrison for his help with this phase of the study. Secondly, the recruitment of sophisticated experimental cohorts would have been a much greater task without the help of my adviser, Dr. Donald K. Fromme. Dr. Fromme contributed helpful ideas and suggestions for improvement, not only throughout preparation of the dissertation, but throughout my entire graduate education. I would like to express my sincere appreciation to experimental cohorts Don W. Adams, Jr., Owen E. Blacklock, Kent Sampson and to experimental assistant Glen Jennings. They were a pleasure to work with, and they were able to make the difficult job of consistent role portrayal appear easy.

The remaining members of my committee, Dr. P. Larry Claypool, Dr. Kenneth Sandvold and Dr. Robert Weber deserve particular appreciation for all of the encouragement, help and time they have given me in the planning and preparation of this study. Numerous members of the

Department of Psychology were quite helpful whenever special advice was needed.

In addition, I would like to thank Mrs. David Jennings for her typing excellence and efficiency.

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## CHAPTER I

### STATEMENT OF THE PROBLEM

#### Purpose of the Study

The purpose of this study was to determine the effects of cooperation and competition upon personal space. Personal space has been described as a series of changing, concentric, spatial globes surrounding an individual and moving about with him (Little, 1965; Sommer, 1959). Hall (1959) conceives of personal space as a well developed complex of patterned spatial modes of relating to, and communicating with, others in the environment. Specific patterns have been experimentally identified by Kuethe (1962a, 1962b), Kuethe and Weingartner (1964) and Sommer (1967a).

Cooperation and competition have been studied quite extensively using a wide variety of tasks (Bass and Duntzman, 1963; Blake and Mouton, 1962; Crombag, 1966; Grossack, 1954; Julian, Bishop, and Fiedler, 1966; Julian and Perry, 1967). A general finding of this literature is that ingroup cooperation and outgroup competition produce ingroup cohesiveness, as measured by different adjective check lists and semantic differential scales. Although it has never been shown, it seems that cooperation and competition may be important factors influencing personal space.

## Personal Space and Behavior

Personal space is a relatively new area of study for psychologists. Concepts similar to personal space have been used by ethologists and other natural scientists to explain many forms of animal behavior (Ardrey, 1966, 1970; Morris, 1969; Wienecke, 1970). Such concepts imply that spatial patterns are the end result, or behavioral balance, of the interaction of a number of animal instincts. Personal space in human beings is hypothesized to be the end result of a balance between cohesive and dispersive processes that help maintain the integrity of the individual. Cooperation and competition appear to be two factors that contribute to cohesion-dispersion and the overall balance present in personal space. In order to understand the significance of personal space in the behavior of man, it will be helpful to examine the uses of similar terms.

Wienecke (1970) states that the dominant organizing characteristic of all animal life is the perpetuation of life itself. Secondary and tertiary characteristics have developed in the course of evolution. Secondary and tertiary characteristics of life would include the propensity to: (1) mate; (2) survive as an individual; (3) incorporate raw materials for growth and survival; (4) protect from toxic influences; (5) express intraspecific aggression; (6) establish and defend territories; (7) form groups and establish group organization and in-group amity; (8) control the environment through the use of implements; (9) control environment through the use of individually and group acquired memory; and (10) use symbols as a way of processing, storing, retrieving and transmitting memory within or between organisms. All of these characteristics can be placed within the cohesion-dispersion



schema.

Animals fight amongst themselves either to establish their dominance in a social hierarchy or to establish their territorial rights over a particular piece of ground. Some species are purely hierarchical with no fixed territories, while others are purely territorial with no hierarchy struggles. Some have hierarchies within their territories and have to contend with both forms of aggression. Man belongs to this last group.

In the course of evolution, Morris (1969) hypothesizes that as man progressed from a food gathering to a food growing animal, he had to increase communication and sharing of food (cooperation or cohesiveness) and decrease his aggressive (competitive or dispersive) tendencies. Thus man began to form groups, which in turn defended their group territory. Ingroup cohesiveness became balanced by outgroup dispersion, and the result was a balance in terms of "group space".

Within these groups, however, pair-bonded units or families began to form. Since the family needed to be protected from outsiders, another outlet for aggressiveness was provided. The spatial defense of the family or home has remained despite many architectural advances. Houses are carefully fenced, hedged or walled off from intrusive neighbors, and these lines of demarcation are adhered to rigidly (Hediger, 1959; Morris, 1969; Sommer, 1967b). The family protects its integrity in terms of space. The resulting balance is again one between ingroup cohesion (family cooperation) and outgroup dispersion (protection of the family).

The balance between cohesive and dispersive tendencies manifests itself on a more individual level, and this balance has been called

personal space. Personal space in humans seems to be closely related to territoriality in animals. Just as many animals will become uneasy and attack whatever invades their territory, humans will become uncomfortable and attempt to make adjustments if another person violates their personal space (Hall, 1959; Felipe and Sommer, 1966). Sommer (1969) describes the everyday tactics of placing personal belongings in certain locations to identify one's territory. For example, placing one's books on the library table, or leaving one's coat in a chair will usually serve as a socially acceptable line of demarcation.

Ardrey (1970) graphically describes many of America's urban problems in the context of territorial aggression. As urban concentration grows, competition appears to be shifting from dominance over a piece of space to dominance over our fellow man in the form of social hierarchies. As hierarchies develop, top prizes for competition become fewer. Consequently man must seek new space, adjustments, alliances, dispensations, tolerances, mutual goals, mutual defenses, laws, punishments and opportunities for achievement. Thus has developed a body of rules of infinite complexity which actually encourages competition, as long as it is not violent. The problem of man is not that he is aggressive, but that he breaks rules and becomes violent. As wars become more capable of total destruction, social violence increases. Regarding the necessity for some expression of personal space in man, Ardrey (1970) says:

Given space, territorial arrangements make possible the invulnerable individual. Stripped of space that is his own, deterritorialized man is stripped of his invulnerability. ... And we shall see, I believe, that man - the stroller is space, the presumable master of all he surveys - is in truth as vulnerable a creature as nature has ever created. ... And that, down below all the asphalt and concrete, is the final statement of the urban problem.

Ardrey (1970) and Wienecke (1970) consider the prognosis for survival of contemporary American society to be guarded. The reason for such pessimism is that two different types of human characteristics are in a fierce struggle with one another. On the one hand, we have the propensity for intraspecific aggression, acquisition of territory and status and the making of weapons to wage wars - all forms of competitive activity. On the other hand, we have those propensities concerned with perpetuating life - all forms of cooperative activity. Man cannot survive without either and so a balance is sought, and one manifestation of this balance is personal space. These observations point out the need for research in the area of cooperation, competition and personal space.

#### Review of the Literature on Personal Space

##### Types of Personal Space Measures

The concept of personal space has just recently been subjected to scientific study. Throughout these studies, situations varying from real life to paper and pencil measures have been used to determine personal space responses.

Rawls, Trego and McGaffey (1968a) compared several different techniques that have been used to measure personal space. They used the real life situation, called the field test, as the criterion. In the field test, the subject was asked to walk toward another individual. The personal space measure was the distance the subject stopped from the person he was approaching. The field test was compared to a simulated personal distance test, a multiple choice test, a circle drawing test and a square drawing test. In the simulated personal distance

test, male figures cut from magnetized plastic were manipulated on a board. The subject was asked to imagine he was one of the figures as the other moved toward him, as well as imagine he was the moving figure.

In the multiple choice test, two male figure drawings were presented on a sheet of paper at varying distances from one another (1/4 inch to 3 1/2 inches). One figure was labeled "X" and the other "Y". The letters a, b, c and d represented increasing distances between the two figures. The subject was asked to imagine that he was person "X", and he was asked to position "Y" as he would in ordinary situations.

The circle drawing test showed male figure drawings from the front, side, rear and above views. These drawings were presented alone on a sheet of paper. The subject was asked to imagine that he was this person being seen from the particular view, and was asked to draw a circle around the figure that indicated how far he liked people to stay in ordinary situations.

The square drawing test was the same as the circle drawing test, except a square was drawn around each figure. Each of these procedures correlated with the field test as follows: simulated personal space ( $r = .70$ ), multiple choice test ( $r = .43$ ), square drawing test ( $r = .35$ ) and circle drawing test ( $r = .34$ ).

A number of studies have used silhouette or stick figures to obtain personal space measures (Addis, 1966; Dosey and Meisels, 1969; Fisher, 1967; Little, 1965, 1968; Little, Ulehla and Henderson, 1968; Trego, 1969; Weinstine, 1965, 1967). In most of these studies, the subjects were asked to imagine that silhouette figures of varying size were real people in different types of situations. Usually the subject imagined he was one of these figures, and the personal space measure was the

distance between figures. This measure is very similar to both the simulated personal distance test and the multiple choice test used by Rawls, Trego and McGaffey (1968a).

Seating distance is another type of personal space measure that has been used (Dosey and Meisels, 1969; Leipold, 1963; Mehrabian, 1968b; Sommer, 1962, 1965). The subject is asked to take a seat at a table, and the distance he places himself from certain other individuals is the measure of personal space. Dosey and Meisels (1969) compared the silhouette, seating and field test measures of personal space and found no consistent relation among measures. The apparent contradiction in the results of Dosey and Meisels (1969) and Rawls, Trego and McGaffey (1968a) can probably be explained by the differences in experimental procedure. Dosey and Meisels (1969) asked their subjects to approach or imagine approaching another person under stressful conditions.

Experimental work using these measures has isolated at least three important variables that influence personal space: (1) the present psychological state of the individual; (2) the environmental and task setting; and (3) the characteristics of the invading person or object.

#### The Present Psychological State

Williams (1963) showed that introverts placed themselves further from people than extroverts. This conclusion was also supported by Leipold (1963), who included praise and anxiety conditions. Closer seating was noticed for both groups in the praising condition, and extroverts tended to sit closer in both conditions.

Another psychological variable is that of perceived shared beliefs with others. The evidence regarding this variable is unclear. Little,

Ulehla and Henderson (1968), using 6-inch silhouette figures placed against a black background, found that Goldwater supporters were placed closer together than were Goldwater-Johnson pairs. Johnson-Johnson pairs, however, showed no significant placement trends. Elkin (1964) used actual discussion groups composed of pro-pro, pro-anti and anti-anti Medicare students and found no differences in pairwise seating distances. The difference in these findings is possibly due to the nature of the perceived beliefs. That is, perhaps feelings regarding presidential candidates were much stronger than those regarding Medicare.

Gottheil, Corey and Paredes (1968) found that the subjective feeling of "closeness" correlates with closeness in real interaction situations. They had subjects place magnetized representations of themselves next to a representation of the experimenter. Subjects placing themselves closer in this condition also placed themselves closer during a real interview.

Hare and Bales (1963) noted that subjects high in dominance needs tended to place themselves in centrally located chairs during a discussion. Beam (1971) found that subjects high in dominance needs approached an experimental cohort faster and had less personal space in relation to the cohort than did subjects with lower dominance needs. Weinstine (1967) showed that subjects with high affiliation needs estimated from memory less distance between silhouette figures than subjects lower in affiliative needs.

