DOCUMENT RESUME

ED 063 039 PS 005 672

AUTHOR Nelson, Linden
TITLE The Development of Cooperation and Competition in Children from Ages Five to Ten Years Old: Effects of Sex, Situational Determinants, and Prior Experiences.
INSTITUTION California Univ., Los Angeles. Center for Head Start Evaluation and Research.
SPONS AGENCY Office of Economic Opportunity, Washington, D.C.
PUB DATE Jun 70
NOTE 107p.

EDRS PRICE MF-$0.65 HC-$6.58
DESCRIPTORS *Age Differences; *Behavioral Objectives; Behavioral Science Research; *Child Development; Conflict Resolution; Experimental Psychology; Games; *Group Experience; *Interaction Process Analysis; Interpersonal Competence; Kindergarten Children; Maladjustment; Sex Differences; Social Maturity; Social Reinforcement

ABSTRACT

Six experiments were designed in order to compare the cooperative and competitive interaction of five-year-olds with that of older children up to age 10. For all experiments, children of the same age and same sex were matched in dyads. The children played various two-person games where they could obtain prizes in a variety of reward contingency conditions. The responsiveness of children to certain situational characteristics was investigated. The need for mutual assistance and the possibility for an equitable outcome were considered as, and were expected to be, situational cues for cooperative behavior. Conflict of interest and the possibility for an inequitable outcome were expected to be cues for competitive behavior. The results supported a general hypothesis that the potential responsiveness of children to both cues for cooperation and cues for competition increases with age. For older children, conflict of interest was a particularly important determinant relative to other determinants of cooperation and competition. For older children, but not for five-year-olds, prior game experiences led to greater cooperation. Sex differences did not generally approach significance. The results suggested that the predisposition of older children to be competitive in conflict of interest situations caused them to interact in maladaptive ways. (Author/DB)

The Development of Cooperation and Competition in Children From Ages Five to Ten Years Old: Effects of Sex, Situational Determinants, and Prior Experiences

Linden Nelson

University of California, Los Angeles

June 1970

This research study was carried out under the direction of Dr. Millard Madsen at the UCLA Head Start Research and Development Center, Dr. Carolyn Stern, Director. The Center is funded by the U.S. Office of Economic Opportunity, Project No. CG9938.

TABLE OF CONTENTS

ABSTRACT

Six experiments were designed in order to compare the cooperative and competitive interaction of five-year-olds with that of older children up to age ten. For all experiments, children of the same age and same sex were matched into dyads. The children played various two-person games where they could obtain prizes in a variety of reward contingency conditions.

The responsiveness of children to certain situational characteristics was investigated. The need for mutual assistance and the possibility for an equitable outcome were considered as, and were expected to be, situational cues for cooperative behavior. Conflict of interest and the possibility for an inequitable outcome were expected to be cues for competitive behavior.

The results indicated that when a situation was characterized by the presence of cues for cooperation and the absence of cues for competition, children of all ages were cooperative. The older children, however, were more efficient in cooperating. When a situation was characterized by competitive cues and the absence of cues for cooperation, older children were far more competitive than five-year-olds. When cues for cooperation and competition were present, interaction was generally non-cooperative, and equally so for all age levels. However, when the mixed-cue situation was designed in one case to make the possibility of an equitable outcome particularly obvious, five-year-olds were more cooperative than older children.

When a situation was characterized by the presence of the cues for cooperation, the absence of conflict of interest, and the presence of a possibility for an inequitable outcome, older children were more cooperative than younger children.

Altogether, the results supported the characterization of certain cues as either cooperative or competitive. The results supported a general hypothesis that the potential responsiveness of children to both cues for cooperation and cues for competition increases with age.

The non-cooperative interaction of older children in the mixed-cue situation was interpreted as a result of an interference between co-operative and competitive response tendencies. For older children, conflict of interest was a particularly important determinant relative to other determinants of cooperation and competition.

Data concerning disparity in outcomes over trials suggested that older children were more concerned about equality of outcomes than were five-year-olds.

Results relevant to the effect of prior game experiences indicated that for older children, but not for five-year-olds, the prior experience of cooperating led to greater cooperation than for groups having either no prior game experience or the prior experience of competing.

Sex differences did not generally approach significance, although for one situation, older boys were more competitive than older girls. Also, following the prior game experience of cooperating in one experiment, older boys were more cooperative than older girls, and younger girls were more cooperative than younger boys.

Overall, the results suggested that the predisposition of older children to be competitive in conflict of interest situations interfered with their problem-solving capabilities and caused them to interact in maladaptive ways. An implication of this study is that a more desirable balance in the dispositions of older children to be cooperative and competitive might result by (1) providing more experiences where children would obtain goals through cooperative interaction and by (2) sensitizing children to the need for mutual assistance in many conflict of interest situations.

Introduction

The years of childhood from ages five to ten are generally considered to be an important period for the child's social development. This is often called the age of group play. In learning how to interact with other persons in many circumstances, the child is expected to acquire certain cooperative and competitive capacities and to learn which forms of interaction are appropriate for various situations. The degree to which the child increases in his ability to behave either cooperatively or competitively in order to effectively obtain certain goals is a matter which has received little attention in psychological studies of child development. Instruments for objectively assessing the cooperative and competitive capacities of children have only recently been developed.

An early review (May & Doob, 1937) of several observational studies on the development of cooperation and competition led its authors to conclude that both forms of behavior were apparent in the third year and developed rapidly until age six when both cooperative and competitive behaviors were observable in nearly all children. Greenberg (1932) noted that at least 90 percent of the six-year-olds that she observed, while they were building blocks in the presence of other children, had well developed competitive behaviors. She found that this competitiveness usually appeared first at age four. Leuba (1933) reported that rivalry responses among children working in pairs and putting pegs in a peg board first appeared with three- and four-year-olds and were the dominant responses of five-year-olds.

Although these and other observational studies (Anderson, 1937; Chittenden, 1942; McKee & Leader, 1955) have documented the presence of cooperative and competitive interaction among preschool children, very few studies have attempted to describe the responsiveness of preschoolers to various situational cues for cooperation and competition.

In one study (Nelson & Madsen, 1969) pairs of four-year-olds interacted cooperatively on a simple task which required that they coordinate their actions in pulling on strings in order to move a pointer on a board to a certain target and to jointly obtain rewards. The same pairs of children, however, were neither very cooperative nor very competitive when the reward contingency was such that each child had a separate target and only one child could obtain a prize on a trial. In this conflict of interest situation, some pairs cooperated by taking turns over trials, some pairs pulled against each other for most of the trials, and the majority of pairs interacted such that one child submissively assisted the other child in obtaining most of the rewards.

Another study (Kagan & Madsen, in press) which placed four- and five-year-old pairs in a conflict of interest situation also found that the preschoolers were generally submissively cooperative and insensitive to verbal instructional sets for cooperation and competition.

One purpose of the experiments to be reported here was to further describe the interaction of five-year-old children in a variety of situations, some which were expected to elicit cooperative behavior and others which were expected to elicit competitive behavior. Another purpose of these studies was to examine differences in the cooperative and competitive behaviors of children between the ages of five and

ten years old.

There is reason to expect that both intellectual and motivational differences between five- and ten-year-old children would relate to differences in cooperative and competitive behaviors. Piaget (1950) has suggested that in order for individuals to cooperate, they must be able to differentiate their viewpoints. He concluded from his studies that until the age of about 7 to 8 years, the egocentric quality of children's thinking interferes with the differentiation of viewpoints and "precludes the formation of the cooperative social functions" (Piaget, 1950, p. 162). Starting at about age 7 or 8, "the more intuitions articulate themselves and end by grouping themselves operationally, the more adept the child becomes at cooperation, a social relationship which...involves a reciprocity between individuals who know how to differentiate their viewpoints."

It seems likely that an increased ability to differentiate viewpoints might also provide a greater capacity for competition. Competition is defined here as a kind of interaction in which persons obstruct the progress of one another while pursuing separate but similar personal goals. A child's ability to understand and anticipate the behavior of another person in a conflict of interest situation, where the other person might be expected to pursue his self-interests at the child's expense, must certainly relate to the child's disposition to obstruct the progress of that other person. So, the greater intellectual capacity of the older child for understanding interdependencies and for predicting behavior would be expected to enhance his potential for both cooperative and competitive behaviors.

It also seems reasonable to expect that older children have, to a greater extent than younger children, acquired certain culturally important rules and motives which mediate behavior in conflict of interest situations. A conflict of interest may be said to exist when persons are interdependent such that behavior which might be instrumental to the maximal attainment of one person's goals would also be detrimental to another person's progress toward maximal goal attainment. Most conflicts of interest may be resolved if all of the individuals involved are willing to settle for a limited share of the goal outcomes. For a child raised in the United States it is likely that certain aspects of conflict of interest situations would elicit both (1) rules about equality and justice and (2) motives "to win," "to get more," and "to be best."

Piaget (1965) observed that disagreements in the play of older children, but not younger children, resulted in appeals to principles of justice, equality, and reciprocity. Younger children also appealed to rules, but the rules for younger children were largely arbitrary and were neither accepted by all players nor followed very closely. This observation suggests that older children should be more affected by principles of equality and reciprocity in situations where these principles might apply.

It is also likely, however, that older children in the United States are more motivated competitively by certain aspects of conflict of interest situations than are younger children. An experiment (McClintock & Nuttin, 1969) with children from the United States and Belgium demonstrated that for both cultures, sixth graders were more

competitively motivated than second graders in the Maximizing Difference Game. In this two-person game both children received maximal points if both children made the cooperative choice (pushed the left button). It was possible for a child who made the competitive choice (right button) to obtain more points than the other child on a trial assuming that the other child made a cooperative choice. However, a child could never obtain maximal points on a trial by making the competitive choice. So, for a game in which points could be obtained, older children were more motivated than younger children to maximize differences between the players' outcomes.

There are characteristics of most conflict of interest situations which elicit both cooperative and competitive response tendencies. Knowledge of both the absolute and relative importance of the various intellectual, motivational, and situational determinants of cooperative and competitive behaviors for each age level would be required in order to predict age differences for particular conflict of interest situations. The experiments to be reported here represented, in part, an attempt to discover the importance of some of these determinants of cooperation and competition for children at various age levels.

A question of particular interest for this inquiry was whether or not children become more adept with age at resolving conflicts of interest in situations where cooperation is required for goal attainment. One study (Kagan & Madsen, in press) which compared the behavior of four- and five-year-olds with seven- to nine-year-olds found that the older children were more competitive and obtained fewer rewards than the younger children in a conflict of interest situation that

required cooperation for reward attainment. The generality of this finding was explored in the experiments to be reported here.

Situational Determinants of Cooperation and Competition

Although a large number of situational factors might be expected to affect cooperation and competition, there are several determinants which seem to be particularly obvious and important. An interpersonal situation in which persons require mutual assistance in order to obtain their various personal goals calls for cooperative interaction. If persons are pursuing the same or similar goals in an interpersonal situation, the possibility of a fair or equitable distribution of outcomes is another variable which would be expected to contribute to the likelihood of cooperation. For the purposes of the present study, the need for mutual assistance and the possibility of an equitable outcome were considered as, and expected to be, situational cues for cooperative behavior.

Comparable variables expected to be cues for competitive behavior were the presence of conflicting interests and the possibility of an inequitable outcome. A conflict of interest was said to characterize a situation if persons were interdependent such that behavior which would be instrumental to one person's maximal goal attainment would also be detrimental to another person's progress toward maximal goal attainment. The possibility of an inequitable outcome was defined as either the possibility or the necessity that one person would benefit more from an interaction than another person.

It is important to observe that these situational characteristics are not mutually exclusive and that a given situation may be characterized by the presence of one, all, or any combination of these four cues. One situation previously studied involved the presence of both cooperation cues and the absence of both competition cues. This may be called a group reward situation since it was possible for all of the participants to obtain reward with mutual assistance, and it was not possible for one person to obtain greater reward than another.

A number of studies (Azrin & Lindsley, 1956; Madsen, 1967; Mithaug & Burgess, 1968; Nelson & Madsen, 1969; Shapira & Madsen, 1969) have demonstrated that the group reward situation stimulates cooperative interaction among children. For one experiment (Vogler, 1968) in which only half of the pairs cooperated in a group reward situation, the cooperating pairs were those where the children had spontaneously verbalized an awareness of the need to cooperate in order to obtain rewards. This study showed the importance of awareness of the need for mutual assistance as a cue for cooperation.