Fromme and Schmidt (1970) had college subjects enact four different affective states: neutral, fear, anger and sorrow. They approached an assistant under these four different conditions. Results showed the

greatest personal space under the fear condition and greater distance under sorrow than anger conditions.

Dosey and Meisels (1969) measured personal space in college subjects under stress and neutral conditions. In the stress condition, one group of subjects approached a person who was evaluating their sex appeal. In the neutral condition, a second group of subjects approached a person while "the orienting reflex" was being studied. The stress condition resulted in greater personal space.

Horowitz, Duff and Stratton (1964) found that schizophrenic subjects approached an inanimate object, such as a hatrack, more closely than they approached other people. They obtained similar results with non-schizophrenic psychiatric patients. Weinstine (1965), using groups of emotionally disturbed and normal boys, found that the normal group placed child figures closer to mother figures than to father or peer figures, while emotionally disturbed children did the reverse. She also showed that when emotionally disturbed and normal boys replaced pairs of human and geometric figures previously set 15 inches apart, the disturbed boys replaced human figures farther apart than nonhuman figures significantly more frequently than the normal boys. In a similar study, Fisher (1967) showed that emotionally disturbed boys placed greater distance between silhouette figures in social schema than normal boys. In the disturbed group, larger distances were positively correlated with the amount of hostility shown by their mothers, as measured by the Buss-Durkee Hostility Scale.

In summary of this group of studies, persons described as extroverts, as having subjective feelings of closeness, as having high affiliative needs, and as high in dominance needs have closer personal

space orientations to others. Normal subjects under role-enactment conditions of fear and sorrow have greater personal space requirements than under neutral and anger conditions. Normal subjects also show greater personal space under conditions of stress. The results regarding persons with shared beliefs with others are inconclusive. These studies also indicate that psychiatric patients have greater personal space requirements than normals.

### Environmental and Task Setting

Environment is the least studied of the major determinants of personal space. Little (1965) compared personal space in waiting rooms, living rooms and street corners. He found that personal space varies inversely with the size of the environmental setting. Sommer (1962) also found that the larger the room, the closer people tend to sit to each other. Conversely Trego (1969) instructed subjects to adjust the space between two figures projected on a screen. The environmental size was manipulated by adjusting cardboard sides. It was found that distance increased as did environmental size. This contradiction in results is possibly due to the difference in methodologies. The differential use of personal space in the Trego (1969) study could have been because such arrangements were more aesthetically pleasing.

Little (1968) used a doll placement task to examine personal space in 19 different social situations. Subjects were male and female students from the United States, Sweden, Greece, Southern Italy and Scotland. The results indicated that subjects from the Mediterranean cultures had closer interaction distances when compared to subjects from Northern Europe. Results also showed that females maintained less



distance than males in situations involving intimate transactions or unpleasant topics (a mutual friend has just been killed in an accident).

Sommer (1965), using paper and pencil responses, noted that subjects tended to seat themselves on the same side of the table as a partner involved in joint studying for an exam (cooperative situation) and on the opposite side in a situation involving the ability to construct jigsaw puzzles (competing situation). When subjects were asked why they chose these positions, the most common response was convenience. The exact nature of the situations involved in this study is hard to determine. It seems that factors such as nonverbal cues and social protocol could have contributed to the results more than cooperation and competition per se.

Although the results of this group of studies are inconclusive, they suggest that personal space varies inversely as the size of the environment, and that the nature of interaction situations affects personal space.

#### Characteristics of the Invading Person

The characteristics of the invading person have been the most thoroughly studied variable and was the one under investigation in the present study. Several studies have found that persons of the same sex maintain greater personal space distances than do persons of the opposite sex, while males desire greater distance among themselves than females (Addis, 1966; Beam, 1971; Garfinkel, 1964; Dosey and Meisels, 1969; Horowitz, Duff and Stratton, 1964; McBride, King and James, 1965; Mehrabian, 1968a, 1968b; Rawls, Trego and McGaffey, 1968b; Sommer, 1959; Trego, 1969). Elkin (1964) found that females sit side-by-side more

often than males. On the other hand, Fromme and Conway (1971) found that subjects approached: (1) men closer than women; (2) young men closer than young women; (3) young men closer than older men; and (4) young men closer than a young man with a beard and unconventional dress. The reasons for these contradictory results are not clear.

Friendliness, liking or personal preference are important determinants of personal space. Mehrabian (1968b) found that college subjects change body posture or location in order to increase personal space when the other imagined person is disliked. He also demonstrated, by use of photographs of another person in varying postures, that a person will infer whether or not he is liked by the other person from his seated posture. A forward-leaning posture more often suggested liking. King (1964, 1966) found similar results with personal preference in college students, as well as preschool children. Little (1965) obtained the same results with the use of drawings, silhouettes and real interaction situations. Although seating posture may not be equivalent to other measures of personal space, variations in seating postures do change the personal space balance among individuals. Finally, Weinstein (1967) had elementary school boys estimate from memory the distance between two silhouette figures. Results showed that subjects who felt more accepted by their parents (as measured by a 12-item questionnaire) estimated less distance between figures.

Another important characteristic of the invading person is his perceived status. Mehrabian (1968a) found that seated body orientation varied depending on whether the other person was perceived as being of higher or lower status than the subject. A forward-leaning posture was more often maintained towards a person of perceived higher status.

Little's (1968) results indicated that males maintain less personal space than females in social situations involving interactions with authority figures or superiors. Furthermore, Lott and Sommer (1967) found that subjects sat further from persons perceived as being either higher or lower in status. Closest seating arrangements were with persons perceived as equal in status. Integrating these findings, one could hypothesize that less personal space would be associated with equal, higher and lower perceived status, respectively.

Campbell, Kruskal and Wallace (1966), using white subjects, noted that increased personal space in regard to Negroes correlated with negative attitudes towards minority groups. Addis (1966) obtained similar results using stick figures. He asked his high school and college freshman subjects to draw stick figures representing themselves in relation to a standard stick figure called the object figure. Significantly greater personal space was obtained when the object figure was imagined to be a Negro.

Finally, Addis (1966) found that subjects representing themselves by way of stick figures, preferred greater distances from older persons. Fromme and Conway (1971) obtained similar results using the field test.

To summarize this group of studies, it appears that greater personal space is maintained if the person being approached is: (1) of the opposite sex; (2) perceived as being either higher or lower in status; (3) not previously acquainted with the subject; (4) of a different race; (5) moderately older; (6) unconventional in dress; and (7) associated with some type of stress. If the person being approached is of the same sex, males prefer greater personal space, except in situations involving interactions with authority figures. Less personal

space would result, of course, if the opposite of these factors was under consideration. In keeping with these findings, the present methodology used subjects and experimental cohorts that were not previously acquainted and were of the same sex, race, approximate age and social status. The intent was to keep these important factors relatively constant.

#### Review of the Literature on Cooperation and Competition

The literature on cooperation and competition is vast and varied. Deutsch (1968b), in summarizing the factors that have been found to contribute to group cohesiveness, hypothesizes a "membership motive" in the individual, which is the counterpart of cohesiveness in the group. Since cooperation and competition are seen as important factors contributing to the cohesion-dispersion balance, the remainder of the literature review is devoted to examining these factors.

This review is generally limited to a type of mixed-motive game called the Prisoner's Dilemma Game, which has been used extensively in the study of cooperation and competition. This game seemed appropriate for the present study because: (1) it involves a choice of motives on the part of the subject; (2) much background work has already been done using the Prisoner's Dilemma Game; (3) game theory can serve as a model for human behavior; (4) simulation is an important way of studying human behavior; (5) there is the possibility of clearly separating cooperative and competitive motives in a somewhat quantitative manner; and (6) the possibility for giving controlled feedback exists.

A mixed motive game is one in which the goals of the players involved are partially in conflict and partially the same. The Prisoner's

Dilemma Game is of particular interest because if a player attempts to maximize his own gain without regarding the consequences for the other player, mutual loss is the result. In the Prisoner's Dilemma Game cooperative behavior is rewarded and competitive behavior is punished. In real situations, however, the game is played competitively. Gallo and McClintock (1965) and Rapoport and Orwant (1962), in fairly comprehensive reviews, show this to be a very consistent result.

Figure 1 shows the general form of the Prisoner's Dilemma Game (Scodel, Minas, Ratoosh and Lipetz, 1959). The following set of rules concerning the value of different choice combinations hold: (1)  $2X_1 > X_2 + X_3 > 2X_4$ ; (2)  $X_3 > X_1$ ; (3)  $X_3 > X_2$ ; and (4)  $X_4 > X_2$ . These rules provide for the mixed motivation present in the game, as explained below.

	B <sub>1</sub>	B <sub>2</sub>
A <sub>1</sub>	X <sub>1</sub> , X <sub>1</sub>	X <sub>2</sub> , X <sub>3</sub>
A <sub>2</sub>	X <sub>3</sub> , X <sub>2</sub>	X <sub>4</sub> , X <sub>4</sub>

Figure 1. General Form of the Prisoner's Dilemma Game

A common Prisoner's Dilemma Game is represented in Figure 2. In the game situation, person 1 chooses between rows A<sub>1</sub> and A<sub>2</sub>, while person 2 chooses between columns B<sub>1</sub> and B<sub>2</sub>. Person 1's payoffs are determined by the first number, and person 2's payoffs are determined by the

second number in each set. The gains or losses obtained by each person are a function of the choices of each. For example, if person 1 chooses row  $A_1$  and person 2 chooses column  $B_1$ , that puts the players in the  $A_1B_1$  cell, and they each gain eight points. Had person 1 chosen row  $A_1$  and person 2 chosen column  $B_2$ , person 1 would have lost nine points and person 2 would have gained nine points (cell  $A_1B_2$ ). Cell  $A_1B_1$  is the result of a cooperative strategy on the part of both players, and cell  $A_2B_2$  is the result of a competitive choice on the part of both players. The remaining two cells reflect a cooperative choice by one player and a competitive choice by the other player.

		Person 2	
		$B_1$	$B_2$
Person 1	$A_1$	+8,+8	-9,+9
	$A_2$	+9,-9	-8,-8

Figure 2. Common Monetary or Point Values in the Prisoner's Dilemma Game

Deutsch (1958, 1960a) has attempted to explain the paradox between mutually cooperative choices being most beneficial, while competitive behavior more often occurs. He reasons that there exists no motivation for either player to make a cooperative choice unless mutual trust exists. If one cannot trust, it is safer to choose minimum rather than maximum losses; hence the dilemma of whether or not to trust the other

person. Deutsch further hypothesized that the most important features of a situation in which an individual can either cooperate or compete are: (1) the individual is confronted with an ambiguous path that can lead to a perceived beneficial event (gaining points) or harmful event (losing points); (2) he sees these events as being contingent upon the behavior of the other person; and (3) he perceives the strength of the harmful event to be greater than that of the beneficial event. Thus if person 1 makes a cooperative choice without knowing whether person 2 will cooperate or compete, person 1 has made a trusting choice. If not, he has made a distrustful choice (Deutsch, 1960a). Deutsch feels that the Prisoner's Dilemma Game is an appropriate experimental procedure for studying problems involving trust, cooperation and competition.

According to Gallo and McClintock (1965), four types of independent variables have been the main focus of Prisoner's Dilemma Game research: (1) manipulation of the payoff matrices; (2) individual characteristics; (3) the strategy of the other player; and (4) possibilities for communication. These variables influence the degree of cooperation or competition obtained in the Prisoner's Dilemma Game. The remainder of this review is concerned with locating and examining exactly what types of changes in these variables produce increased or decreased cooperation and competition. These factors were examined in order to arrive at the most appropriate Prisoner's Dilemma Game for the present methodology.

#### Manipulations of the Payoff Matrix

Manipulations of the payoff matrix have generally been done in three ways: (1) the discrepancy between  $X_3$  and  $X_2$  has been varied within the Prisoner's Dilemma Game framework; (2) one or more of the game

rules have been relaxed; or (3) the symmetry of the game has been changed. The second type of manipulation has usually been done in an attempt to encourage cooperation, while the third investigates unequal power on the part of the players. Both of these manipulations change the Prisoner's Dilemma Game into a different type of mixed-motive game that would not be appropriate for the considerations of this study. The results of such studies will be mentioned only when their results are directly comparable to the usual Prisoner's Dilemma Game.

It should also be mentioned that there is a specific type of manipulation that slightly changes the Prisoner's Dilemma Game matrix, while closely following the four rules. This type of manipulation produces what is called a Maximizing Difference Game, and it is contrasted to the Prisoner's Dilemma Game in Figure 3.

		Person 2		Person 2	
		B <sub>1</sub>	B <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>
Person 1	A <sub>1</sub>	+8,+8	-9,+9	A <sub>1</sub>	+8,+8    0,+9
	A <sub>2</sub>	+9,-9	-8,-8	A <sub>2</sub>	+9, 0    0, 0
Prisoner's Dilemma Game			Maximizing Difference Game		

Figure 3. A Comparison of Payoff Matrices for the Prisoner's Dilemma Game and the Maximizing Difference Game

This variation has been used to study the differences among three possible motives that are hypothesized to be operating in the Prisoner's



Dilemma Game: (1) maximizing own gain; (2) maximizing joint gain; and (3) maximizing the difference between own and other's gain. A cooperative choice ( $A_1$  or  $B_1$ ) in the Prisoner's Dilemma Game would isolate motive two, but the motive for competition ( $A_2$  or  $B_2$  choice) could be either motive three or motive one (maximizing own gain by way of minimizing own potential losses). In contrast, the Maximizing Difference Game allows one to study the competitive motive in isolation, in that a competitive choice ( $A_2$  or  $B_2$ ) would now represent only motive three, since there is no danger of ever obtaining a negative sum.

A search of the literature revealed no studies showing any explicit differences in results using these two games. Since the present study was concerned with cooperation and competition per se, the literature review considered the Prisoner's Dilemma Game and Maximizing Difference Game to be the same type of mixed-motive game.

Two factors in the manipulation of payoff matrices that have been found to produce more competition are an increase in the index of competitive advantage ( $X_3 - X_2$ ) and trivial rewards. More cooperation is obtained if payoff values are very high.

Rapoport and Orwant (1962) have developed an index of competitive advantage. It is obtained by subtracting the  $X_2$  payoff from the  $X_3$  payoff (see Figure 1). Several studies have enlarged this index and obtained a greater percentage of competitive choices (Ells and Sermat, 1966, 1968; Komorita and Mechling, 1967; Minas, Scodel, Marlowe and Rawson, 1960; Scodel, et al., 1959). Similar results were obtained by Steele and Tedeschi (1967) using a variation of the competitive index. The Scodel and Minas studies also relaxed rules 2 ( $X_3 > X_1$ ) and 4 ( $X_4 > X_2$ ) of the Prisoner's Dilemma Game in order to make competition less

rewarding (see Figure 1). Rule 4 was relaxed so that competitive choices ( $A_2B_2$ ) would result in the worst payoff. Rule 2 was relaxed so that no individual advantage would be gained by making a competitive choice. Competitive choices were reduced, but they were still more numerous than cooperative choices. Scodel (1962) found similar results. These studies again demonstrate the competitiveness with which the game is normally played.

Another type of manipulation of the payoff matrix involves real versus imaginary money. Evans (1964), Gallo, Funk and Levine (1969), and Wrightsman (1966) found that subjects made the same percentage of competitive responses regardless of the real or imagined conditions.

A group of studies supports the conclusion that trivial payoffs result in more competition. McClintock and McNeel (1966) varied high (1 cent) versus low (.1 cent) reward and found more competitive responses in the low reward conditions. Other studies found similar results (Ells and Sermat, 1966; McClintock and McNeel, 1964, 1967). Gallo (1966) noted the same results in a bargaining game which also produces cooperative and competitive behavior. In all of the studies mentioned above, the high reward conditions were still quite trivial (a few cents per trial). Radlow (1965) increased rewards so that the lowest cell sum was \$6 ( $A_2B_2$ ). Subjects played more cooperatively under these conditions. Oskamp and Perlman (1965b) found that higher average payoffs per trial produced more cooperation.

#### Individual Characteristics

A series of recent studies suggests that competitive individuals:

- (1) score high on the F scale;
- (2) score high on need aggression and

autonomy in the Gough Adjective Check List; (3) adhere to more rigid ethical standards; and (4) have a non-altruistic orientation. On the other hand, cooperative individuals: (1) are internationalistic; (2) score high on need abasement; (3) adhere to less rigid ethical standards; and (4) are altruistic in orientation. The question of how sex of the subject affects the percentage of cooperative responses in the Prisoner's Dilemma Game remains unanswered.

A study by Deutsch (1960b) concluded that high scorers on the F scale play more competitively than low scorers. Deutsch's study employed only two trials, and subjects were told that the simulated "other" player had made a cooperative response before each of his choices. Deutsch felt that a competitive choice on the first trial indicated a lack of trust on the part of the subject, while a competitive choice on the second trial indicated a lack of trustworthiness on the part of the subject.

Several investigators have studied subjects varying in internationalistic versus isolationistic foreign policy belief, and have found that the internationalistic subjects play the Prisoner's Dilemma Game more cooperatively. Internationalism has been found to correlate negatively with high scores on the F scale (Lutzker, 1960). Lutzker (1960) demonstrated that internationalistic subjects made fewer competitive responses during a Prisoner's Dilemma Game than did isolationistic subjects. The internationalists, however, still chose competitively on the majority of the trials. A later study by McClintock, Harrison, Strand and Gallo (1963) confirmed these findings. McClintock, Gallo and Harrison (1965) suggest that internationalists may be more responsive to their opponent's strategy, since they punished previously

competitive and rewarded previously cooperative behavior by their opponents more often than isolationists.

Two studies support the view that subjects who hold less rigid ethical beliefs play the Prisoner's Dilemma Game more cooperatively. Bixenstine has developed a measure of a personality variable he calls "flexible ethicality" (Bixenstine, Potash and Wilson, 1963). This scale measures the extent to which a hero is approved on moderate ethical grounds (N) or on the basis of extreme and rigid adherence to ethics (F). The scale consists of 20 stories, each followed by four comments. Subjects were asked to read these stories and judge the comments for agreement with their own reaction to the hero's decision. The comments had been drawn from particular classes so that a moderate (N) or rigid (F) ethical score could be easily obtained. Subjects who scored high on the flexible ethicality index (N - F) made more cooperative choices than medium or low scorers. A similar relationship was suggested by Bixenstine and Wilson (1963).

The type of outlook an individual takes toward his fellow man seems to influence the extent to which he will cooperate or compete. Marlowe (1963) found that competitive subjects scored higher than cooperative subjects on need aggression ( $p = .06$ ) and autonomy ( $p = .03$ ), while cooperative subjects scored higher on need abasement ( $p = .07$ ) and deference ( $p = .02$ ), as measured by the Heilbrun adaptation of the Gough Adjective Check List. Marlowe, Gergen and Doob (1966) noted that subjects who anticipated further interaction were more exploitative of egotistical opponents than self-effacing opponents. Terhune (1968) studied the relation of achievement, affiliation and power motives, as measured by the Thematic Apperception Test. He concluded that significant trends

were suppressed by the inclusion of a threat condition which minimized motive differences. Altruistic, trusting subjects made more cooperative responses than subjects who hold more negative views of human nature, as measured by Wrightsman's Philosophies of Human Nature Scale (Wrightsman, 1966).

Another type of individual characteristic, which is considered to be an important variable, is sex. The relationship between sex and cooperation and competition in the Prisoner's Dilemma Game is unclear. Rapoport and Chammah (1965) had male-male, female-female, and mixed pairs play a Prisoner's Dilemma Game for 300 trials. They found that male pairs were significantly more cooperative than female pairs. When men played against women, however, sex differences seemed to disappear, and men responded more like women and vice-versa. A number of other studies have also found males to be more cooperative (Bixenstine, Chambers and Wilson, 1964; Komorita, 1965; Oskamp and Perlman, 1965b). These results are in conflict with several studies finding no sex differences (Bixenstine, Potash and Wilson, 1963; Lutzker, 1960; Minas, et al., 1960; Wilson and Bixenstine, 1962). No explanations for these contradictory results are apparent.

#### Strategy of the Other

The third variable, strategy of the other, has been varied by many of the previously cited studies. The findings surrounding this variable are unclear, but they suggest that very high unconditional preplanned strategies (those that approach 100 percent consistent cooperative or competitive choices) do not elicit cooperation from subjects. Matching or systematically varying the strategies does increase cooperation.

Several of the experiments referred to used a "simulated other", which means that the subject played against a preplanned set of responses fed to him by the experimenter, while believing he was actually playing an opponent. Bixenstine, Potash and Wilson (1963) used unpatterned preplanned strategies of 83 percent cooperative responses for one group and 83 percent competitive responses for a second group of subjects. These strategies were continued for the first 30 trials. For the next 60 trials, an 83 percent matching strategy was used, in which subjects' responses were matched by the program. No differences were found between the two groups or between the strategies used on the groups. McClintock, et al. (1963) used random strategies of 85, 50 and 15 percent cooperative responses and found no differences among the three groups. Scodel (1962) used 100 percent cooperative strategy against one group. Against a second group, he used a strategy in which the first ten trials were competitive and the rest cooperative. He obtained no group differences. Gahagan and Tedeschi (1968) varied strategies around the 50 percent range and observed no differences between the groups. The same general conclusions were reached by Komorita (1965), Minas, et al. (1960) and Sermat (1964).

There are several exceptions to these findings. Solomon (1960) used the following preplanned strategies: (1) 100 percent cooperative; (2) 100 percent competitive; and (3) a cooperative choice on trial one, followed by matching the subject's selection. The game lasted for only six trials. Solomon found that the third strategy produced more cooperative responses than the unconditional strategies. Post-experimental interviews indicated that subjects either thought there was no other person in the unconditional strategies, or "he" was rather foolish.