Another situation previously studied involved the presence of both cooperation cues and also the presence of the possibility of an inequitable outcome. There was no conflict of interest in this situation, however, since both Ss could simultaneously progress toward maximal reward. This situation was represented by the Maximizing Difference Game, and both adults and children were generally competitive in this situation when the rewards were points or small monetary incentives (McClintock & McNeel, 1966; McClintock & Nuttin, 1969). There is evidence, however, suggesting that interaction becomes more cooperative

in this situation as the value of the rewards is increased (McClintock & McNeel, 1966). These experiments do support the assumption that the possibility of an inequitable outcome is a cue for competition.

Most studies of cooperation and competition have placed adults in conflict of interest situations where mutual assistance is required in order for individuals to obtain personal goals and where there is a possibility for either an equitable or an inequitable outcome. Adults in such situations have been generally competitive, but the degree of cooperation or competition has been shown to be influenced by other situational variables such as incentive value, possibility for communication, availability of information, and possibility for use of threat (Kelley, 1968; Vinacke, 1969). Research with the prisoner's dilemma game has suggested that interaction was competitive even when the potential gains for cooperative interaction over trials were high compared to gains that resulted from competitive interaction (Gallo & McClintock, 1965; Vinacke, 1969). This was true even in cases where the value of the available rewards was quite high (Gumpert, Deutsch, & Epstein, 1969). For adults, conflict of interest appears to be a very powerful cue for competitive behavior.

Research with children suggests that they were less cooperative when conflict of interest and the possibility for an inequitable outcome were introduced into the same game situations, which required mutual assistance and allowed equitable outcomes, for which the children were otherwise cooperative (Madsen, 1967; Madsen & Shapira, 1970; Nelson & Madsen, 1969; Shapira & Madsen, 1969). Although it was difficult in these experiments to measure the degree to which the less co-

operative interaction in the conflict of interest situations was due to an increase in active competition, as opposed to simply the lack of cooperation, the childrens' verbal responses and the Es' observations suggested that the introduction of conflict of interest did indeed stimulate competitive behavior.

The evidence also shows very clearly that the effect of the competitive cues in reducing cooperation is much greater for urban and middle-class groups than for Mexican village children (Kagan & Madsen, in press; Madsen, 1967; Madsen & Shapira, 1970) or Israeli kibbutz children (Shapira & Madsen, 1969). This result may be explained by assuming that for urban and middle-class groups, conflict of interest and the possibility of an inequitable outcome are situational cues for competititve behavior.

In order to examine the responsiveness of children at various ages to important situational determinants of cocperation and competition, the following situational characteristics were manipulated for the experiments to be reported: the possibility of an equitable outcome, the need for mutual assistance, the possibility of an inequitable outcome, and the presence or absence of conflict of interest.

The Effect of Prior Experience upon Cooperation and Competition

One way to regulate interaction is to control situational variables that are importantly involved in the elicitation of cooperation and competition. Another possible way is to control relevant prior experiences of the individuals to be involved in the interaction. There

are both practical and theoretical reasons for investigating the effect of prior experience upon the interaction of children at various age levels.

It seems reasonable to expect that the experience of either co-operating or competing in one situation would affect an individual's thoughts about social interaction so as to influence the person's behavior in a subsequent social interaction. The individual's thoughts and attitudes about social interaction in a game situation will be referred to in this paper as the person's "game set." Morton Deutsch (1969) has hypothesized that "if you take a situation in which there is a mixture of cooperative and competitive elements..., you can move it in one direction or the other by creating as initial states the typical consequences of effective cooperation and competition." This reasoning suggests that the prior experience of cooperating or competing should create different game sets or "initial states" for individuals that will lead them to be more cooperative or more competitive than they would otherwise be.

Other experimenters have attempted to manipulate game set by giving various instructions to different groups who then played the same game with the same rules. Instructions designed to make the Ss think about the possibility of working together and the possibility of seeking an equitable outcome have resulted in more cooperative interaction than either neutral instructions or instructions designed to make the Ss think competitively (Deutsch, 1962; Kagan & Madsen, in press; Radlow, Weidner, & Hurst, 1968).

Although these studies have demonstrated that game set is impor-

tant, it is possible that the effect of the set manipulations were largely the result of changes in the Ss' thoughts about what the experimenters wanted the Ss to do. The effect of this component of game set (thoughts about the E's wishes) was minimized in the experiments to be reported in this paper since (1) the instructions for the prior experience games included only the rules of the games, (2) the instructions for the subsequent games were the same for all groups, and (3) for each game all Ss were told that they could play any way that they wished.

One aspect of game set that is probably important involves one player's expectations about the behavior of another player. Attitudes of friendliness and trustfulness would be included as part of this aspect of set. Studies with the prisoner's dilemma game (Pilisuk, Potter, Rapoport, & Winter, 1965; Terkune, 1968) have shown that initial experiences in the first few trials of interaction have a strong effect on subsequent cooperation and conflict. This result may be explained by assuming that attitudes and expectations about the other player are formulated by each player on the initial trials. In a review of studies examining the beliefs of cooperators and competitors about their partners, Kelley and Stahelski (in press) found that, in general, a subject's behavior corresponded closely to the S's expectation of what the partner would do.

A prior game experience may have the effect of changing a S's expectations about partners in general, and it may affect only expectations about a particular partner. For certain conditions in Experiment VI to be reported, some dyad members were switched following the prior

experience game such that each dyad member had the same prior experience treatment, but had a new partner for the subsequent game. This manipulation made it possible to control for the possible effect that the prior experiences had in inducing trust or friendly relations between particular dyad members.

Assuming that a prior game experience does affect behavior on a subsequent game, it is of interest to investigate the importance of the similarity between the prior game situation and the subsequent game situation. Experiments IV, V, and VI to be reported here were designed to provide evidence relevant to that issue. Of particular interest was whether or not cooperative interaction in a group reward situation would have as much effect as cooperative interaction in a conflict of interest situation upon interaction in a subsequent conflict of interest situation.

In perhaps the only previous study of the effect of a prior experience in one game upon interaction in a second game (Harrison & McClintock, 1965), adult dyads first played a reaction-time game in which each S was led to believe erroneously that he was interdependent with another S in working for rewards in a group reward situation. Dyads who obtained reward on 85 percent of the trials were more cooperative in a prisoner's dilemma game, played immediately following the first game, than dyads who either lost reward on 85 percent of the trials or did not play the first game. Some of the dyads in the gain-reward and lost-reward conditions waited one week before playing the prisoner's dilemma game. For the dyads tested one week after the first game; there were no significant differences between reward groups,

neither reward group differed from the gain-reward group that was tested immediately after the first game, and both reward groups were more cooperative than the control group which did not play the prior experience game.

Although the effect of the interval between games was difficult to interpret, this experiment did suggest that interaction in a prior group reward situation increased cooperative interaction in a subsequent conflict of interest situation. This effect was further explored for children of various ages in Experiments IV, V, and VI.

Experiment I

The purpose of the first experiment was to describe age differences for a situation containing a mixture of cooperative and competitive cues. The children played a game that required mutual assistance in order for any child to obtain a reward and in which it was possible to divide rewards equitably over trials. Also, however, the game was a conflict of interest situation for which there existed the possibility of an inequitable outcome.

Method

Subjects

Children from four Combination Children's Centers in Los Angeles County were matched on the basis of sex, race, and age into 67 pairs. There were 14 pairs of five-year-olds, 25 pairs of 6- to 7-year-olds, and 28 pairs of 8- to 10-year-olds. All of the children were from low

to middle income families with working mothers. Most of the children were Anglo-American, but there were several pairs of Afro-American and Mexican-American children in each age group. The children were about equally represented by sex in each age group.

Apparatus

Each pair of children played a game called the Marble-pull (Madsen, 1969). The game consisted of a small four-legged rectangular table 43 cm. tall, 15 cm. wide, and 62 cm. long (see Fig. 1). There were two strings, each connected to a plastic form containing magnets. When the plastic forms were attached to each other by the attraction of the magnets, they formed a marble holder which could be slid upon the table with a marble in the holder. A child stood at each end of the table holding the end of one string. The marble could be slid in its holder in either of two directions depending on which string was pulled. If both strings were pulled simultaneously, the marble holder would easily pull apart allowing the marble to roll to one side of the table. There was a goal cup at each end of the table. If the marble holder was pulled over a goal cup, the marble would drop into that goal. In order for a marble to be pulled to a goal, it was necessary for one child to let loose on his string while the other child pulled on the other string.

Procedure

Each pair of children was taken to a small office and instructed:

> "This is a game where you may get some prizes. First, the game will be played for marbles. When we are finished, you may trade the marbles you get for prizes. These are the prizes (E showed box of prizes to Ss). Each marble is worth one prize of your choice. How many prizes will you

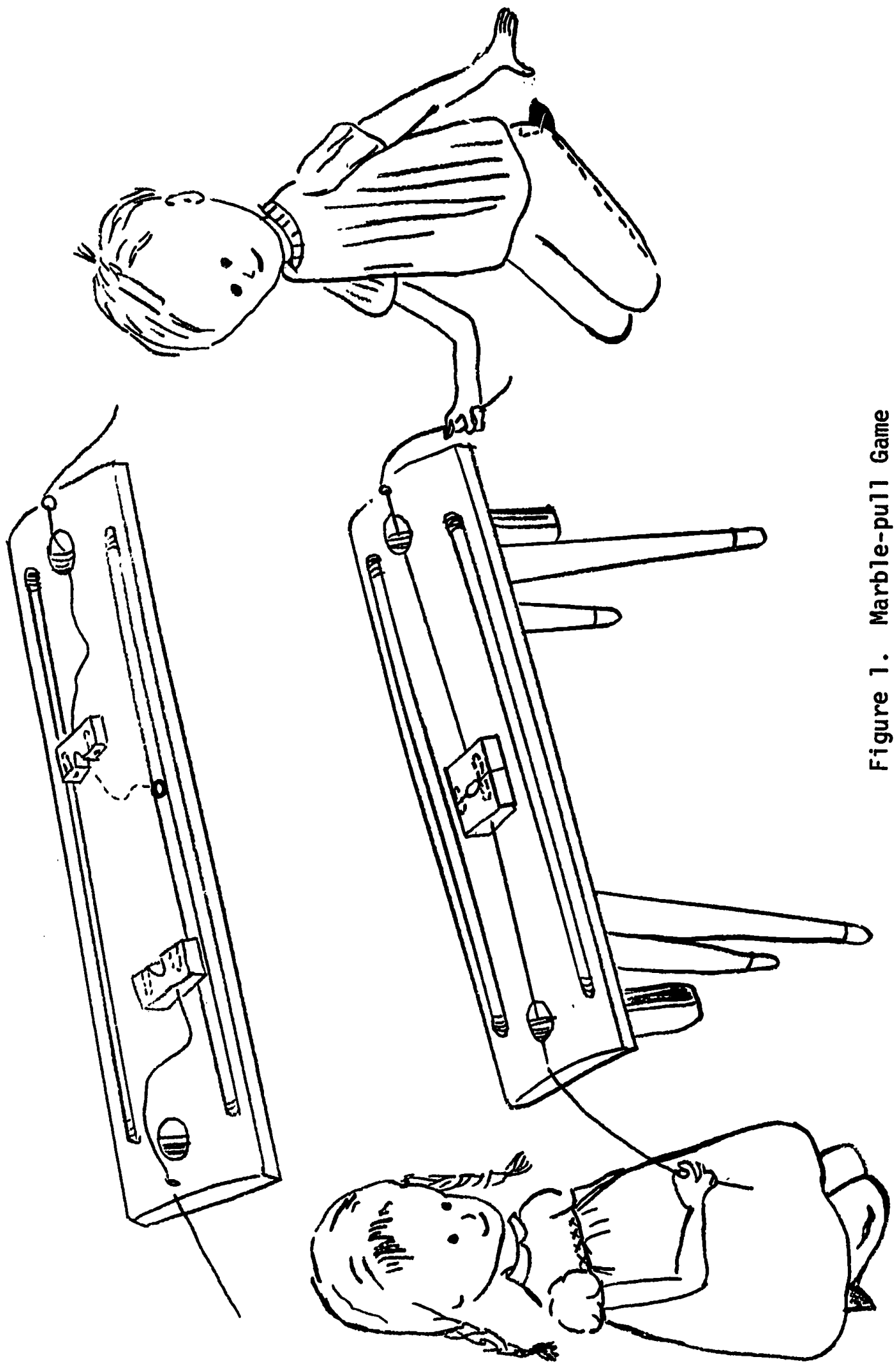


Figure 1. Marble-pull Game

be able to choose if you get two marbles during the game? One marble? Four marbles? Here is how the game is played. I place a marble here and then say 'go.' This will be child 1 (name)'s string and this will be child 2 (name)'s string. If a marble goes here, like this (E pulled marble to goal at child 1's end of the table), child 1 will get the marble. If a marble goes here (E pulled marble to other goal), like this, child 2 will get the marble.

If the marble holder breaks like this (E pulled both strings, breaking marble holder), no one will get that marble. We will play the game for this many times (E pointed to 8 marbles), 8 times. Who gets a prize for every marble that goes there? What happens if the marble holder breaks?" E repeated relevant parts of the instructions if the children could not answer these questions correctly.

After each trial, E said "child 1 (name) got (or 'no one gets') that marble, there are n more marbles." After the eighth trial, each child chose one prize for every marble he had received. Every child was allowed to choose at least two prizes. The children were instructed not to discuss the game or the prizes until it was time to go home. The prizes were placed in paper bags which the teachers gave to the children when they left for home. The prizes for 5- to 7-year-olds included rings, whistles, pins, and varied colorful plastic figures and toys. The prizes for 8- to 10-year-olds included pins, pens, magnets, combs, bracelets, pop guns, etc. Without exception, the children's verbal responses indicated that they were excited by the prizes and motivated to obtain them.

Results

Two indicators of the amount of cooperative interaction between persons playing the Marble-pull game were (1) the degree to which Ss obtained and equitable divided the eight available rewards, and (2)

the number of trials in which Ss cooperated such that a reward was obtained.

Distribution of rewards. The degree to which the children obtained and equitably divided the eight available prizes may be represented for each pair by the number of prizes obtained by the child who obtained the fewest prizes over the eight trials. This number will be referred to as the "cooperation score." A score of 4 indicates that each member of a pair obtained four prizes, the maximum equitable outcome. A score of 2 indicates that one child obtained two prizes while the other child obtained two or more prizes. The mean cooperation scores are listed for each age and sex group in Table 1. An analysis of variance for experiments with unequal sample sizes (see Table 2) indicated that the effects of age and sex and the interaction were nonsignificant.

Since it was possible for one child to obtain more rewards than another child, it is of interest to examine the degree to which there was a disparity between the outcomes of pair members. Table 3 gives the proportion of pairs having unequal outcomes and the mean disparity in number of rewards for those pairs having unequal outcomes.

A chi-square test suggested that the proportion of pairs with unequal outcomes was significantly greater for younger than older children ($\chi^2 = 6.9$, $df = 2$, $p < .05$).

Cooperation trials. Because it was impossible for any child to obtain a reward on a trial unless one child let loose on his string while the other child pulled, a trial in which a reward was obtained may be defined as a cooperation trial. The proportion of pairs at each

Table 1

Mean Cooperation Scores x Age x Sex

Sex	Age in years		
	5	6-7	8-10
Male	.8 (n=8)	.9 (n=14)	1.3 (n=16)
Female	.5 (n=6)	1.0 (n=11)	.7 (n=12)

Note. — n=number of pairs.

Table 2

Analysis of Variance: Cooperation Scores

Source	df	MS	F
Sex (A)	1	1.0	
Age (B)	2	.7	
A x B	2	.7	
Within cell	61	1.2	

Table 3

Proportion of Pairs with Unequal Outcomes

and Mean Disparity by Age

Age	Proportion of pairs with unequal outcomes	Mean disparity in rewards for pairs with unequal outcomes
5 (n=14)	.50	1.6
6-7 (n=25)	.40	1.1
8-10 (n=28)	.14	1.3

Note. – n=number of pairs.

age level for which a reward was obtained is listed for each trial in Table 4.

Table 4

Proportion of Pairs Obtaining Reward x Trial x Age

Age	Trials								
	1	2	3	4	5	6	7	8	M
5 (n=14)	.07	.21	.21	.29	.29	.36	.36	.29	.26
6- 7 (n=25)	.16	.12	.24	.28	.40	.44	.44	.20	.27
8-10 (n=28)	.07	.07	.21	.28	.36	.39	.43	.36	.27

Note. — n = number of pairs.

Table 4 shows that pairs at every age level tended to be more cooperative on the later trials and that there were no differences between age groups approaching significance.

Verbalizations. For the first 48 pairs (10 pairs of 5-year-olds, 15 of 6- to 7-year-olds, and 23 of 8- to 10-year-olds) in this experiment, a complete record was made of all spontaneous verbalizations occurring before and during the game. One or both children verbalized about the possibility of taking turns in 24 of these 48 pairs, and these spontaneous verbalizations about the possibility of taking turns occurred in about half of the pairs regardless of the age group. Common examples

of these verbalizations were "Let's take turns" or "If you help me, I'll help you."

For the 24 pairs in which one or both children verbalized the possibility of taking turns, the distribution of prizes was such that for 75% of the pairs each child obtained one or more prizes and for 54% of the pairs each child obtained two or more prizes. For the 24 pairs in which neither child verbalized about taking turns, only in 46% of the pairs did each child obtain one or more prizes and in only 13% of the pairs did each child obtain two or more prizes.

Discussion

In a situation where cooperation and taking-turns was required in order for individuals to resolve a conflict of interest, interaction between children of ages 5 to 10 years was generally competitive although it became more cooperative over trials. Neither the over-all frequency of cooperation nor the increasing frequency of cooperation over trials seemed to vary with age.

It seems peculiar that the older children, who would be expected to be more adept at problem solving, were no more proficient than the younger children at working out a taking-turns strategy in a situation which required cooperation in order to resolve a conflict of interest and to obtain rewards. A possible explanation is that the greater problem solving capacity of the older children was overcome by a tendency to be more competitively responsive than the younger children to the conflict of interest and the possibility of an inequitable outcome.

The fact that a significantly greater proportion of 5-year-old than 8- to 10-year-old pairs obtained unequal outcomes indicated that the younger children were less concerned about pursuing equal outcomes and avoiding unequal outcomes than the older children. This result supported Piaget's observation (1965) that equality becomes an increasingly important norm during late childhood, but it is interesting that the concern for equality did not necessarily relate to more frequent cooperation.

The evidence concerning the relationship between verbalization about the possibility of taking-turns and cooperative interaction suggests that verbalized awareness of the possibility of obtaining an equitable outcome by cooperating facilitates cooperative interaction in conflict of interest situations that require mutual assistance for goal attainment.

Experiment II

The purpose of this second experiment was to further describe age differences in cooperation and competition by studying the behavior of children in an interaction situation quite different from that in Experiment I. The children worked for rewards in a game situation in which there was a need for mutual assistance and where there existed a possibility for an equitable outcome on every trial. There was also the possibility of an inequitable outcome, but there was no real conflict of interest because behavior which was instrumental to one child's maximal goal attainment was not necessarily detrimental to the other child's maximal goal attainment. It was possible, however, for

a child to seek maximal goal attainment by a means detrimental to the other child.

The game situation was similar to the Maximizing Difference Game (McClintock & Nuttin, 1969) in that the children could obtain equitable outcomes and maximal individual reward on every trial by cooperating, or they could seek an inequitable outcome. In this experiment, however, the children worked for material rewards rather than for points.

Method

Subjects

Children from four Combination Children's Centers in Los Angeles County were matched on the basis of sex, race, and age into 32 pairs. Although some of the children were from two of the same centers as the children in Experiment I, no child was a subject for both experiments. There were eight pairs of children for each of the following four age groups: 5-, 6-, 7-, and 8- to 10-year-olds. All of the children were from low to middle income families with working mothers. Most of the children were Anglo-American, but there were some Afro-American and Mexican-American children in each age group. The children were about equally represented by sex in each age group.

Apparatus

The game was an adaptation of the Cooperation Board game (Madsen, 1967). Figure 2 shows the positioning of the children and the essential parts of the Cooperation Board. The three target spots were white self-adhesive labels (2.5 cm. diameter). A movable plastic weight, called a pointer, which could easily be pulled and slid upon the board

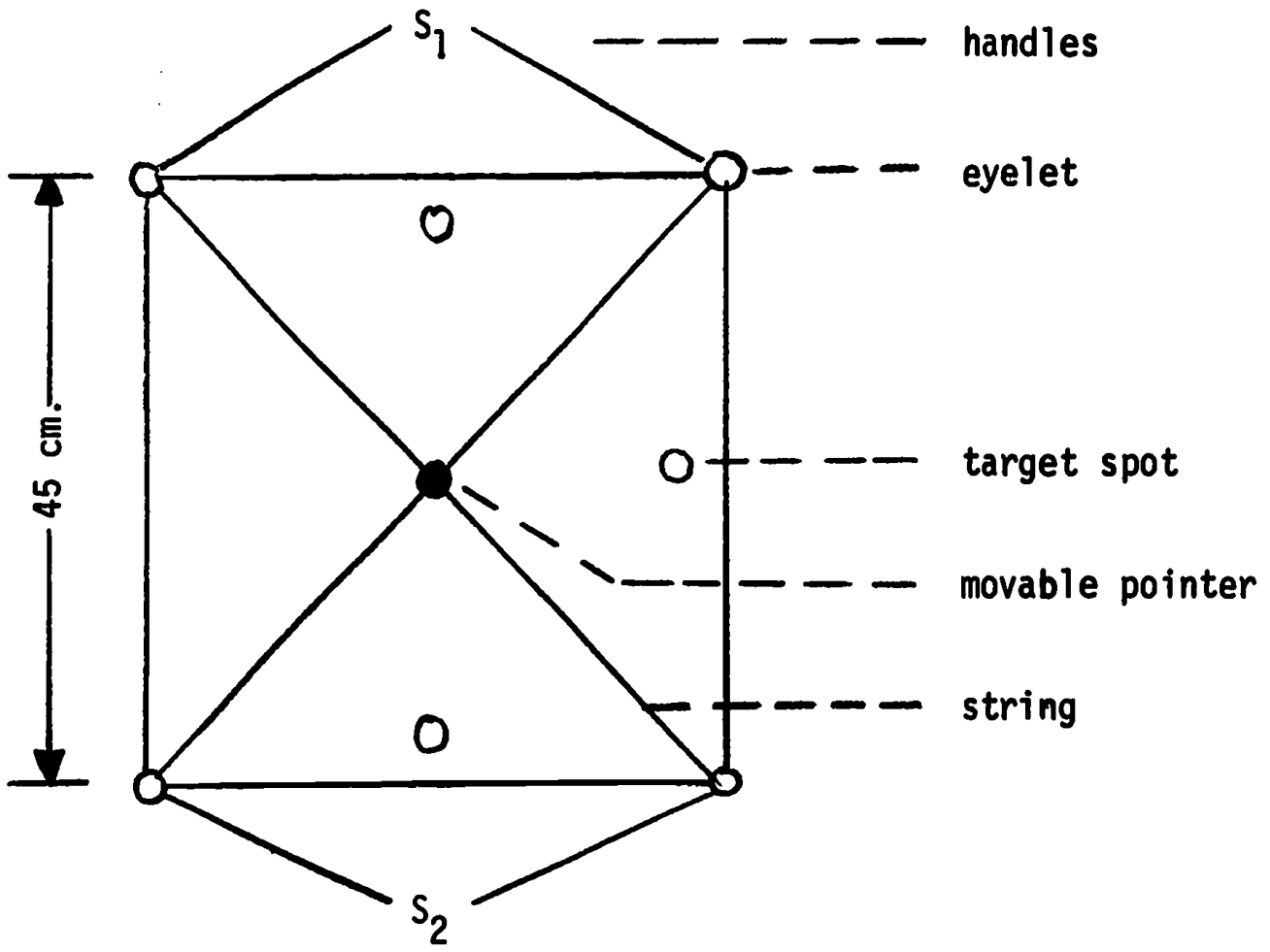


Figure 2. Madsen Cooperation Board as Adapted for Experiment II

by strings is shown in Fig. 2 at the starting position in the center of the board. Each child held one string in each hand. Either child could make the pointer touch the target spot immediately in front of him by pulling both of the strings that he controlled. This could not be easily done, however, if the other child was also pulling in the opposite direction. The mechanics of the game are such that when each child pulled on both strings, it was very difficult for either child to pull the pointer to a target spot unless one child was very much stronger than the other.

A third target spot was located on one side of the board equidistant from each child. It was impossible for a single child to move the pointer to this target spot by pulling his strings only. In order to move the pointer to this spot, it was necessary for each child to pull on his string that was nearest the target spot and to refrain from pulling on the other string.