Bixenstine and Wilson (1963) found that when the systematically varied programmed strategy reached as high as 95 percent cooperative or competitive responses, the subjects' responses matched the programmed responses. Even more effective in producing cooperation is a sequence of choices progressing from low to high cooperation. These strategies still failed to produce more than 50 percent cooperative choices in subjects (Bixenstine and Wilson, 1963). Sermat (1967a) significantly increased cooperative behavior by using a strategy which consisted of 30 consecutive cooperative or competitive responses followed by a matching strategy for 200 trials. Both groups showed this increase, and in some cases subjects chose cooperatively more than 50 percent of the time. Finally, Sermat (1967b) found that subjects responded more cooperatively following a change in preplanned strategies from competitive to cooperative when they thought they were playing against a free-responding partner, as opposed to an absent partner or one committed to a previous strategy.

In attempting to understand why very high unconditional preplanned strategies do not elicit cooperation, motivation seems to be an important factor. Such a conclusion is supported by the work of Bruning and Mettee (1966) using a different type of task. The task was to predict the outcome of a simulated horse race. Cooperative subjects were told their scores would be summed, while competitive subjects were told their individual score would be added and compared to others. By way of manipulated feedback, they concluded that persistent winners or losers are less motivated than those who perform under conditions in which the outcome is more in doubt.

### Possibilities for Communication

The fourth major variable, possibilities for communication, brings about more consistent findings. The more opportunity there is for communication, the more cooperation will result. Loomis (1959) used the Prisoner's Dilemma Game to study the effects of communication on cooperative and competitive choices. Half of his subjects received, while the other half sent, standardized notes expressing expectation, intention, retaliation, absolution or mixtures of these. Subjects who sent or received messages, perceived more mutual trust than subjects who were unable to communicate. The level of trust varied with the complexity of the message allowed. The more complete messages resulted in higher levels of trust. A number of other studies have obtained similar results (Evans, 1964; Horai and Tedeschi, 1969; Radlow and Weidner, 1966; Scodel, et al., 1959; Swensson, 1967; Terhune, 1968). Pilisuk and Skolnick (1968) and Tedeschi, Lindsold, Horai and Gahagan (1969) found that a conciliatory strategy with honest prior announcement of moves led to higher amounts of cooperation after subjects had been given the motivational set to maximize their own gain. Gahagan and Tedeschi (1968) found increased amounts of cooperation if the subject felt he could predict the strategy of the other, which was a preplanned matching strategy in this case.

### Other Important Variables in the Prisoner's Dilemma Game

In addition to these four major variables, other important factors have been less thoroughly studied and will be briefly mentioned. Previous interaction can influence choices in the Prisoner's Dilemma Game. Oskamp and Perlman (1965b) found that friendship ranging from



unacquainted to fairly friendly has no effect on Prisoner's Dilemma Game responses. On the other hand, close friendship may produce either high amounts of cooperation or competition (Oskamp and Perlman, 1965a). Unrewarding prior dyadic experiences (preplanned competitive opponent) in a Prisoner's Dilemma Game resulted in more competition in a second Prisoner's Dilemma Game (Marlowe, Gergen and Doob, 1966; McClintock and McNeel, 1967; Scodel, 1962). Harrison and McClintock (1965) compared subjects who were rewarded during a reaction-time game with subjects who had no previous dyadic experience. They reported that previously rewarded subjects exhibited a higher percentage of cooperative responses.

In other studies, Rapoport and Dale (1966) reported that subjects cooperate more at first and compete more on the last trial if they know how many trials there will be. They call these phenomena the "end" and "start" effects. McClintock and McNeel (1966) and Messick and McClintock (1968) noted that if opponent's score feedback is presented during the Prisoner's Dilemma Game, more competition will result. The latter investigators also found that labeling the other player as opponent or partner made no difference in game playing behavior. If the Prisoner's Dilemma Game matrix is presented in non-matrix form, more cooperation results (Evans and Crumbaugh, 1966). Also subjects who find themselves arbitrarily behind at the beginning of play cooperate less often than their ahead partners (Marwell, Ratcliff and Schmitt, 1969). In addition, Oskamp and Perlman (1965b) reach the following conclusions: (1) level of cooperation is sensitive to the amount of social interaction at the beginning of the experiment; (2) higher levels of cooperation are more easily achieved with subjects from smaller

colleges as opposed to large universities; (3) previous public commitment to the norm that cooperation in the game is desirable results in more cooperation; and (4) instructions labeling the experiment as dealing with cooperation and competition have no effect.

The next few studies in this review deal with variables that were considered particularly important to the present study. Deutsch (1960a) manipulated cooperation and competition in the Prisoner's Dilemma Game by varying pregame instructions. The different sets of instructions emphasized the three possible motives that could be operating in the Prisoner's Dilemma Game. The instructions called for maximizing own gain, maximizing join gain and maximizing the difference between own and other's gain. The sets were called individualistic, cooperative and competitive, respectively. Results were as follows: (1) the individualistic set group cooperated anywhere from 21 to 77 percent of the time; (2) the cooperative set group cooperated on 78 to 97 percent of the responses; and (3) the competitive set group cooperated from 13 to 36 percent of the time. Since the present study was interested in obtaining high amounts of cooperation between the subject and one cohort, as well as high amounts of competition between the subject and another cohort, the second and third sets of pregame instructions were used to induce the appropriate effects.

The present research was also concerned with measuring postgame attitudes involving partners and opponents. Wilson, Chun and Kayatani (1965) had two teammates jointly choose a strategy of play against the opposing team, while playing the same Prisoner's Dilemma Game between themselves to determine the division of the winnings, if any. Subjects were 40 college students, and the game lasted for 20 trials. The

results showed that partners received more cooperative choices than their opponents ( $p < .001$ ). After the 20 trials, all subjects were rated by each other on personality, sociometric, ability and motive traits. Positive ratings on motives such as kind, cooperative and generous increased for partners ( $p < .05$ ), and decreased for opponents ( $p < .05$ ). Examples of the personality traits that were used are anxious, dependable and gullible. Some of the sociometric traits are likable, attractive, and desirable as a friend; while ability traits are exemplified by capable, efficient and intelligent. Subjects rated on a 9-point scale each of the other three persons on 22 total traits. In a follow-up study using emotionally disturbed boys 9-16 years of age, partners again received significantly more cooperative choices than opponents ( $p < .001$ ). However, postgame ratings on traits failed to distinguish ingroup and outgroup (Wilson and Rickard, 1968). The different results regarding ratings on the traits in these two studies can probably be accounted for by the difference in the subjects' ages and emotional instability. The present study attempted to show how rating on traits such as those used in these two studies relates to physical personal space.

Zajonc and Marin (1967), using two-man teams in a Prisoner's Dilemma Game, investigated the effect on interpersonal attitudes of winning or losing. One member of each team, by way of programmed outcomes, always decreased the likelihood of his team gaining points, while the other team member always increased that likelihood. The experiment was set up so that one member of each team played one member of the other team, while their teammates watched the progression of the game. After a fixed number of trials, the observing teammates would play one

another. The "winner" of one team always played the "loser" of the other team. The results showed that successful members had more favorable attitudes towards their opponents than their teammates. Pylyshyn, Agnew and Illingworth (1966) found that two-man teams tended to make more cooperative responses than individuals. In a competitive game other than the Prisoner's Dilemma Game, losing or winning of a two-man team was manipulated (Wilson and Miller, 1961). It was found that success and failure of the team interacted with ratings of opponent or teammate on 27 traits. Similar results were found by Rabbie and Horwitz (1969).

In summary of these studies, it appears that a greater degree of cooperation can be obtained by: (1) some previous acquaintance or social interaction prior to the game; (2) presenting the game in non-matrix form; (3) giving the subjects a cooperative motivational set; and (4) playing the game with a "partner". More competition can be engendered by: (1) having very close friends play the Prisoner's Dilemma Game; (2) having opponents' scores presented; (3) giving subjects a competitive motivational set; and (4) playing the game with an "opponent".

Summary: Cooperative and Competitive Variables in the Prisoner's Dilemma Game

The important cooperative and competitive variables are represented in Tables I and II. Of these variables, the most important and influential appears to be motivational set (pregame instructions). All of the factors, however, seem to fit into the cohesion-dispersion scheme mentioned earlier. Factors increasing cooperation in the Prisoner's

TABLE I

## VARIABLES INFLUENCING COOPERATION IN THE PRISONER'S DILEMMA GAME

Increased Cooperation	
Variable	References
(1) Very high rewards	(1) Oskamp and Perlman, 1965b; Radlow, 1965
(2) Altruistic subjects	(2) Wrightsman, 1966
(3) Allow communication	(3) Evans, 1964; Horai and Tedeschi, 1969; Loomis, 1959; Pilisuk and Skolnick, 1968; Radlow and Weidner, 1966; Scodel, <u>et al.</u> , 1959; Swensson, 1967; Tedeschi, <u>et al.</u> , 1969; Terhune, 1968
(4) Previously acquainted subjects	(4) Oskamp and Perlman, 1965b
(5) Non-matrix form of game	(5) Evans and Crumbaugh, 1966
(6) Cooperative instructions	(6) Deutsch, 1960a
(7) Use of "partners"	(7) Wilson, Chun and Kayatani, 1965; Wilson and Rickard, 1968
(8) Subjects with low scores on F scale	(8) Deutsch, 1960b
(9) Subjects with internation- alistic foreign policy beliefs	(9) Lutzker, 1960; McClintock, <u>et</u> <u>al.</u> , 1965; McClintock, <u>et al.</u> , 1963
(10) Subjects with less rigid ethical beliefs	(10) Bixenstine, <u>et al.</u> , 1963; Bixenstine and Wilson, 1963
(11) Matching subjects' strategy	(11) Bixenstine and Wilson, 1963; Sermat, 1967a
(12) Subjects from small colleges	(12) Oskamp and Perlman, 1965b
(13) Previous cooperative experience	(13) Marlowe, <u>et al.</u> , 1966; McClin- tock and McNeel, 1967; Scodel, 1962

TABLE II

## VARIABLES INFLUENCING COMPETITION IN THE PRISONER'S DILEMMA GAME

Increased Competition	
Variable	References
(1) Large index of competitive advantage	(1) Ells and Sermat, 1968; Komorita and Mechling, 1967; Minas, <u>et al.</u> , 1960; Scodel, <u>et al.</u> , 1959; Scodel, 1962; Steele and Tedeschi, 1967
(2) Low rewards	(2) Evans, 1964; Gallo, <u>et al.</u> , 1969; McClintock and McNeel, 1966; Wrightsman, 1966
(3) Non-altruistic subjects	(3) Wrightsman, 1966
(4) Less than 100% consistent "other" strategy	(4) Bixenstine, <u>et al.</u> , 1963; Gahagan and Tedeschi, 1968; Komorita, 1965; McClintock, <u>et al.</u> , 1963; Minas, <u>et al.</u> , 1960
(5) Allow no communication	(5) Evans, 1964; Horai and Tedeschi, 1969; Loomis, 1959; Pilisuk and Skolnick, 1968; Radlow and Weidner, 1966; Scodel, <u>et al.</u> , 1959; Swensson, 1967; Tedeschi, <u>et al.</u> , 1969; Terhune, 1968
(6) No prior acquaintance of subjects	(6) Oskamp and Perlman, 1965b
(7) Present opponent's score	(7) McClintock and McNeel, 1966; McClintock and McNeel, 1968
(8) Competitive instructions	(8) Deutsch, 1960a
(9) Subjects with high scores on F scale	(9) Deutsch, 1960b
(10) Subjects with isolationistic foreign policy beliefs	(10) Lutzker, 1960; McClintock, <u>et al.</u> , 1963; McClintock, <u>et al.</u> , 1965
(11) Use of "opponents"	(11) Wilson, Chun and Kayatani, 1965; Wilson and Rickard, 1968
(12) Subjects with more rigid ethical beliefs	(12) Bixenstine, <u>et al.</u> , 1963; Bixenstine and Wilson, 1963
(13) Subjects from large colleges	(13) Oskamp and Perlman, 1965b
(14) Previous competitive experience	(14) Marlowe, <u>et al.</u> , 1966; McClintock and McNeel, 1967; Scodel, 1962

Dilemma Game would probably increase cohesion when applied to many everyday situations, while competitive factors would likely increase dispersion.