Procedure

Each pair of children was taken to a small office and instructed:

> "This is a game where you may get some prizes. Here are the prizes. If you get a prize during the game, I will put your prize into a bag with your name on it. When we are done with the game, you may trade your prizes for other prizes if you don't like the prizes I have given you. Now I'll tell you about the game."
>
> "This is the pointer. It is possible for the pointer to touch this spot, this spot, or this spot. You can move the pointer on the board by pulling strings. You (name of child 1) may pull these strings, and you (name of child 2) may pull these strings. Now we will practice moving the pointer so that you may understand how it can be moved. See if you can make the pointer go here." The children practiced moving the pointer to a target spot until they could do so with ease. The same procedure was followed for the second and third target spots.

> "We will play the game only four times. Each time I will say 'go.' After I say 'go,' if the pointer touches here first (the spot nearest child 1), child 1 (name) will get a prize. If the pointer touches here first (spot nearest child 2), child 2 (name) will get a prize. If the pointer touches here first (spot equidistant from and to one side of the Ss), you both will get a prize, one for child 1 (name) and one for child 2 (name). I will keep time, and if the pointer does not touch any spot before I say 'stop,' no one will get a prize."
>
> About each target spot the children were asked "Who will get a prize if the pointer touches here first?" If necessary, E corrected the children and continued to question them until they could give the appropriate answer. Finally, the children were told "You may talk, and you may play the game any way that you wish."

If no target spot was touched within 10 seconds after the signal to begin, E said "stop" and no one was rewarded for that trial. After the fourth trial, each child was allowed to choose at least one prize. The children were instructed not to discuss the game or the prizes until it was time to go home. The prizes for 5- to 7-year-olds included rings, whistles, pins, and varied colorful plastic figures and toys. The prizes for 8- to 10-year-olds included pins, pens, magnets, combs, bracelets, pop guns, etc.

Results

Trials in which the pointer was moved to the target spot equidistant from and to one side of the subjects are called cooperation trials. Trials for which none of the target spots were touched within 10 seconds are called competition trials. On such trials the children interferred with one another's progress and neither child was able to obtain reward. The third possible type of trial outcome was for one child to pull the

pointer to the target spot immediately in front of that child. Such an outcome was possible by either of the following interaction patterns: (1) the children competed and one child was much stronger or more persevering than the other, or (2) one child passively cooperated by helping the other child obtain a reward. Trials having this third type of outcome were given the interaction category of "other" because such an outcome could follow only from some kind of cooperative or competitive interaction quite different from that which is categorized here as "cooperation" or "competition."

The mean number of trials (out of a possible 4) categorized as competition trials, cooperation trials, and "other" are listed for each age group in Table 5. A single-factor analysis of variance suggested that the number of competition trials differed significantly between

Table 5

Mean Number of Cooperation and Competition Trials by Age

Interaction category	Age in years 5	6	7	8-10
Competition	.50	1.75	1.38	.25
Cooperation	1.25	1.25	1.75	3.75
Other	2.25	1.00	.88	.00

Note. 1. There were 8 pairs in each age group.
2. There were 4 trials for each pair.

age groups (F=3.3, df=3/28, $p < .05$). A Newman-Keuls test suggested that the mean number of competition trials for the 6-year-olds was greater than for the 8- to 10-year-olds, and that the other differences between competition means were not significant at the .05 level. Interaction in which competition was so intense that the children prevented one another from obtaining reward was more frequent for 6-year-olds than for 8- to 10-year-olds.

A second single-factor analysis of variance showed that the number of cooperation trials also differed significantly between age groups (F=5.9, df=3/28, $p < .01$). According to a Newman-Keuls test on the differences between means, the mean number of cooperation trials for 8- to 10-year-olds was significantly greater than for the other three age groups ($p < .01$). The 8- to 10-year-olds cooperated in moving the pointer to the target spot which allowed both children to obtain rewards more often than did the younger children. On the fourth trial all eight of the 8- to 10-year-olds pairs cooperated in this manner, whereas the numbers of pairs cooperating on the fourth trial for 5-, 6-, and 7-year-old pairs were respectively: 4, 3, and 4.

A third single-factor analysis of variance suggested that the number of trials for which interaction was classified as "other" differed significantly between age groups (F=4.9, df=3/28, $p < .01$). A Newman-Keuls test showed that only the difference in the mean number of "other" trials between 5-year-olds and 8- to 10-year-olds was significant at the .01 level.

Data on the distribution of rewards between pair members and the experimenter's observational impressions suggested that the interaction

of 5-year-olds on these trials categorized as "other" might best be described as domination-submission. Although the 5-year-old child who did not obtain a reward on such trials was clearly dissatisfied, he seldom seemed to offer much resistance to his partner's actions. The submissive children's behavior may have been passively cooperative, but it was not generally a reciprocal kind of cooperation. Although seven of the eight 5-year-old pairs had at least one trial categorized as "other," in only two pairs was reward obtained on these trials distributed over trials such that both children obtained a prize.

There were no significant sex differences at any age level in this game.

Discussion

The game situation for this experiment was characterized by the presence of a need for mutual assistance, by the possibility for either an equitable or inequitable outcome, and by the absence of a real or necessary conflict of interest . The results showed that the 8- to 10-year-old children were more cooperative than the younger children. In another experiment using a game situation that could be characterized in the same way as the situation for the present experiment, McClintock and Nuttin (1969) found that sixth graders were more competitive than second graders. Probably the most important difference between these studies was that for the McClintock and Nuttin experiment the children worked for points, whereas for the present experiment the children worked for material rewards.

The McClintock and Nuttin experiment suggests that older children were more motivated to maximize differences than younger children by the possibility of an inequitable outcome in a situation where only points were at stake. It seems likely that older children are generally more competitively motivated than younger children by the possibility of an inequitable outcome. However, when motivated to obtain extrinsic rewards in a situation where there was no real conflict of interest as in the present experiment, the older children as compared to the younger children were relatively more cooperatively responsive to the need for mutual assistance and the possibility of an equitable outcome than they were competitively responsive to the possibility of an inequitable outcome. This reasoning suggests that older children are potentially more responsive than younger children to both cooperative and competitive cues and that the direction of age differences to be expected depends on the value of the extrinsic incentives and on the salience of certain situational determinants of cooperation and competition.

The high frequency of cooperative interactions for 8- to 10-year-olds in Experiment II compared to Experiment I suggests that 8- to 10-year olds are particularly sensitive to conflict of interest as a situational determinant of competition. There existed the possibility for either an equitable or inequitable outcome in both Experiments I and II, and the need for mutual assistance was as great or greater in Experiment I; so the fact that the 8- to 10-year-olds were much less cooperative in Experiment I may be attributed to the presence of conflicting interests in Experiment I and the absence of conflict of

interest in Experiment II. This interpretation received additional support in Experiment VI where for one condition fifth graders were highly competitive in a conflict of interest situation requiring mutual assistance, even though it was possible to obtain equitable outcomes on every trial as well as over trials.

The domination-submission kind of interaction which commonly occurred in Experiment II between the 5-year-olds was similar to the interaction of 4-year-olds observed in a previous study (Nelson & Madsen, 1969). This pattern of interaction was probably indicative of a large diversity between 5-year-olds in the degree to which they have acquired cooperative and competitive responsiveness. If, for example, one member of a dyad of 5-year-olds continually responded competitively and the other member continually responded noncompetitively, a domination-submission kind of interaction would result. Domination-submission interaction was probably not so common among 5-year-olds in Experiment I because, for the Marble-pull game, a rather passive noncooperative kind of response was sufficient to prevent a highly competitive child from dominating a potentially submissive child. Both Experiments I and II suggested that 5-year-olds are less guided by a concern about equality of outcome than are 8- to 10-year olds.

Experiment III

This experiment was designed in order (1) to test the effect of a variation in reward contingency upon interaction in a situation where cooperation was required in order for individuals to obtain rewards and

(2) to examine the responsiveness of children at various ages to this variation. It was expected that interaction would be cooperative for a situation having a group reward contingency in which no conflict of interest existed and in which reward outcome was necessarily equitable. Interaction was expected to be more competitive and less cooperative, relative to the group reward contingency condition, with an individual reward contingency for which there existed a conflict of interest and for which there was the possibility of an inequitable outcome.

The situation in the individual reward condition was similar to the game situation in Experiment I in that there existed a need for mutual assistance; either an equitable or inequitable outcome was possible; and there was a conflict of interest. The situation was different from that in Experiment I in that a very different game apparatus was used which permitted differentiation between passive non-cooperation and active competition.

Method

Subjects

Children from five Combination Children's Centers in Los Angeles County were matched on the basis of sex, race, and age into 60 pairs. None of the children had been subjects in Experiments I and II. There were 20 pairs of children for each of the following three age groups: 5-, 6- to 7-, and 8- to 10-year-olds. The sexes were equally represented in each age group. Within each age and sex grouping, pairs were assigned randomly into one of two experimental conditions. All of the children were from low to middle income families with working mothers.

Most of the children were Anglo-American, but there were some Afro-American and Mexican-American children in each age group.

Apparatus

The Pull-block game[1] was used for this experiment. In this game each child was assigned to one of two ropes upon which the child could pull or let loose. Each rope was 1.1 m. long and had four 3.8 cm. square plastic blocks strung at intervals of 10 cm. starting at one end of the rope. The blocks were securely fastened to the ropes with set screws. The ropes and attached blocks could be pulled through a 3.8 cm. square opening in a movable block of transparent plastic mounted at the top of a wooden ramp. The ramp and plastic block were attached to a wooden structure that was clamped onto the top of a small table (see Fig. 3).

The ramp had dividers to prevent the ropes from tangling before reaching the opening. The square opening had one small notch on each of two sides (see Fig. 3) so that it was possible for a block on one rope to pass through the opening if, and only if, the other rope was positioned in one of the notches. Whenever the ropes were pulled such that either (1) one block from each rope arrived at the opening simultaneously or (2) one block arrived at the opening while the other rope was not in a notch, the progress of the game was temporarily blocked. If the pull on the ropes was then lessened, the blocks would slide back down the ramp thus ending the blocking.

---

[1]The Pull-block game was designed and constructed by the present author in collaboration with M. C. Madsen following his suggestion that the general paradigm used by Mintz (1951) be extended into a game appropriate for small children.

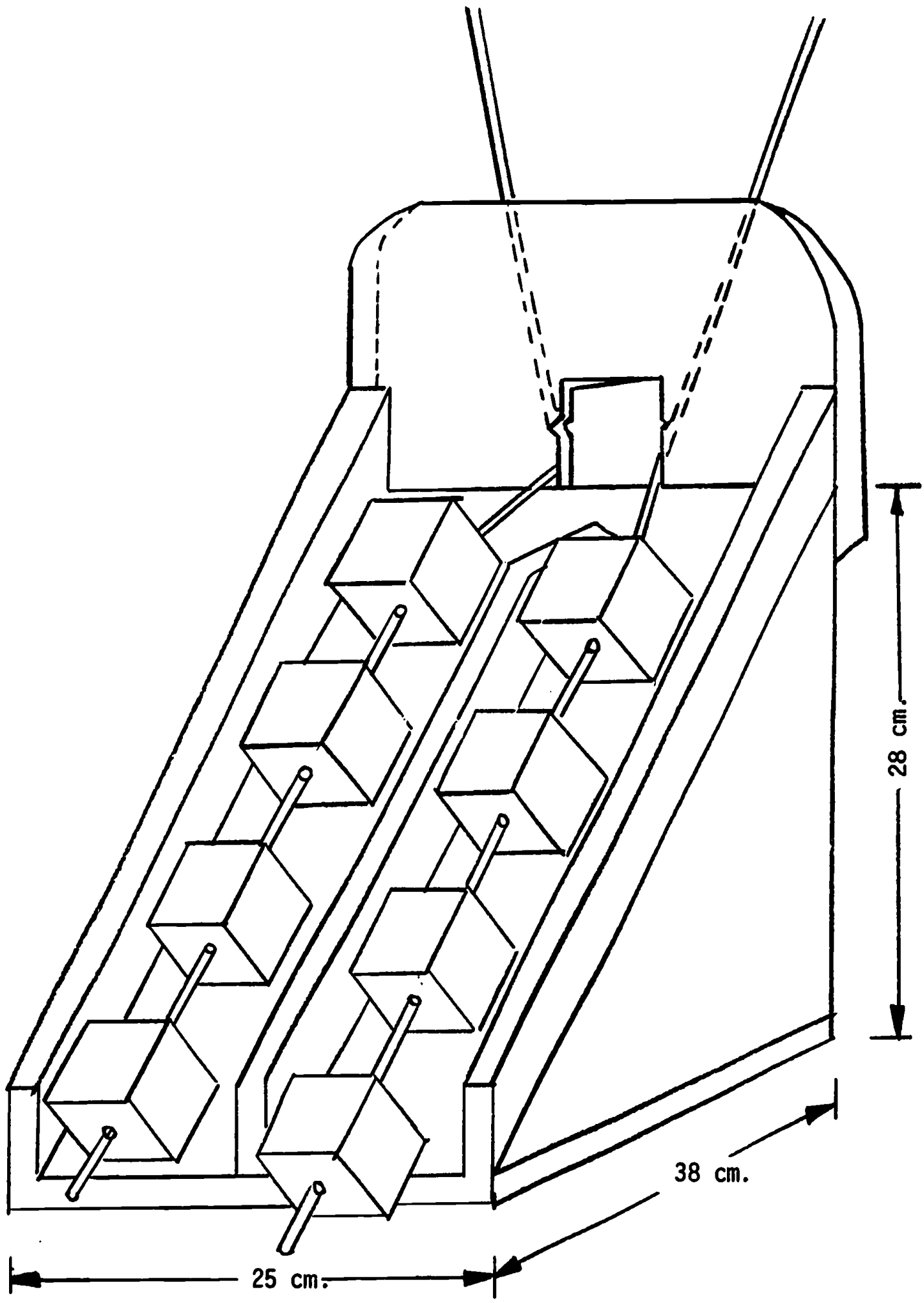


Figure 3. Pull-block Game

Whenever the progress of the game was blocked, the pressure against the movable plastic block at the top of the ramp activated a resetable electric counter and timer which automatically recorded the number of such blockings as well as the accumulated blocking time. It was possible to deactivate the counter and timer with a switch for that purpose.