#### Effects of Cooperation and Competition on Attitudes

In addition to looking at personal space, the present study attempted to measure differences in psychological distance that may accompany personal space differences in regard to a partner or opponent. Psychological distance can be defined as the feeling or attitude one has towards another person. Feelings of warmth, closeness and liking would be associated with a close psychological distance, while their opposites would suggest greater psychological distance. The general finding of the following studies is that cooperative group tasks result in more favorable ingroup interpersonal attitudes and relationships.

Although they did not use a noncompetitive control condition, Singer, Radloff and Wark (1963) found increased favorableness (as measured by a 7-point rating scale) towards teammates following competition. Using appropriate controls, Myers (1962) had three-man rifle teams compete with each other over a period of five weeks. A semantic differential type scale showed that teams that competed with each other had greater internal cohesiveness than did teams competing against a fixed, unchanging standard.

Similar studies in cooperative and competitive settings have also found increased ingroup cohesiveness. Bass and Dunteman (1963) had a group of eight or nine men collaborate with a second group of similar size. Their task was to develop a plan for more efficient operation of an engineering corporation. This plan was to be placed in competition

with another plan developed by a second pair of collaborating groups. Rank order evaluations of each of the groups were obtained from the subjects before, during and after the competition. The results showed that: (1) all outgroups were consistently underrated; (2) until the "winner" was announced, members rated their own group as best; (3) groups who arbitrarily became allies increased in evaluation at the expense of those forced into competition; and (4) ratings were higher if the collaborators were allied in victory.

Gottheil (1955) used a cooperative and competitive essay writing contest in classes of 13-14 year old grade school boys. He found that individuals who were members of the cooperating group perceived this group in a more favorable light. This was not the case in control or competitive groups. Individuals in cooperative groups were also more accepting of other people in general, apparently as a result of the cooperating experience. A similar type of task, involving cooperating and competing in psychology laboratory assignments, was used by Julian and Perry (1967). These subjects were college students, and the results indicated that the most favorable interpersonal relations were among the cooperative group members. Julian, Bishop and Fiedler (1966) found the same results using combat engineering squads that competed against each other in their training and garrison duties.

Grossack (1954) used college students divided into cooperative and competitive groups. Their task was to consider appropriate treatment procedures for a delinquent boy as described in a case study. The results showed that cooperative groups manifested significantly more cohesive behavior than the competitive groups. Similar conclusions were reached by Deutsch (1949, 1968a) and Levy (1953). Back (1951) found



that group cohesiveness could be increased by stressing to subjects how much they would like each other, how important it was for their group to do well on the task or how prestigious the group was.

Finally, Raven and Eachus (1963) used a cooperative task that involved three subjects grasping the sides of an equilateral triangle and making it level with the ground as quickly as possible. In each side was a carpenter's level, and balance was achieved when all three sides were balanced at the same time. The cooperative task was termed a test of "group intelligence", while the competitive task was to see which individual could level his own side most quickly. Sociometric data showed that coalitions formed more quickly in cooperative groups. A replication of this study by Crombag (1966), using Dutch students, found faster coalition formation in the competitive groups. Coalition in these studies was a function of the amount and kind of communication that took place between the subjects. Crombag suggested that his results were different possibly because overt striving for leadership in the competitive group is less acceptable for Dutch than American students. Possibly Dutch students attain leadership in groups by the formation of informal coalitions.

The conclusion from this group of studies is that cooperative tasks and outgroup competition produce ingroup cohesiveness, while ingroup competition produces more dispersion. Several extensive reviews of the literature result in the same conclusion (Collins and Guetzkow, 1964; Crombag, 1966; Hare, 1962; McGrath and Altman, 1966). In terms of the cohesion-dispersion schema discussed at the beginning of this chapter, ingroup cooperation should result in more favorable attitudes towards one's partner (more cohesiveness). More favorable attitudes should be

closely associated with closer psychological distance, which should be reflected by closer personal space orientation to one's partner rather than opponent.

#### Summary of the Problem

The concept of personal space was seen as developing from a balance of cohesive and dispersive tendencies present in man and other animals. Cohesive tendencies are those which bring individuals together in cooperative, mutually beneficial situations in which basic aggressive urges are less important. Dispersive tendencies keep individuals apart and interacting on a less cooperative basis. It was concluded that personal space was a type of balance between cohesive and dispersive forces.

Not until recently has personal space been studied scientifically. The most popular methods of measurement have been the field and pencil and paper techniques. Among the most important factors influencing personal space are the characteristics of the person being approached. Although it has never been demonstrated, it was hypothesized that if the person being approached was seen as a cooperative partner or a competitive opponent, different personal space orientations would result. It was concluded that field and seating methods of measurement would be used.

The literature review on cooperation and competition suggested that the Prisoner's Dilemma Game would provide a thoroughly studied and somewhat quantitative procedure for producing cooperation and competition. There are a number of factors in the Prisoner's Dilemma Game that can be manipulated to produce greater or lesser amounts of cooperation or competition. It was concluded that pregame motivational instructions

are the most powerful factors. The literature also showed that cooperation and competition can affect one's attitude towards his partner or opponent. The most frequent measure was ratings on traits. Attitudes were seen to be similar to psychological distances in that a negative attitude would suggest greater psychological distance. Psychological distance was hypothesized to be part of what contributes to the overall balance present in personal space. It was further hypothesized that cooperation and competition would produce greater psychological distance as measured by interpersonal attitudes.

The present study had subjects play a simultaneous cooperative and competitive Prisoner's Dilemma Game with experimental cohorts. A neutral cohort was used as a control. Immediately following the game, personal space measures were taken using approach, seating and questionnaire measures. It was predicted that subjects would show a closer personal space orientation to the cooperative as opposed to the competitive cohort. The personal space orientation to the neutral cohort was predicted to be intermediate.

## CHAPTER II

### METHOD AND PROCEDURES

#### Subjects

The experimental subjects were 18 male volunteers from the men's dormitory on the Oklahoma State University campus, during the summer session of 1970. All subjects were Caucasian, had not had a psychology course more advanced than elementary psychology and ranged in age from 18 to 37 years, with a mean of 21.3 years. The only prior information the subjects had about the experiment was that there would be a good possibility of winning some money.

#### Experimental Cohorts

Three experimental cohorts played the cooperative, competitive and neutral roles. The ages of the cohorts were 21, 23 and 27 years, with a mean of 23.7 years. A male assistant, 38 years of age, was used to help with the experimental procedure in general. All cohorts and the assistant participated in the present study as part of the requirements of a graduate level psychology course.

#### The Prisoner's Dilemma Game and Motivational Sets

The treatment in the present study consisted of having each subject play concurrent cooperative and competitive Prisoner's Dilemma Games with two experimental cohorts. An additional cohort, identified as

scorekeeper (see tally sheet, Appendix A), was used as a control. The payoff matrices for the game are illustrated in Figure 4.

		Person 2	
		B <sub>1</sub> (blue)	B <sub>2</sub> (red)
Person 1	A <sub>1</sub> (blue)	(+ 9¢,+ 9¢)	(-10¢,+10¢)
	A <sub>2</sub> (red)	(+10¢,-10¢)	(- 9¢,- 9¢)

Figure 4. Prisoner's Dilemma Game Payoff Matrix

The Prisoner's Dilemma Game motivational instructions were taken from Deutsch (1960a). The cooperative motivational set was induced by the following set of instructions:

Before you start playing the game, let me emphasize that in playing the game you should consider yourself to be partners. You're interested in your partner's welfare as well as in your own. You do have an interest in whether your partner wins or loses. You do care how he does and he does care how you do. His feelings make a difference to you and your feelings make a difference to him. You want to win as much money as you can for yourself and you do want him to win. He feels exactly the same way, he wants you to win too. In other words, you each want to win money and you also want your partner to win too.

The competitive motivational set was induced by these instructions:

Before you start playing the game, let me emphasize that in playing the game your motivation should be to win as much money as you can for yourself and also to do better than the other person. You want to make rather than lose money but you also want to come out ahead of the other person. Assume that you don't know each other and that you'll never see each other again. His feelings don't make any difference to you and your feelings don't make any difference to him. Except that you're out to beat him and he's out to beat you.

### Procedure

Several hours prior to the arrival of the subject, experimental cohorts were given: (1) their cooperative, competitive or neutral role assignment; (2) the trial numbers on which they were to deviate from their cooperative or competitive strategy; and (3) the seat in which they were to sit for the seating distance measure of personal space. All of these assignments were randomly determined. The cooperative, competitive and neutral roles were balanced so that each of the three cohorts played each role a total of six times. The cooperative cohort played a random cooperative strategy 90% of the time, while the competitive cohort played a random cooperative strategy 20% of the time (Deutsch, 1960a). The experimenter also randomly predetermined where the subject would sit while playing the Prisoner's Dilemma Game.

The game apparatus was set up in a room (Room A) that was 10 x 12 feet. The only furniture in the room was a card table and four chairs. Plywood dividers, 12 inches high and 36 inches long, served to make a compartment for each of the four individuals sitting at the table (see Appendix B). The dividers were high enough to hide the participant's hands, but not their faces. Platforms 6 inches square were placed on the dividers between the compartment to be utilized by the subject (designated W in Appendix B) and every other compartment. Within each compartment was a dittoed representation of the Prisoner's Dilemma Game (see Figure 4). Compartment W contained 60 red and 60 blue poker chips, while two of the remaining compartments contained 30 red and 30 blue poker chips. In the remaining compartment was the response talley sheet and a pencil.

As each participant arrived, the experimenter asked his first name,

allowed him to choose a seat in Room A and requested that he not talk beyond this point except to ask the experimenter questions regarding the experimental procedure. After all cohorts and the subject had arrived, the experimenter introduced everyone and explained that since all participants would not have an equal chance to win money, numbers would be drawn to determine playing positions. The experimenter seated the subject in position W and seated the cohorts in randomly predetermined positions among the three remaining seats.