Procedure

The game was played in a small private room. The children were told that they could receive prizes, but that before playing the game, it would be necessary to learn how it worked. They were instructed about use of the notches and shown how to pull first one block on one rope and then one block on the other rope through the opening. They were also told that they would not be allowed to touch the other person's rope or blocks or the apparatus. The children then practiced pulling the ropes in a manner such that they alternated in assisting one another pull through one block at a time. They were given whatever time and instruction that was necessary in order to pull all of the blocks through the opening in this manner twice (two trials with no time limit). Then there was a third practice trial in which one child was told to hold his rope in the notch while the other child pulled all of his blocks through the opening at once. This was described as "another way that you may play the game."

Following these three practice trials, the children were shown some small paper tokens and told: "You may get some paper coins like this during the game. Every coin is worth one prize. After the game is over, you may choose one prize for every coin that you receive.

Here are the prizes. How many prizes will you be able to choose if you get two coins?" E questioned each child until the coin-prize relationship was understood. The following instructions were given depending on the experimental condition. Each instruction was given twice.

> Group Reward. "If all of the blocks on both ropes are pulled through the opening before I say 'stop,' each of you will get a coin, one for you and one for you. If some of the blocks are not pulled through the opening when I say stop, no one will get a coin. For example, if one block is not pulled through the opening, like this (demonstration), and I say 'stop,' no one will get a coin."
>
> Individual Reward. "There will be one coin every time. The first person who pulls their rope all of the way through the opening before I say 'stop' will get the coin. If no one pulls their rope all the way through, all four blocks through the opening like this (demonstration), before I say 'stop,' no one will get the coin."

All subjects were told that the game would be played six times, that talking was allowed, and that they could play the game any way that they wished. Either six tokens or six pairs of tokens were displayed to represent the available number of prizes. As soon as one child pulled a rope all of the way through the opening, the E pushed the switch to deactivate the counter and timer. The second child was then given time to pull his rope through the opening. If neither child had pulled a rope all the way through the opening after 20 seconds, E said "stop" and pushed the switch. After each trial, E dispensed the paper coins for that trial and reminded the children of the number of remaining trials. After the sixth trial, each child was allowed to choose at least one prize. The children were instructed not to discuss the game or the prizes until it was time to go home. The prizes for

8- to 10-year-olds differed from those for 5- to 7-year-olds and were the same as in Experiments I and II.

Results

The results were analyzed by examining two kinds of data relevant to cooperative-competitive interaction.

Blocking time. This measure represented for each trial the accumulated time in seconds during which pressure upon the movable block at the opening activated the timer and indicated that the progress of the children was being blocked. The greater the blocking time, the greater was the indication that interaction was competitive. The mean blocking times for the various age groups as a function of reward contingency may be seen in Table 6.

Table 6

Mean Blocking Time in Seconds as a Function of Reward Contingency and Age, Trials and Sex Collapsed

Reward contingency	Age in years		
	5	6-7	8-10
Group reward	1.0	.4	.3
Individual reward	2.4	4.8	4.4

Note. — n=10 pairs in each cell.

Inspection of the results indicated that trial and sex differences did not approach significance, so the results for these factors were collapsed in the present analysis.

A two-factor analysis of variance (Reward Contingency x Age) suggested that blocking time was significantly greater with individual reward than with group reward (F=15.0, df=1/54, $p < .01$). The main effect of age and the interaction of age with reward contingency did not approach significance (see Table 7). Tests for the simple effects of reward contingency for each age grouping suggested that blocking time

Table 7

Analysis of Variance: Blocking Time

Source	df	MS	F
Age (A)	2	4.35	
Reward contingency (B)	1	163.40	15.0**
A X B	2	13.20	
Within cell	54	10.88	

** $p < .01$

was significantly greater with individual reward than with group reward for the 8- to 10-year-olds (F=7.71, df=1, $p < .01$) and for the 6- to 7-year-olds (F=8.88, df=1, $p < .01$). However, the blocking time for

5-year-olds did not differ significantly between reward contingency conditions.

Time to solution. This measure represented the time in seconds between the signal to begin a trial and the completion of the trial by the first child who pulled his rope all of the way through the opening. The maximum time to solution was 20 seconds because a trial was stopped after 20 seconds if no child had successfully completed the trial. The lower the time to solution, the greater is the implication that interaction was cooperative. The mean times to solution for each age group in both reward contingency conditions are listed in Table 8.

Table 8

Mean Time to Solution in Seconds as a Function of Reward Contingency and Age, Trials and Sex Collapsed

Reward contingency	Age in years		
	5	6-7	8-10
Group reward	12.5	8.3	5.3
Individual reward	12.1	12.7	13.3

Note. - n=10 pairs in each cell.

Inspection of the results indicated that for all age groups, time to solution decreased from the first to the sixth trial in the Group Reward condition. The rate of decrease was about the same for each age group, and the mean time to solution in seconds for each age group on trial six was as follows: 5-year-olds, 8.9; 6- to 7-year-olds, 6.3;

8- to 10-yea -olds, 4.7. Differences between trials in the Individual Reward condition and sex differences did not approach significance.

A two-factor analysis of variance (Reward Contingency x Age, Trials and Sex Collapsed) indicated that the main effect of reward contingency was significant (F=12.1, df=1/54, $p < .01$) and that the main effect of age did not approach significane (see Table 9).

Table 9

Analysis of Variance: Time to Solution

Source	df	MS	F
Age (A)	2	45.60	
Reward contingency (B)	1	240.00	12.1**
A X B	2	88.80	4.5*
Within cell	54	19.77	

* $p < .05$
** $p < .01$

Simple effect tests were required in order to interpret this finding because the interaction between reward contingency and age was significant (F=4.5, df=2/54, $p < .05$). These further tests suggested that significant age differences did exist for the Group Reward condition (F= 6.6, df=2/54, $p < .01$). Tests on the simple effects of reward contingency showed that time to solution was significantly less with Group

Reward than with Individual Reward for 8- to 10-year-olds (F=16.2, df=1/54, $p < .01$) and for 6- to 7-year-olds (F=4.9, df=1/54, $p < .05$). Time to solution did not differ significantly between reward contingency conditions for 5-year-olds.

Discussion

The fact that for all age groups the mean time to solution in the Group Reward condition was considerably less than the 20 second time limit and the fact that time to solution decreased over trials for all age groups suggested that interaction was cooperative in the group reward situation. The very low mean blocking times certainly demonstrated the absence of competition for the Group Reward condition. The children at every age level were evidently cooperatively responsive to the need for mutual assistance and the possibility of an equitable outcome.

Assuming that time to solution was a measure of the efficiency of cooperative interaction, the older children were significantly more efficient in cooperating on all trials than were the younger children. Although it seems likely that 5-year-olds would differ somewhat from 8- to 10-year-olds on any task requiring perceptual-motor skills, it should be noted that the essential ability required for the Pull-block game involves coordinating the actions of two persons. No differences between 5- and 8- to 10-year-olds would be expected for the simple task of pulling a single rope through the opening. The differences arise when two ropes are involved. Insofar as this coordination problem required certain perceptual-motor abilities, it seems likely that most co-

ordination problems, for which cooperation is a solution, require these abilities. Older children might be expected to be more cooperative than younger children in most group reward situations requiring coordination of the actions of two or more persons.

The 6- to 10-year-olds, but not the 5-year-olds, took significantly more time to complete the game task and spent significantly more time blocking each other in the Individual Reward condition than in the Group Reward condition. This suggests that the older children were competitively responsive to the possibility of an inequitable outcome and the conflict of interest which characterized the individual reward situation. The results do not permit making this conclusion for the 5-year-olds, and the results indicate that the 5-year-olds were not very much affected by the competitive cues in the Individual Reward condition.

As noted in the section on procedure, all children in the present experiment were required to cooperate successfully on three practice trials prior to receiving the reward contingency instructions. Although the purpose of the practice trials was to assure that all of the children understood the workings of the apparatus, the practice trials may also have minimized differences between age groups and between reward conditions. It is possible that the practice trials may have limited competition in the Individual Reward condition by providing a cooperative set. It is also possible that any effects of the practice trials may have been more pronounced for one age group than another. Experiment IV, in which children played the Pull-block game without practice trials, provided evidence relevant to these possibilities.

Experiment IV

Every dyad in this experiment played the Pull-block game in one of three conditions and immediately thereafter played the Marble-pull game. The three conditions for the Pull-block game involved different arrangements of situational variables that were expected to elicit varying degrees of cooperation and competition. The Marble-pull game was used as the dependent measure for examining the effects of the various prior experiences induced by the three Pull-block game conditions. The effects of the situational variables and of the prior experiences were studied for both male and female dyads and for both kindergarten and fifth grade children.

A group reward condition and an individual reward condition for the Pull-block game were the same as the experimental conditions in Experiment III, except that for the present experiment the practice trials were omitted in order to avoid establishing a cooperative game set. The third condition was an individual reward situation where the need for mutual assistance was minimal and where the Ss were led to believe that only one S could obtain reward.

Method

Subjects

Children from a Los Angeles public school were matched on the basis of sex and grade into 60 pairs. There were 30 pairs of kindergarten children and 30 pairs of fifth grade children with each grade level being equally divided between sex. Within each sex and grade

grouping, pairs were selected randomly and assigned consecutively to one of three experimental conditions. The school was located in a middle to upper income area of western Los Angeles.

Apparatus

The Pull-block game described in Experiment III and the Marble-pull game described in Experiment I were used.

Procedure

Each pair of children was taken to a small office and instructed as follows:

> "This is a game where you may get some prizes. During the game you may get some paper coins like these. Every coin is worth one prize. After the game is over, you may choose one prize for every coin that you have gotten. Here are the prizes. How many prizes will you be able to choose if you get two coins?" E questioned each S until the coin-prize relationship was understood.
>
> "In this game you try to pull the blocks through this opening. This will be your (child 1) rope, and this other rope will be your (child 2) rope. One thing is very important. See the notches!" E demonstrated, using the first block on each rope, how one rope must be in the notch in order for a block to pass through. "There are two rules: You are not allowed to touch this (movable plastic part of the apparatus). And you are not allowed to touch the other person's rope or blocks. You may reach behind here (the movable plastic part) and you may use your hands up close like this."

Variations in and additions to these instructions occurred as follows depending on the reward contingency condition:

> Group Reward (GR). "If all of the blocks on both ropes are pulled through the opening before I say 'stop,' each of you will get a coin, one for you and one for you. If some of the blocks are not pulled through the opening when I say 'stop,' no one will get a coin. For example, if one block is not pulled through the opening, like this (demonstration), and I say 'stop,' no one will get a coin." E placed six pairs of coins on the table. "The game will be played this many times (E pointed to six pairs of coins.), six times."

Individual Reward 1 (IR1). "There will be one coin every time. The first person who pulls their rope all of the way through the opening before I say 'stop' will get the coin. If no one pulls their rope all of the way through, all four blocks through the opening like this (demonstration) before I say 'stop,' no one will get the coin." E placed six coins on the table. "The game will be played this many times (E pointed to six coins.), six times."

Individual Reward 2 (IR2). There was no use nor mention of the paper tokens in this condition, and the word "prize" was used in its singular form as though only one prize were available. "The person who pulls the most blocks through the opening will get a prize. If all of the blocks are pulled through, then the first person who pulled their rope all the way through will get a prize. Only one person can get a prize in this game. Who will get the prize if the ropes are like this (demonstration of one rope with one block through and another rope with three blocks through) and I say 'stop?' Who will get the prize if both ropes are pulled all the way through the opening and this rope is pulled through first?"

All groups were told that they could talk and play the game any way they wished, and they were reminded about the notches before the signal to begin. As soon as one child pulled a rope all of the way through the opening, E pushed the switch to deactivate the counter and timer. The second child was allowed time to pull his rope through the opening also. If neither child pulled his rope all the way through the opening after 20 seconds, E said "stop" and pushed the switch. After each trial in the GR and IR1 conditions, E dispensed the paper coins for that trial and reminded the children of the number of remaining trials. After each trial in the IR2 condition, E told the children how many prizes had been earned by each child to that point and then said "You may choose your prize(s) when we are all done. We are going to play the game again. There will be one prize again this time." If

on a given trial in the IR2 condition neither child pulled his rope all the way through the opening and both children pulled the same number of blocks through the opening, then no one received a prize for that trial.

Following the sixth trial on the Pull-block game, all pairs played the Marble-pull game for eight trials. The instructions for the Marble-pull game were the same as in Experiment I, and the instructions were the same for all experimental groups. After the eighth trial on the Marble-pull game, each child was allowed to choose at least two prizes.

The prizes were placed into paper bags which were not to be opened during school hours. The children were instructed not to discuss the games or the prizes with other children. The fifth graders were told that they had participated in a study which would be invalidated if discussed with children yet to participate. The teachers assisted in discouraging the children from discussing the prizes and the games. The fifth graders were asked prior to testing whether they had received information or advice about the games, and only one pair had to be disqualified when one child had been informed "You have to help each other." The E's observations, as well as the nature of the results obtained, suggested that these precautions, taken to prevent discussion about the games, were successful.

The prizes for the kindergarteners included marbles, pins, rings, blowers, whistles, and a large variety of colorful plastic figures of bugs, animals, cars, etc. The prizes for fifth graders included pins, ball point pens, funny badges, combs, plastic flowers, bird whistles, pop guns, creepy crawlers, harmonicas, bracelets, and medalions. The prizes available for the Pull-block game were different from the prizes

available for the Marble-pull game. From all appearances, the children were highly motivated to obtain the prizes.

Results

Pull-block game

Blocking time. The measure of the degree of competitive interaction occurring on each trial in the Pull-block game was the accumulated time (blocking time) during which the Ss blocked one another's progress. This was automatically timed as described in the apparatus section of Experiment III. The mean blocking time in seconds for each grade and sex grouping as a function of reward contingency is listed in Table 10. The blocking time for each pair was averaged over the six trials since inspection of the results suggested that, with one exception, differences between trials did not approach significance. The exception was that all fifth grade pairs had higher blocking times on trial six than trial one for the IR2 condition.

The analysis of variance for blocking time reported in Table 11 suggested that all of the main effects as well as the Grade x Reward Contingency and Grade x Sex interactions were statistically significant. Tests on simple effects suggested that the effect of reward contingency did not approach significance for kindergarteners. Fifth graders, however, had significantly higher blocking times in the IR1 condition than in the GR condition ($F=17.6$, $df=1/48$, $p < .01$), and fifth graders had significantly higher blocking times in the IR2 condition than for the IR1 condition ($F=7.7$, $df=1/48$, $p < .01$).

Simple effects tests on the differences between grade levels

Table 10

Mean Blocking Time in Seconds as a Function of Grade, Sex, and Reward Contingency, Trials Collapsed

Grade	Sex	Reward contingency		
		GR	IR1	IR2
Kindergarten	M	3.0	5.1	2.0
	F	2.0	6.7	2.0
Fifth	M	4.0	15.2	17.9
	F	.8	6.4	14.7

Note. — Five pairs in each cell.

Table 11

Analysis of Variance: Blocking Time

Source	df	MS	F
Grade (A)	1	606.1	30.6**
Reward contingency (B)	2	267.0	13.5**
Sex (C)	1	88.3	4.5*
A x B	2	265.8	13.4**
A x C	1	103.4	5.2*
B x C	2	5.3	
A x B x C	2	24.9	
Within cell	48	19.8	

*$p < .05$

**$p < .01$

suggested that (1) differences in the GR condition did not approach significance, (2) fifth grade boys had higher blocking times than kindergarten boys for both the IR1 condition (F=12.7, df=1/48, $p < .01$) and the IR2 condition (F=31.8, df=1/48, $p < .01$), and (3) fifth grade girls had higher blocking times than kindergarten girls in the IR2 condition (F=20.3, df=1/48, $p < .01$).

Tests on the simple effects of sex indicated that the only significant sex difference occurred in the IR1 condition where fifth grade boys had higher blocking times than fifth grade girls (F=9.6, df=1/48, $p < .01$).

Time to solution. This measure indicated the interval of time in seconds between the signal to begin a trial and the completion of the trial by the first child who pulled his rope all of the way through the opening. The time limit was 20 seconds per trial. The lower the time to solution, the greater is the indication of cooperative interaction. The mean time to solution for each grade, sex, and reward contingency combination is listed in Table 12. Time to solution for each pair was averaged over the six trials since inspection of the results suggested that differences between trials approached significance only in the GR condition. The mean time to solution for kindergarteners in the GR condition was 18.4 seconds on the first trial compared to 11.2 seconds on the sixth trial (8 of 10 pairs showing a decline). The mean time to solution for fifth graders in the GR condition was 14.4 seconds on the first trial compared to 7.5 seconds on trial six (7 of 10 pairs showing a decline).

Table 13 reports the analysis of variance for time to solution

Table 12

Mean Time to Solution in Seconds as a Function of Grade, Sex, and Reward Contingency, Trials Collapsed

Grade	Sex	Reward contingency GR	IR1	IR2
Kindergarten	M	15.6	16.0	18.6
	F	16.4	17.4	17.8
Fifth	M	9.0	17.8	19.8
	F	12.2	13.6	20.0

Note. — Five pairs in each cell.

Table 13

Analysis of Variance: Time to Solution

Source	df	MS	F
Grade (A)	1	36.8	
Reward contingency (B)	2	165.4	11.2**
Sex (C)	1	.2	
A x B	2	64.2	4.3*
A x C	1	2.0	
B x C	2	15.0	
A x B x C	2	22.9	
Within cell	48	14.8	

*$p < .05$

**$p < .01$

results. The main effect of reward contingency and the Reward Contingency x Grade interaction were statistically significant. Simple effects tests showed that the differences between reward contingency conditions for kindergarteners did not approach significance. Fifth graders, however, had significantly lower times to solution in the GR condition than in the IR1 condition (F=8.8, df=1/48, $p < .01$) and had significantly lower times to solution in the IR1 condition than in the IR2 condition (F=6.0, df=1/48, $p < .05$). Tests on the simple effects of grade suggested that the only significant difference was for the GR condition where time to solution was less for fifth graders than for kindergarteners (F=9.8, df=1/48, $p < .01$).

Cooperation trials. Another measure of cooperation for the Pull-block game was the number of trials (out of six possible) for which a pair cooperated such that reward was obtained. This measure has meaning only when applied to the GR and IR1 conditions, because in the IR2 condition reward attainment did not require cooperative interaction. Table 14 lists the mean number of cooperation trials for the various grade and sex groups for the GR and IR1 conditions. An analysis of variance (see Table 15) suggested that only the main effect of reward contingency was significant. Although the mean number of cooperation trials for all groups was less in the IR1 condition than in the GR condition, this difference was statistically significant only for fifth grade boys (F=6.9, df=1/32, $p < .05$).

Distribution of rewards. For the IR1 condition Ss knew that the game would be played for six trials, and it was possible for them to take turns obtaining rewards. Perfect turn-taking would have given

Table 14

Mean Number of Cooperation Trials as a Function of Grade, Sex, and Reward Contingency

Grade	Sex	Reward contingency	
		GR	IR1
Kindergarten	M	3.8	3.0
	F	2.4	1.4
Fifth	M	4.8	1.2
	F	3.6	3.2

Note. — Five pairs in each cell.

Table 15

Analysis of Variance: Cooperation Trials

Source	df	MS	F
Grade (A)	1	3.1	
Reward contingency (B)	1	21.1	4.5*
Sex (C)	1	3.1	
A x B	1	2.9	
A x C	1	8.9	
B x C	1	5.5	
A x B x C	1	7.4	
Within cell	32	4.7	

*$p < .05$

three prizes to each child. That turn-taking was infrequent for both grade levels in the IR1 condition is suggested by the fact that for six of the pairs in each grade group, at least one child obtained no prizes; and for eight of the pairs in each grade group, at least one child obtained one or fewer prizes.

An inequitable outcome was possible in the IR1 and IR2 conditions. Table 16 gives for each grade level the proportion of pairs having unequal outcomes and the mean disparity in numbers of rewards for those pairs having unequal outcomes. Although the grade differences reported in Table 16 are not statistically significant, they are reported here in order to allow comparison with similar data from the other experiments in this paper.

Marble-pull game

The measure of cooperative interaction for the Marble-pull game used in this analysis is the "cooperation score" which was also used for the analysis of Marble-pull results in Experiment I. The cooperation score for each dyad is the number of prizes obtained by the child who obtained the fewest prizes over the eight trials. A score of 4 indicated the maximum equitable distribution of prizes. Mean cooperation scores as a function of prior game experience, grade level, and sex are listed in Table 17. The prior game experience conditions are identified for each group according to the reward contingency experienced previously by the group during the Pull-block game.

The analysis of variance for cooperation scores (see Table 18) showed that the main effects of grade and prior game experience were significant. Simple effects tests on the differences between grade

Table 16

Proportion of Pairs with Unequal Outcomes and Mean Disparity x Reward Contingency x Grade

Reward contingency	Grade	Proportion of pairs with unequal outcomes	Mean disparity in rewards for pairs with unequal outcomes
IR1	Kindergarten	.50	2.5
	Fifth	.30	2.7
IR2	Kindergarten	.80	2.5
	Fifth	.90	1.4

Note. — Ten pairs in each condition x grade group.

Table 17

Mean Cooperation Scores as a Function of Grade, Sex, and Prior Game Experience

Grade	Sex	Prior game experience GR	IR1	IR2
Kindergarten	M	1.4	.0	.4
	F	1.4	1.4	1.8
Fifth	M	3.2	2.6	1.6
	F	3.8	1.4	.8

Note. — Five pairs in each cell.

Table 18

Analysis of Variance: Cooperation Scores

Source	df	MS	F
Grade (A)	1	20.4	8.2**
Prior game (B)	2	9.8	3.9*
Sex (C)	1	.8	
A x B	2	5.1	
A x C	1	7.3	
B x C	2	.1	
A x B x C	2	3.7	
Within cell	48	2.5	

*$p < .05$

**$p < .01$

levels suggested that fifth graders were more cooperative than kindergarteners in the GR prior experience condition (F=8.8, df=1/48, $p < .01$) and that fifth grade boys were more cooperative than kindergarten boys in the IRI prior experience condition (F=6.8, df=1/48, $p < .05$). Tests on the simple effects of prior game experience suggested that differences were significant only for fifth graders (F=5.5, df=2/48, $p < .01$).

It was possible for one child in a dyad to obtain more prizes than the other child in the Marble-pull game. Table 19 gives the proportion of pairs having unequal outcomes for each grade level and the mean disparity in numbers of prizes for those dyads having unequal outcomes. Since all pairs were given the same instructions for the Marble-pull game and since inspection of the results suggested that disparity in outcome was not affected by the prior game experiences, the results for the various prior experience groups are collapsed in Table 19. A chi-square test indicated that the proportion of pairs with unequal outcomes was greater for kindergarteners than for fifth graders at a marginal level of significance (χ^2=3.0, df=1, $p < .10$).