The game was then explained by a set of standardized instructions (see Appendix C). In these instructions, several examples were given to insure the fact that the subject understood the game. The payoff values were understood to be in terms of pennies. The cooperative, competitive and neutral instructions were then given to the appropriate pair. The set of instructions that was given first was randomized. The experiment was briefly explained as being concerned with studying each of the cohorts' reactions to the subject as a cooperative, competitive and neutral person, respectively.

Both the cooperative and competitive games were played for 30 trials. Participants made their cooperative or competitive choices from their stack of red and blue poker chips in which red represented a competitive choice and blue represented a cooperative choice. Each choice was made simultaneously by the subject and his partner or opponent behind the 12 inch high dividers. Participants held the poker chips concealed in their hands until the experimenter gave a signal. At the signal, both participants placed the poker chip in a separate stack on the platform between them. The neutral cohort then marked these choices on the tally sheet. The experimenter randomly selected

cooperative and competitive games for trial 1. Thereafter the trials alternated between the two games.

At the end of the games, before any monetary gains or losses were established, measures were taken using the three personal space techniques. The subject and one of the randomly predetermined cohorts were taken into Room B (see Appendix D), which was 17 feet x 16 feet, 6 inches. A circle of 9 desk chairs was placed approximately in the center of the room. The subject was positioned in the southwest corner and the cohort was positioned in the southeast corner of the room. Ring electrodes from a GSR machine (Model 12-13 T, manufactured by the Marietta Apparatus Company, Marietta, Ohio) were attached to the first and third fingers of the cohort's right hand. It was explained that the purpose of these electrodes was to measure the cohort's response to the subject's approach. The subject was then asked to walk toward the cohort and the approach measure of personal space (see below) was recorded.

After the approach measure of personal space was taken, the subject was asked to resume his original position. The cohort was asked to take a pencil and three sociometric questionnaires, from a stack on a small round table in the center of the circle of chairs (see Appendix C). The circle was composed of 9 desk chairs placed approximately in the center of the room and equally spaced to form a circle 8 feet in diameter. The cohort then sat in a randomly predetermined seat and was asked not to look at the questionnaires until told to do so.

The remaining cohorts were brought into the room one at a time, and the same procedure was repeated. The experimenter told each remaining cohort to "leave space" between himself and the other seated



participants, since they would be completing questionnaires on one another. The purpose of "leaving space" was to seat the cohorts so that two chairs were vacant on either side of each cohort. The experimenter made certain that the subject was seated last and recorded his position as the seating distance measure of personal space. The cohort by whom the subject sat was asked to move so that one chair remained between him and the subject before the questionnaires were completed.

All participants were asked to complete one of the sociometric questionnaires (see Appendix E) on each of the other three seated players. After the sociometric questionnaires were completed, questionnaires designed to determine the subject's perception of his role in the experiment were also completed by the subject and each of the cohorts (see Appendix F). The subject was then debriefed and paid one dollar plus his winnings from the Prisoner's Dilemma Game. The average winnings were slightly over 52 cents.

### Response Measures

Two measures of actual personal space and one sociometric questionnaire were taken as response measures. One measure of personal space was the simple approach technique used by Rawls, et al. (1968a), while the other was a more natural seating distance measure. These measures were always taken in the following sequence: approach, seating, questionnaire.

The approach measure of personal space had the subject approach each of the cohorts one at a time. The cohort was wired to a GSR machine that was supposedly measuring his responses to the subject's approach. The subject was told only to walk toward each cohort. The

personal space measure was the distance that the subject stopped from each cohort, as measured by tape strips placed along a wall 9 inches apart. The tape strips were ostensibly there to tape electrical wires together. Distance was recorded to the nearest 4 1/2 inches. The experimenter observed the subject's approach from a desk chair placed 8 feet to the cohort's right and was supposedly observing the GSR machine.

In the seating distance measure, experimental cohorts were seated at randomly predetermined positions equidistant from each other so as to form an equilateral triangle. Between each cohort, two remaining vacant chairs were positioned so as to form a circle. The subject then chose among the remaining chairs. The number of chairs from each of the cohorts was taken as the measure of personal space.

The sociometric questionnaire consisted of rating each of the three other participants on a group of 24 traits. The rating was done on a 7-point semantic differential type scale. There were 4 personality traits, 6 sociometric traits, 5 intellectual traits and 9 motive traits. The traits were the same as those used by Wilson, Chun and Kayatani (1965).

## CHAPTER III

### RESULTS

A t test was done on the number of competitive choices the subjects made toward their cooperative and competitive opponents. The one-tailed test was calculated to be 3.922 and is significant with  $p < .0005$  (Winer, 1962). These results are consistent with those of Deutsch (1960a) and suggest that the treatment was quite effective. Table III shows that treatment means for all analyses were in the predicted order and direction. In each case a lower total reflects less personal space or psychological distance.

TABLE III  
TREATMENT MEANS AND STANDARD DEVIATIONS FOR PERSONAL SPACE  
MEASURES AVERAGED ACROSS COHORT GROUPS

Measures	Mean			Standard Deviation		
	Cooper- ation	Compe- tition	Neutral	Cooper- ation	Compe- tition	Neutral
Total Questionnaire <sup>1</sup>	215.50	245.00	228.83	22.99	23.35	27.56
Personality	41.66	45.33	42.83	6.40	4.96	4.62
Ability	41.33	47.83	42.00	4.71	6.11	4.73
Motive	85.33	95.83	89.16	7.71	10.41	10.87
Sociometric	47.16	56.00	54.83	8.15	8.07	11.26
Approach (inches)	37.50	44.25	39.75	9.29	6.62	8.73
Seating (chair distances)	4.50	7.00	7.00	1.37	0.89	1.67

<sup>1</sup>1-7 units on Likert-type scale.

Since the distances in the seating measure of personal space were not independent of each other, seating data were analyzed using the Friedman two-way analysis of variance by ranks (Siegel, 1956). The sums of ranks for each treatment condition were as follows: cooperative 27, competitive 42, and neutral 42. The  $\chi^2_r$  test statistic was calculated to be 20.26, which was significant ( $p < .0005$ ).

The remaining measures were analyzed using an analysis of variance for a two-factor experiment with repeated measures on one factor (Winer, 1962). Factor one represented the cooperative, competitive and neutral cohort roles, and the other factor represented a cohort group factor. A group was formed by all subjects who had the same cooperative, competitive and neutral cohorts. Since the groups on factor two were not completely independent, the more conservative Greenhouse-Geisser  $\underline{F}$  ratio, as well as the ordinary  $\underline{F}$  test was used.

The approach measure of personal space showed no significant treatment or interaction effects. The results of the analysis of variance for the approach data are shown in Table IV.

Table V shows the results of the analysis of variance for the questionnaire measure of personal space. No significant treatment or interaction effects were obtained using either the regular or conservative  $\underline{F}$  test.

Since questionnaire data have never been compared directly to personal space measures utilizing actual physical distances, these data were also analyzed after being broken down into the four subclassifications. The purpose of these further analyses was to examine the specific types of traits that are more closely related to physical personal space. The results of the analysis of variance for the ability traits

TABLE IV  
ANALYSIS OF VARIANCE FOR THE APPROACH MEASURE OF PERSONAL SPACE

Source	SS	df	MS	F
<u>Between Subjects</u>	2025.0000	17		
A (cohort group)	261.0000	5	52.2000	0.3551
Subjects within groups	1764.0000	12	147.0000	
<u>Within Subjects</u>	526.5000	36		
B (treatment)	47.2500	2	23.6250	1.4318
AB	83.2500	10	8.3250	0.5045
B x subjects within groups	396.0000	24	16.5000	

TABLE V  
ANALYSIS OF VARIANCE FOR THE TOTAL QUESTIONNAIRE  
MEASURE OF PERSONAL SPACE

Source	SS	df	MS	F
<u>Between Subjects</u>	5909.7037	17		
A (cohort group)	402.8148	5	80.5629	0.1755
Subjects within groups	5506.8889	12	458.9074	
<u>Within Subjects</u>	9311.3334	36		
B (treatment)	872.9259	2	436.4629	1.8109
AB	2653.9630	10	265.3963	1.1101
B x subjects within groups	5784.4445	24	241.0185	

are presented in Table VI. No significant treatment or interaction effects were found using either the regular or conservative F test.

TABLE VI  
ANALYSIS OF VARIANCE FOR THE ABILITY TRAITS

Source	SS	df	MS	F
<u>Between Subjects</u>	391.2037	17		
A (cohort group)	16.0925	5	3.2185	0.1029
Subjects within groups	375.1112	12	31.2592	
<u>Within Subjects</u>	628.0000	36		
B (treatment)	51.1481	2	25.5740	1.3454
AB	120.6297	10	12.0629	0.6345
B x subjects within groups	456.2222	24	19.0092	

Table VII shows the results of the analysis of variance for the motive traits. No significant treatment or interaction effects were found using either the regular or conservative F test.

The analysis of variance for the personality traits is shown in Table VIII. No significant treatment or interaction effects were found using either the regular or conservative F test.

Table IX presents the analysis of variance for the sociometric traits. The treatment effects approach significance ( $p < .10$ ) for the regular, but not the conservative F test. The interaction effects

TABLE VII  
ANALYSIS OF VARIANCE FOR THE MOTIVE TRAITS

Source	SS	df	MS	F
<u>Between Subjects</u>	1436.5926	17		
A (cohort group)	203.2593	5	40.6518	0.3955
Subjects within groups	1233.3333	12	102.7777	
<u>Within Subjects</u>	1661.3334	36		
B (treatment)	112.9260	2	56.4630	1.0631
AB	273.7407	10	27.4740	0.5172
B x subjects within groups	1274.6667	24	53.1111	

TABLE VIII  
ANALYSIS OF VARIANCE FOR THE PERSONALITY TRAITS

Source	SS	df	MS	F
<u>Between Subjects</u>	209.2036	17		
A (cohort group)	25.2036	5	5.0407	0.3287
Subjects within groups	184.0000	12	15.3333	
<u>Within Subjects</u>	396.0000	36		
B (treatment)	14.0369	2	7.0184	0.6429
AB	119.9631	10	11.9963	1.0989
B x subjects within groups	262.0000	24	10.9166	

TABLE IX  
ANALYSIS OF VARIANCE FOR THE SOCIOMETRIC TRAITS

Source	SS	df	MS	F
<u>Between Subjects</u>	464.6667	17		
A (cohort group)	54.8889	5	10.9777	0.3214
Subjects within groups	409.7778	12	34.1481	
<u>Within Subjects</u>	826.6667	36		
B (treatment)	92.1111	2	46.0555	3.0856*
AB	376.3334	10	37.6333	2.5214**
B x subjects within groups	358.2222	24	14.9259	

\*  $p < .10$ , regular F ratio, but not Greenhouse-Geisser F ratio.

\*\*  $p < .10$ , regular and Greenhouse-Geisser F ratio.

approach significance ( $p < .10$ ) for both the regular and conservative F test.