Discussion

Pull-block game

The fifth graders were more responsive than the kindergarteners to the situational differences created by the three reward contingency conditions. The effect of reward contingency was significant for fifth graders, but did not approach significance for kindergarteners, for the measures of blocking time, time to solution, and number of cooperation trials. The Grade x Reward Contingency interaction was significant for

Table 19

Proportion of Pairs with Unequal Outcomes and
Mean Disparity as a Function of Grade Level

Grade	Proportion of pairs with unequal outcomes	Mean disparity in rewards for pairs with unequal outcomes
Kindergarten	.40	1.5
Fifth	.17	1.0

Note. — Thirty pairs per grade level.

both the blocking time and time to solution measures. These results suggest that fifth graders were more responsive than kindergarteners to situational cues for cooperation and competition.

Fifth graders were most cooperative and least competitive in the GR condition which was characterized by the need for mutual assistance, the possibility for an equitable outcome, and the absence of cues for competition. The fifth graders were more competitive and less cooperative in the IR1 than the GR condition. The IR1 condition was characterized by the presence of cues for competition, conflict of interest and the possibility for an inequitable outcome, in addition to the cues for cooperation.

Fifth graders were most competitive and least cooperative in the IR2 condition. Although both the IR1 and IR2 conditions were characterized by the presence of cues for competition, the cues for cooperation were much more salient in the IR1 condition. The need for mutual assistance was more salient in the IR1 condition since it was nearly impossible for one child to pull his rope all the way through the opening without the willful cooperation of the other child. In the IR2 condition, however, it was possible for a child to pull one block through the opening and to obtain a reward without the intentional assistance of the other child. The possibility for an equitable outcome was also more salient in the IR1 than in the IR2 condition since Ss could see the six available prizes and were told repeatedly that the game would be played six times. There was no way for Ss in the IR2 condition to know whether one trial would be followed by another.

The most striking difference between fifth grade and kindergarten

children occurred in the IR2 condition which was characterized by the presence of situational cues for competition and the absence of cues for cooperation. In this situation the fifth graders spent considerably more time blocking each other than did the kindergarteners. This suggests that the behavior pattern of actively blocking another person's progress as a response to cues for competition is highly developed for fifth graders and is developed to a much less extent for kindergarteners.

Competitive interaction among kindergarteners, when it occurs, may often result simply from a failure to cooperate rather than from active competition. In some situations, such as the Marble-pull game in Experiment I, even a very passive non-cooperative response may block another person's progress toward goal attainment. This kind of competition should not be confused with the kind of blocking which may be distinguished operationally from simple non-cooperation.

The differences between grade levels in blocking time may not be attributed to age differences in physical strength because very little strength was required for activation of the blocking time switch. The kindergarten pairs were easily capable of continuous activation of the blocking time switch, even if each child pulled on his rope with one hand only, and the children did in fact pull with both hands. It seemed to the E that the kindergarten child was typically concerned only about pulling the blocks on his own rope through the opening as quickly as possible. The kindergarten child appeared to avoid continuous blocking because blocking prevented his own progress as well as the other child's progress. The fifth grade child seemed typically

more concerned than the kindergartener about preventing the other child's progress even before either child had pulled a block through the opening.

In the IR1 condition the behaviors of fifth grade and kindergarten children were similar in several respects. There were no significant differences between grade levels in either time to solution or in number of cooperation trials. The only significant difference in the IR1 condition was that fifth grade boys had higher blocking times than kindergarten boys or girls.

The results for Experiment I and the results for the IR condition in Experiment III were congruent with the results for the IR1 condition in the present experiment in showing that the interaction of older and younger children may be very similar in mixed-cue situations. The present experiment supports an interpretation of these results which suggests that older children are (1) more cooperatively responsive than younger children to cues for cooperation, and (2) more competitively responsive than younger children to cues for competition. This interpretation implies that when cues for both cooperation and competition are salient in a situation, the competitive responsiveness of older children may interfere with their cooperative responsivity such that their behavior may be phenotypically similar to that of younger children.

Experiment II showed that older children were more cooperative than younger children for a situation where there was no real conflict of interest. Experiment III and the present experiment showed that older children cooperated more efficiently than younger children in the GR situation. And of particular importance to the interpretation stated

in the last paragraph, the present experiment demonstrated that older children were far more competitive than younger children in a situation characterized by the presence of cues for competition and the absence of cues for cooperation.

A comparison of the results in Experiment III with the results for the present experiment suggested that the effect of the more lengthy and detailed instructions for the Pull-block game in Experiment III was to decrease blocking time and time to solution for both experimental conditions and for all age groups in Experiment III. The results of statistical significance were the same for both experiments with the one exception that, for Experiment IV, the older boys had higher blocking times than the other groups in the IRl condition.

The only significant sex difference obtained in the present experiment was in the IRl condition where fifth grade boys had higher blocking times than fifth grade girls.

Marble-pull game

All pairs played the Marble-pull game immediately following the Pull-block game, and the instructions for the Marble-pull game were the same for all pairs. The results suggested that for fifth graders, interaction in the Marble-pull game was differentially affected by prior experiences in the three reward contingency conditions of the Pull-block game. The effect of prior game experience did not approach significance for kindergarten children.

The effect of the prior game experiences for kindergarteners may have been diminished by the fact that the behavior of kindergarteners was similar in all three reward contingency conditions for the

Pull-block game. However, the treatment of kindergarteners was quite different for the various prior experience conditions. Also, the fact that kindergarteners became more cooperative over trials in the GR condition, but not in the other conditions, might have been expected to affect behavior on the Marble-pull game. The failure to find a significant effect of prior game experience for kindergarteners was similar to the findings in a previous study (Nelson & Madsen, 1969) that order of group reward or individual reward treatments had no significant effect for four-year-olds in a counterbalanced experiment.

Although interaction was largely cooperative for both kindergarten and fifth grade children in the GR condition of the Pull-block game, fifth graders in the GR prior experience condition were significantly more cooperative in the Marble-pull game than were kindergarteners in the same prior experience condition. Fifth grade boys who were more competitive than kindergarten boys in the IR1 Pull-block condition were more cooperative than the same kindergarten boys for the subsequent Marble-pull game.

The results for fifth graders suggested that the Pull-block game conditions which led to relatively more cooperative interaction for the Pull-block game also resulted in relatively more cooperative interaction in the subsequent Marble-pull game. A comparison of the Marble-pull results for fifth graders in the present experiment with the Marble-pull results for 8- to 10-year-olds in Experiment I suggested that the effect of the prior game experiences in the present experiment was one of increasing cooperativeness in some conditions rather than an effect of decreasing cooperativeness in certain conditions. The 8- to

10-year-olds who played the Marble-pull game with no prior game experience in Experiment I cooperated to nearly the same extent as fifth graders in the IR2 prior experience condition of the present experiment (compare Tables 1 and 17). The same was true for fifth graders who played the Marble-pull game with no prior game experience in Experiment V (compare Tables 17 and 20).

The prior experience of cooperating in the Pull-block game may have created a cooperative set in the minds of the fifth graders which predisposed them for cooperative behavior in the subsequent Marble-pull game. This cooperative set may have involved simply an increase in thinking about the possibility of, and appropriateness of, cooperation. If so, the rewards obtained for cooperative behavior may be conceptualized as reinforcers which (1) directed the Ss' attention to the possibility of cooperating, and (2) increased the Ss' tendencies to think about cooperating in the same and similar game situations. It is also possible that the experience of cooperating may have affected the Ss' attitudes and expectations about their game partners in a direction favorable to cooperation.

Assuming the validity of these explanations, it follows that (1) the kindergarteners' thoughts about cooperation were so specific to the Pull-block game that they did not generalize to the Marble-pull game, and/or (2) the kindergarteners' attitudes toward their partners were unaffected by cooperating or did not relate to their future dispositions to be cooperative.

The proportion of pairs having unequal outcomes in the Marble-pull game was greater for kindergarten than fifth grade children. Although

this difference was significant at only the $p < .10$ level, this evidence is congruent with similar results from Experiments I and II suggesting a greater concern about equality of outcome among fifth graders compared to kindergarteners.

Experiment V

The effect of cooperation in a prior game upon interaction in a subsequent game was further studied with fifth graders in this experiment. The prior experience game used in this experiment was different from the game used for the prior experience in Experiment IV. The subsequent game (Marble-pull game) was the same as the game used to test for the effect of prior experience in Experiment IV.

The prior experience game (Pull-block game) in Experiment IV required a kind of turn-taking interaction because only one child could pull a block through the opening at a time. Since the Marble-pull game also required turn-taking in order for both Ss to obtain reward, the turn-taking feature of both games may have provided a basis for transfer from the prior experience game to the subsequent game. In order to study the importance of this similarity between the prior and subsequent games, the prior experience game used in the present experiment was designed such that turn-taking was not involved.

The present experiment was also designed in order to allow comparison between a group which cooperated in a prior experience game with a group that played the Marble-pull game with no prior experience. The group that played the Marble-pull game with no prior experience also played the Marble-pull game a second time in order to allow study of the

effect of a prior experience in a conflict of interest game upon subsequent play in the same game.

Method

Subjects

The fifth grade children were from a different Los Angeles public school than the Ss in Experiment IV. This second school was also located in a middle to upper income area of western Los Angeles. There were 10 pairs of boys and 10 pairs of girls. For each sex group the pairs were selected randomly and assigned alternately to one of two experimental conditions.

Apparatus

An adaptation of the Madsen Cooperation Board game and the Marble-pull game were used. The dimensions and essential parts of the Cooperation Board game are displayed in Fig. 2 and described in the apparatus section of Experiment II. The adaptation of the Cooperation Board used in the present experiment may be seen in Fig. 4. Target spots were numbered as shown in Fig. 4, and cooperation was required in order for the Ss to pull the pointer to the various target spots. The Marble-pull game is displayed in Fig. 1 and described in the apparatus section of Experiment I.

Procedure

Each pair of children was taken to a small office and was told that they were about to play a game where they might obtain some prizes. The

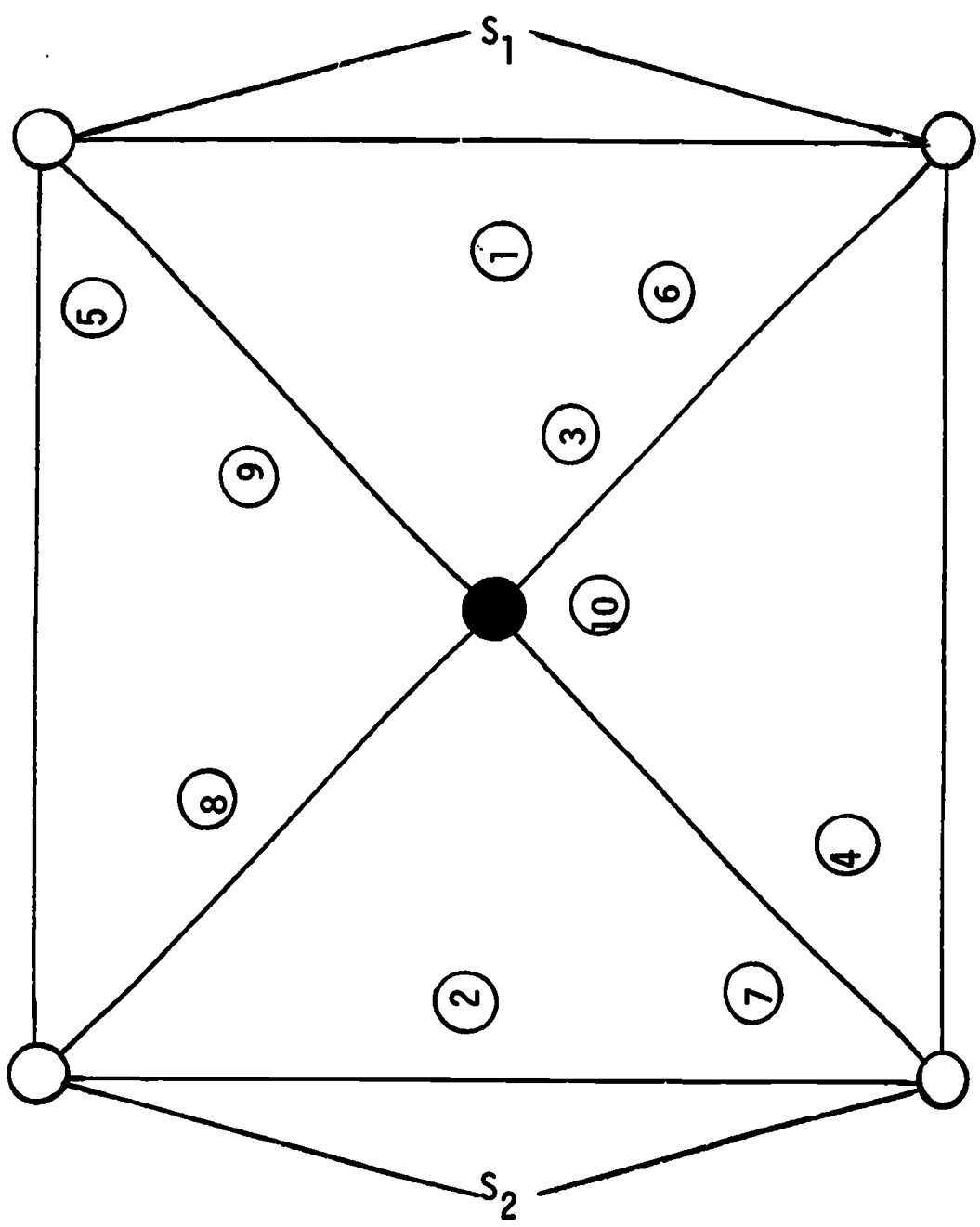


Figure 4. Madsen Cooperation Board as Adapted for Experiment V

children were then allowed to see the available prizes. Half of the pairs played the Cooperation Board game for three trials and immediately afterwards played the Marble-pull game for eight trials. The other half of the pairs played the Marble-pull game for eight trials and immediately afterwards played the Marble-pull game for eight more trials.