## CHAPTER IV

### DISCUSSION

The present study was designed to investigate the influence of cooperation and competition on the use of personal space. Three different measures of personal space were employed: approach, seating and questionnaire. Only the seating measure produced statistically significant results; however, these results were quite striking in that only one subject chose to sit next to the competitive cohort. Neither the approach nor the questionnaire rating data reached statistical significance, although there were trends in the predicted direction. Overall, the basic hypothesis of this study, that personal space lessens as a function of increased cooperation, may be said to have been supported.

The present results are consistent with those of Deutsch (1960a) in suggesting that cooperative and competitive instructions used with the Prisoner's Dilemma Game are useful experimental tools for producing and studying cooperative and competitive behaviors. The results are inconsistent with those of Dosey and Meisels (1969), who found an approach measure to be more sensitive than a seating measure. There are several methodological differences that may account for this inconsistency. Dosey and Meisels had subjects approach each other in the approach situation, and responses of the subject were seen as the object of study. The present design had subjects approach a cohort who was wired to a GSR machine, and cohort responses were seen as the object of

study. This deception may have made the subjects feel they had to "help" the experimenter and approach each cohort beyond the most comfortable, more natural distance. Any treatment effects could have been lessened by the perceived demands of the experiment. In addition, the seating distance in the Dosey and Meisels study was measured in relation to the experimenter. The experimenter may have been perceived as being different in status; that is, previous studies have shown that perceived status influences personal space (Little, 1968; Lott and Sommer, 1967; Mehrabian, 1968a). The seating situation also involved the subject choosing among three chairs placed at a table, as opposed to the circular arrangement in the present study. The circular arrangement presented the subject with a forced choice, and this may have increased the sensitivity of this measure. Finally, Dosey and Meisels administered a Body Contact questionnaire immediately prior to the seating measure, which may have aroused some anxiety in the subjects.

The trends in the present questionnaire data are consistent with the large body of research indicating that more positive ingroup feelings are associated with cooperation, as opposed to competition (Collins and Guetzkow, 1964; Crombag, 1966; Hare, 1962; McGrath and Altman, 1966). The fact that sociometric trait ratings showed the largest difference is inconsistent with the results of Wilson, Chun and Kayatani (1965), in which ratings on motive traits were significantly different. The possible reasons for this inconsistency are not clear. The trends in the questionnaire data also lend marginal support to a number of studies which find generally positive feelings are associated with less personal space (Fisher, 1967; Gottheil, Corey and Paredes, 1968; King, 1964, 1966; Little, 1965; Mehrabian, 1968a).

The present results provide support for the theory that cooperation and competition are factors which contribute to the overall balance of cohesive and dispersive forces. In particular, cooperation seems to be a cohesive force, while competition can be seen as a dispersive force in relation to the competitor. Since cooperation and competition can be seen as factors contributing to the cohesive-dispersive balance, these results also provide some support for those theories of behavior pathology which see disordered behavior as resulting from a change in a stable equilibrium. That is, if an individual's personal space is invaded in the absence of positive feelings like those produced by cooperation, the cohesive-dispersive equilibrium is changed, and disordered behavior may result. Many psychiatric disturbances in Western civilization are hypothesized to have their etiologies centered around sexual and aggressive feelings - cooperation and competition in extreme forms. Cooperation and competition, in all their varying intensities, can clearly be viewed as factors that might change the equilibrium of a stable personality.

There are several implications of the results of the present study. First, personal space is a useful interactional measure. Secondly, cooperation and competition do appear to be factors that influence personal space. Thirdly, deception in the use of approach measures may add extraneous variables to these measurement situations. Finally, the unique seating method used in the present design appears to be a useful experimental measure of personal space. From the experimenter's point of view, the seating method was useful because data analysis and recording were quite easy. In contrast to the approach measure, the seating situation presented the subject with a forced choice. After

the subject entered the center of the seating circle to obtain the pencil and questionnaires, he was free to choose any of the remaining seats. Since there were only two vacant chairs between each cohort, the subject was forced to sit next to one of the cohorts. This choice also meant that the subject was furthest from the cohort seated on the opposite side of the circle, and the distance from the other cohort was intermediate. Answers on the post-measure questionnaires, as well as many of the subjects' comments after debriefing, suggest one reason the seating method was sensitive was that its purpose was covert.

If the present study were to be replicated, several modifications are suggested. A covert approach situation could involve the subject and each cohort in an activity that required them to be left alone in a room to interact spontaneously for several minutes, while personal space distances could be photographed by a hidden camera or observed through a one-way mirror. This would allow cohorts to assume a fixed position, while the subject approached to a natural, preferred distance. A longer list of motive and sociometric traits could help resolve the conflict between the present results and those of Wilson, Chun and Kayatani (1965) by providing greater potential variability in the ratings. It is also suggested that a modification of this design which would allow personal space measurements to be taken while subjects were actually participating in the cooperative, competitive or neutral situations may provide more accurate measures of the treatment effects by avoiding any changes in feelings that may occur when treatment and measurement situations are separated by time.

Extensions of the present work could attempt to answer several questions that have resulted: (1) how stable are the present effects

over time; (2) what are the effects of more longlasting or intensive cooperative and competitive treatments; (3) can personal space differences be reversed by having cohorts switch cooperative or competitive roles; (4) what other types of feelings are associated with these personal space differences; and (5) at what age do cooperation and competition begin to influence the personal space orientation of children or adolescents? Regarding this last question, the results of Fisher (1967) and Weinstine (1967) indicate that parental attitudes influence personal space at a relatively early age. If parents place high value on cooperation or competition, this emphasis may be reflected in the personal space orientations of the child.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

The purpose of this study was to determine if cooperation and competition are important variables influencing personal space. Personal space has previously been defined as a complex of patterned spatial modes of relating to, and communicating with, others in the environment. Eighteen male college students were given cooperative, competitive and neutral game-playing experiences using the Prisoner's Dilemma Game. These game-playing experiences served as the experimental treatments. Three different types of personal space measures were taken immediately following the treatments. The three measures were approach, seating and questionnaire methods. It was predicted that the subjects would show a closer personal space orientation to the cooperative as opposed to the competitive cohort. The personal space orientation of the neutral cohort was predicted to be intermediate.

The seating measure showed a highly significant difference in the personal space orientation of the subject in the hypothesized order and direction. In addition to being analyzed as a whole, the questionnaire measure was also analyzed considering each of the four types of traits separately. The sociometric traits showed treatment effects that approached significance using the usual  $F$  test, but not the more conservative Greenhouse-Geisser  $F$  test. This analysis also showed a treatment by cohort group interaction that approached significance using

both the usual and conservative F tests. Analysis of the approach data produced no significant effects. All treatment means for all analyses were in the predicted order and direction. Overall the hypothesis of this study, that personal space lessens as a function of cooperation, was seen as being supported.

These results were found to be in conflict with the work of Dosey and Meisels (1969) who found an approach measure to be more sensitive than seating. Several methodological differences were offered as explanations for this conflict. The results generally agreed with a number of studies which have found more positive ingroup feelings are associated with cooperation, as opposed to competition. The present results were seen to support the theory that cooperation and competition are factors which contribute to the overall balance of cohesive and dispersive forces hypothesized to be present in personal space. In addition, some support was provided for those theories of behavior pathology that see disordered behavior as resulting from a change in a stable personality equilibrium.

The major implications of the present results were seen to be: (1) personal space is a useful interactional measure; (2) cooperation and competition appear to be factors that influence personal space; (3) deceptive approach measures may add extraneous variables to approach responses; and (4) the unique seating design used in the present study is an effective measure of personal space. The seating measure was seen as desirable because data analysis and recording were easy, its purpose seemed to be quite unapparent to the subjects, and it presented the subjects with a forced choice.

Several modifications and extensions of the present work were

suggested for further research. The questions raised by the present results were seen as bases for additional further research.



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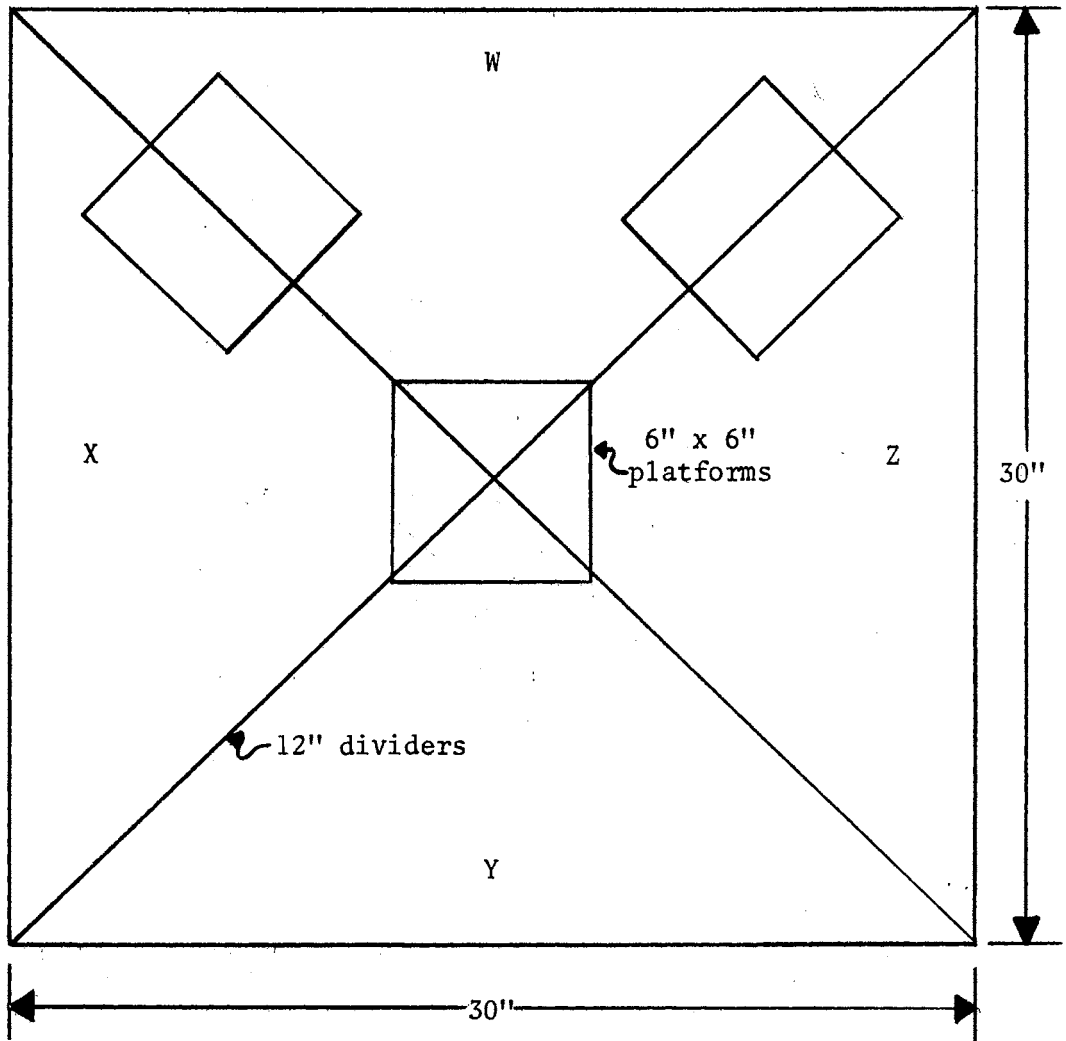
APPENDIX A

RESPONSE TALLY SHEET

Trial	Person 1			Person 2
	Person 2	1st Choice	2nd Choice	
1				
2				
3				
4				
5				
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APPENDIX B

PRISONER'S DILEMMA GAME APPARATUS



APPENDIX C

PRISONER'S DILEMMA GAME INSTRUCTIONS

There are two of you who are going to play a game in which you can either win money or lose money. The money is going to be in terms of pennies. I want you to feel that it really makes a difference to you whether you win a lot or a little or whether you lose a lot or a little.

Here is how the game is played. There are two of you, and how much you win or lose is determined not only by what you yourself do but also by what the other person does. On the paper which you have been handed there is a diagram which shows how the game is played. One of you is Person 1 (Person 1 please raise your hand); the other is Person 2 (Person 2 please raise your hand). Person 1 has to choose between Row  $A_1$  and Row  $A_2$ , while Person 2 has to choose between Column  $B_1$  and Column  $B_2$ . The amount of money that Person 1 can win or lose is indicated by the first numbers in the parentheses, the amount of money that Person 2 can win or lose is indicated by the second numbers.

How much money either of you wins or loses is determined by the choices which you each make. Let me illustrate by considering Person 1. Suppose he chooses Row  $A_1$ , whether he wins 9¢ or loses 10¢ will be determined by what Person 2 does. If Person 1 chooses Row  $A_1$  and Person 2 chooses Column  $B_1$ , Person 1 will win 9¢. However, if Person 1 chooses Row  $A_1$  and Person 2 chooses Column  $B_2$ , Person 1 will lose 10¢. Suppose Person 1 chooses Row  $A_2$ , he will either win 10¢ or lose 9¢, depending upon whether Person 2 chooses Column  $B_1$  or Column  $B_2$ . If you compare the choice between Rows  $A_1$  and  $A_2$  for Person 1, you'll notice that, if he chooses  $A_2$  and Person 2 chooses Column  $B_1$ , Person 1 will win 10¢ rather than 9¢. If Person 1 chooses  $A_2$  and Person 2 chooses  $B_2$ , he will lose only 9¢ rather than 10¢.

Now let us consider Person 2, what he can win or lose is indicated by the second numbers in the parentheses. He has to choose between Column  $B_1$  and  $B_2$ , how much he wins or loses is determined not only by his own choice but also by how Person 1 chooses. Thus if Person 2 chooses Column  $B_1$  and Person 1 chooses Row  $A_1$ , Person 2 will win 9¢. On the other hand, if Person 1 chooses  $A_2$  when Person 2 chooses  $B_1$ , Person 2 will lose 10¢. If Person 2 chooses  $B_2$  he can either win 10¢ or lose 9¢, depending upon what Person 1 does. If Person 1 chooses  $A_1$ , Person 2 by choosing  $B_2$ , will win 10¢ rather than 9¢. If Person 1 chooses  $A_2$ , Person 2, by choosing  $B_2$ , will lose only 9¢ rather than 10¢.

Let me point out an interesting thing. If Person 1 chooses  $A_2$  and if Person 2 chooses  $B_2$ , then both Person 1 and Person 2 will lose 9¢. On the other hand, if Person 1 chooses  $A_1$  and Person 2 chooses  $B_1$ , then both Person 1 and 2 will win 9¢. However, if Person 1 knows or can be assured that Person 2 is going to choose  $B_1$ , Person 1 can win more by choosing  $A_2$ . Similarly, if Person 2 knows or can be assured that Person 1 is going to choose  $A_1$ , Person 2 can win more by choosing  $B_2$ . If Person 1 chooses  $A_2$  when 2 chooses  $B_1$ , 1 will win 10¢ and 2 will lose 10¢. If Person 2 chooses  $B_2$  when 1 chooses  $A_1$ , 2 will win 10¢ and 1 will lose 10¢.

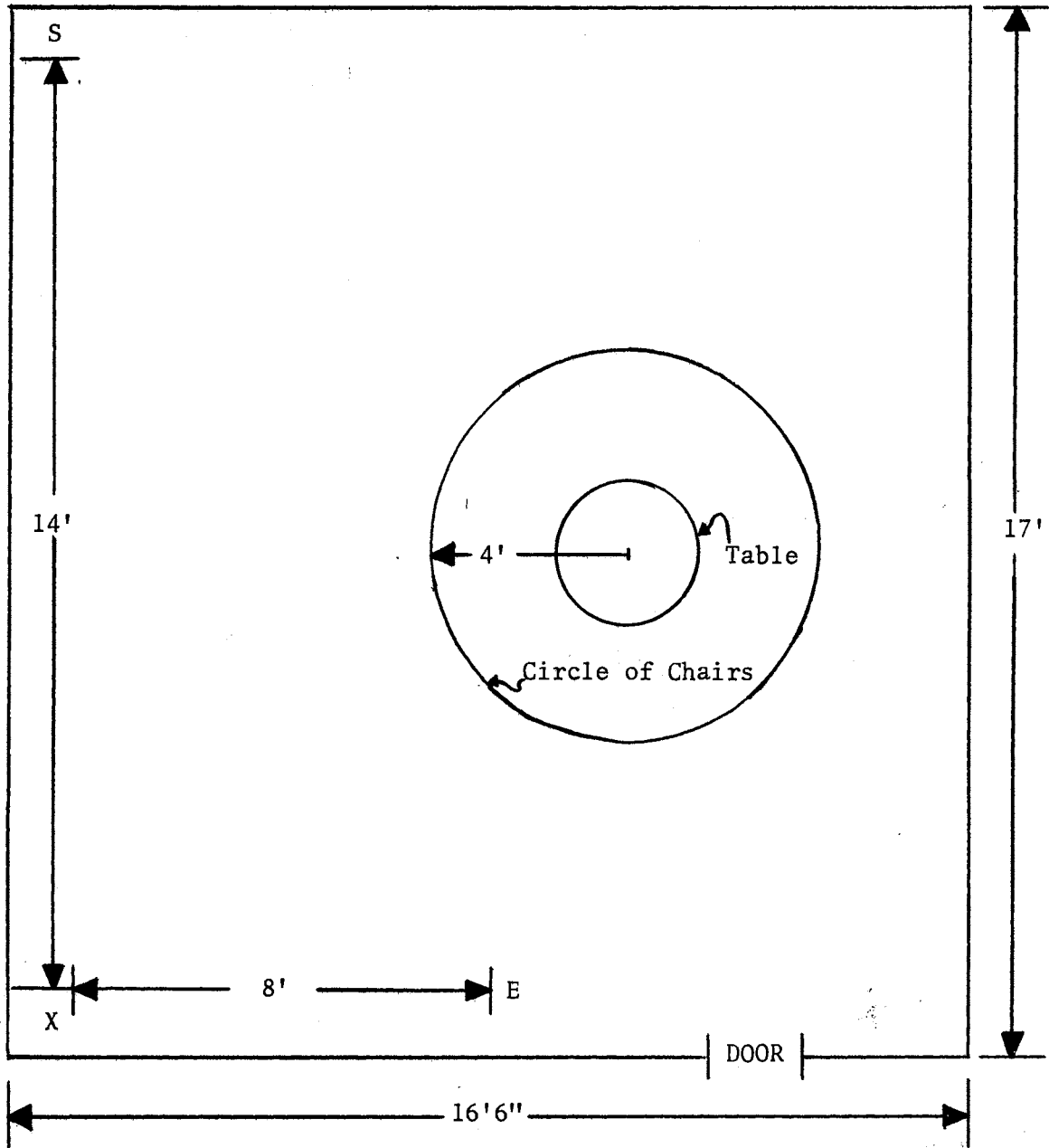
Are there any questions about what happens when Person 1 chooses between Rows  $A_1$  and  $A_2$  and Person 2 chooses between Columns  $B_1$  and  $B_2$ ? (At this point they were asked some questions to ensure that there was complete cognitive clarity.)

Okay, here's how you play the game. When I tell you to make your choice, you will make your choice in secret, not telling the other person of your choice. You will make your choice by simply selecting either a red or a blue poker chip from the stack in front of you. As you can see by the diagram, a blue poker chip means Row  $A_1$  if it is selected by Person 1, and it means Column  $B_1$  is the choice if it is selected by Person 2. In a like manner, a red poker chip means Row  $A_2$  or Column  $B_2$  depending on whether Person 1 or Person 2 is choosing. After you select a poker chip, keep it concealed in your hand behind the partitions until I tell you it is all right to display your choice. When I give you this signal, simply place the poker chip on this platform, keeping your own stack separate. It will be your job (indicating neutral cohort) to thus keep track of the money won or lost by each of these three people. Are there any questions?



APPENDIX D

ROOM B



APPENDIX E

QUESTIONNAIRE MEASURE OF PERSONAL SPACE

Directions: Below is a list of pairs of adjectives which are opposite in meaning. Rate each of the other participants as accurately as possible by circling your response for each adjective pair. The following abbreviations are appropriate: E - extremely, M - moderately, S - slightly and N - neutral.

Unkind	E	M	S	N	S	M	E	Kind
Friendly	E	M	S	N	S	M	E	Unfriendly
Intelligent	E	M	S	N	S	M	E	Unintelligent
Cooperative	E	M	S	N	S	M	E	Uncooperative
Mean	E	M	S	N	S	M	E	Nice
Independent	E	M	S	N	S	M	E	Dependent
Inefficient	E	M	S	N	S	M	E	Efficient
Hostile	E	M	S	N	S	M	E	Cordial
Anxious	E	M	S	N	S	M	E	Calm
Capable	E	M	S	N	S	M	E	Incapable
Gullible	E	M	S	N	S	M	E	Knowledgeable
Likable	E	M	S	N	S	M	E	Unlikable
Unpleasant	E	M	S	N	S	M	E	Pleasant
Not competitive	E	M	S	N	S	M	E	Competitive
Unselfish	E	M	S	N	S	M	E	Greedy
Generous	E	M	S	N	S	M	E	Stingy
Ugly	E	M	S	N	S	M	E	Attractive
Desirable as a friend	E	M	S	N	S	M	E	Undesirable as a friend
Boring	E	M	S	N	S	M	E	Charming
Messy	E	M	S	N	S	M	E	Orderly
Ineffective	E	M	S	N	S	M	E	Effective
Stubborn	E	M	S	N	S	M	E	Obliging
Fair	E	M	S	N	S	M	E	Unfair
Submissive	E	M	S	N	S	M	E	Dominant

APPENDIX F

POST-MEASUREMENT QUESTIONNAIRE

Date: \_\_\_\_\_

Name: \_\_\_\_\_

1. What do you feel the purpose of this experiment was?

2. How do you feel you contributed to this purpose?

(2)

3. How "smooth" did the procedure of the experiment seem to go?

4. What, if any, part of the experiment seemed "fake" or "unreal" to you?

VITA

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Doctor of Philosophy

Thesis: THE EFFECTS OF COOPERATION AND COMPETITION ON PERSONAL SPACE

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