The procedure for the Cooperation Board game allowed the Ss to first practice moving the pointer to certain target spots selected by the E. As soon as the E judged that the Ss understood how the pointer could be moved to a given spot on the board, instructions for the game were given. All of the pairs were able to move the pointer to a given spot after just a few attempts. The instructions for the Cooperation Board game were as follows:

> "Notice that there are ten spots numbered from one to ten. The pointer must touch the spots in order: first, spot number one; second, spot number two; and so on up to spot number ten. If spot number ten is reached before I say 'stop,' each of you will be able to choose a prize for that time. The game will be played only three times. I will keep time with this watch, and if I say 'stop' before the pointer gets to spot number ten, no one will get a prize for that time."

The time limit for each trial was 30 seconds. After the third trial, the Ss chose the prizes that they had earned.

The procedure and instructions for the Marble-pull game were the same as in Experiments I and IV. A complete description may be found in the procedure section of Experiment I. Between games the Ss who played the Board game first were told "Now there will be a different game where you may get some more prizes." Ss who played the Marble-pull game first were allowed to choose the prizes which they had earned and then were told "Now you will play the game again for eight more times. You may play the game any way that you wish."

The prizes available for the subsequent Marble-pull game were different from the prizes available for the Cooperation Board game or the Marble-pull game when played first. The prizes, the manner of dispensing the prizes, and the instructions designed to keep Ss from discussing the experiment were the same as that described for fifth graders in the procedure section of Experiment IV.

Results

Nine of the ten pairs who played the Cooperation Board game obtained reward on all three trials. The other pair obtained reward on the third trial only. So, all of the pairs that played the Cooperation Board game did in fact cooperate.

The measure of cooperative interaction for the Marble-pull game was the "cooperation score" that was also used in the previous experiments with the Marble-pull game. The cooperation score for each dyad is the number of prizes obtained by the child who obtained the fewest prizes over the eight trials. Mean cooperation scores as a function of prior game experience and sex are listed in Table 20.

Pairs in the No Prior Game condition were the same pairs as those in the Marble-pull Prior Game condition since these were the pairs that played the Marble-pull game twice. Because the pairs in the No Prior Game condition were the same pairs as those in the Marble-pull Prior Game condition, the results for the No Prior Game condition were excluded from the analysis of variance (Sex x Prior Game Experience) reported in Table 21. The analysis of variance indicated that the pairs having the Cooperation Board prior game experience were more

Table 20

Mean Cooperation Scores for Marble-pull Game as a Function of Sex and Prior Game Experience

Sex	Prior game experience		
	Cooperation board	Marble-pull	No prior game
M	3.8	2.4	1.6
F	3.0	1.4	.2

Note. — 1. Five pairs in each cell.

2. Pairs repeated across Marble-pull and No prior game conditions.

Table 21

Analysis of Variance: Cooperation Scores for Cooperation Board and Marble-pull Prior Game Conditions

Source	df	MS	F
Sex (A)	1	4.05	
Prior game (B)	1	11.25	4.59*
A x B	1	.05	
Within cell	16	2.45	

*$p < .05$

cooperative for the subsequent Marble-pull game than the pairs having the Marble-pull prior game experience (F=4.59, df=1/16, p <.05).

A further statistical test indicated that the pairs having the Cooperation Board prior game experience were also more cooperative for the Marble-pull game than the other pairs when compared to the other pairs' interaction while playing the Marble-pull game with no prior game experience (t=4.5, df=18, p <.01). A statistical test for experiments with repeated measures suggested that the pairs who played the Marble-pull game twice were more cooperative when playing the Marble-pull game for the second time (t=2.74, df=9, p <.05).

Discussion

The results for Experiment IV suggested that the prior experience of cooperative interaction in one game situation tended to increase cooperation among fifth graders in a subsequent conflict of interest game. The present experiment added further support to that conclusion. Pairs of fifth graders who cooperated in the Cooperation Board game were subsequently more cooperative for the Marble-pull game than children who played the Marble-pull game with no prior experience. Interaction in the Marble-pull game was also more cooperative for the Cooperation Board prior experience group than for the other group even when compared to the other group's interaction while playing the Marble-pull game for the second time (a second eight trial game).

The present experiment demonstrated that cooperative interaction in a prior game may increase cooperation in a subsequent game even though the two games are quite dissimilar. Unlike the Marble-pull game,

the Cooperation Board game was a group reward situation where there was no conflict of interest and where cooperation did not require taking-turns or alternation of any kind.

Experiment VI

Experiment VI was designed, as was Experiment IV, to examine the effects of situational variables and various prior experiences upon the interaction of children at different grade levels. A different game was used in the present experiment in order to create interaction situations which in some conditions were quite comparable to the situations in Experiment IV, but in other conditions involved new situations of theoretical interest.

There was a group reward condition and an individual reward condition similar to those of the previous experiments. For two additional conditions, the form of the game apparatus was changed in order to create a group reward condition and an individual reward condition for which the need for mutual assistance was particularly obvious. It was expected that interaction in an individual reward situation would be more cooperative when the salience of the need for mutual assistance was increased.

Another individual reward condition was created in which it was possible for the Ss to obtain maximal and equitable outcome on every trial. For this individual reward condition the salience of the possibility of an equitable outcome was increased since reward could be shared on a trial as well as over trials, and conflict of interest was reduced since both Ss could obtain maximal outcomes on a trial. It

was expected that interaction in this condition would be more cooperative than in the individual reward condition where an equitable outcome was possible only by sharing rewards over trials.

The experimental conditions described above provided situations for creating various game experiences. The effect of these various experiences upon interaction in a subsequent game was investigated. Certain effects of prior experiences which may not be limited to particular dyads were studied by switching members of dyads and forming new dyads following certain prior experience conditions.

Method

Subjects

About half of the children in each experimental group were from the same Los Angeles public school as Ss in Experiment IV, and the rest of the children were from the same Los Angeles public school as Ss in Experiment V. No child was a S in more than one experiment. There were 70 pairs of kindergarten children and 70 pairs of fifth grade children. For both grade levels, half of the dyads were all male and half were all female. Within each grade and sex group, pairs were selected randomly and assigned consecutively to one of seven experimental conditions.

Apparatus

Two forms of the Cooperation Board game were used. The dimensions and essential parts of the Cooperation Board game are displayed in Fig. 2 and described in the apparatus section of Experiment II. The

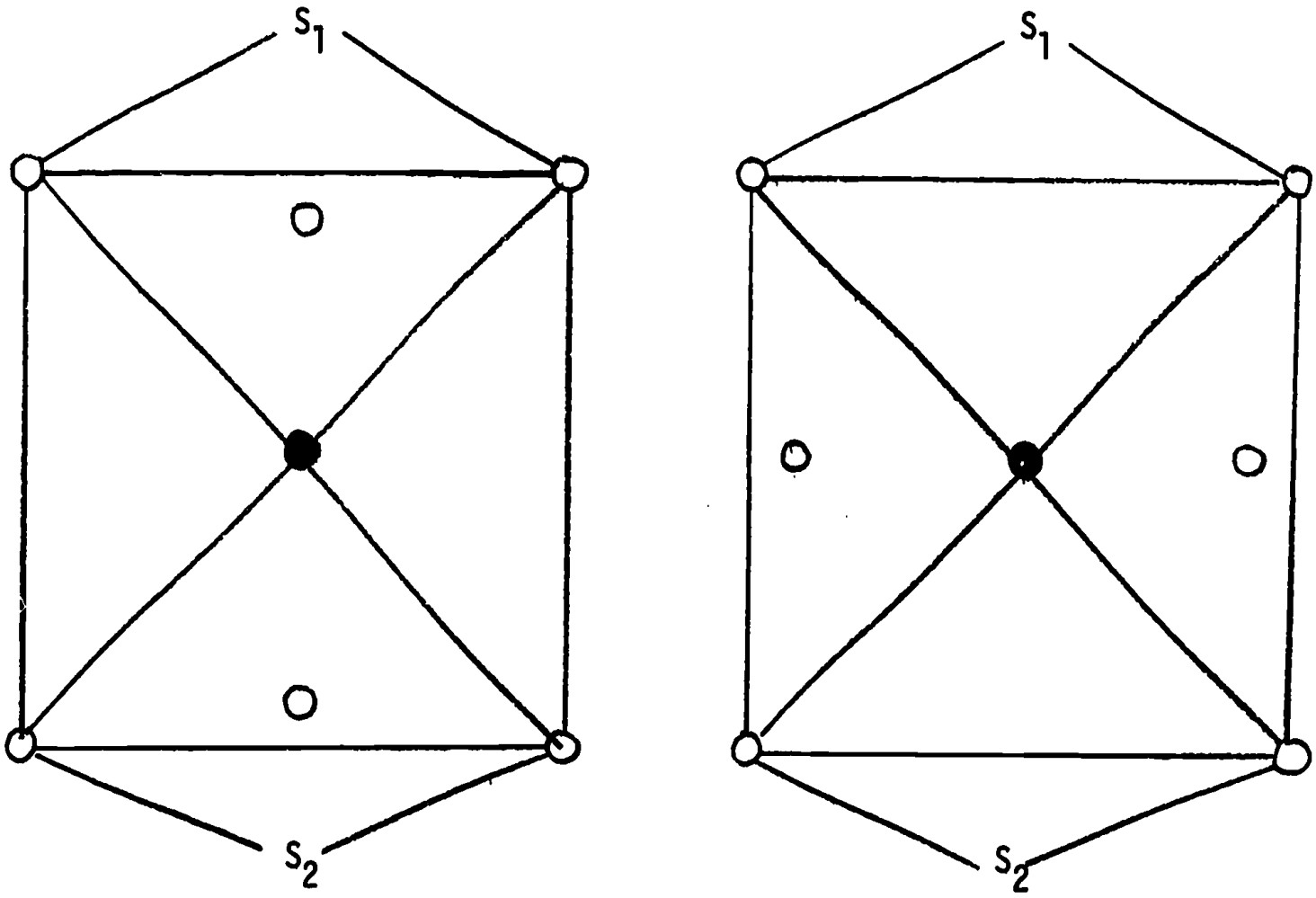
two forms of the Cooperation Board used in this experiment may be seen in Fig. 5. Each form had two target spots, but the arrangement of the spots vis-a-vis the two subjects varied. In order for the pointer to touch a target spot on form 1 of the Cooperation Board, one S had to pull on both strings under his control and the other S could not resist by pulling against the first S. In order for the pointer to touch a target spot on form 2 of the Cooperation Board, each S had to pull on one string and let loose of the other string under his control, and both Ss had to pull on the strings at the same side of the board.

Procedure

Every pair was taken from the classroom to a small office and was told, "This is a game where you may get some prizes. First, I will tell you about the game." Each pair then received instructions in the use of either form 1 or form 2 of the Cooperation Board.

> Form 1. "This is the pointer. The pointer can be moved on the board by pulling strings. Each of you has two strings to pull, one string for each hand. See if you can make the pointer move here." E assisted until the children could move the pointer from several places on the board to a given target spot. Ss then practiced moving the pointer to the other spot.
>
> Form 2. "This is the pointer. The pointer can be moved on the board by pulling strings. You each have two strings. In this game you may pull only one of your strings at a time. Don't pull both strings at the same time. Pull whichever one of your strings that you wish. You may start by pulling one string and then switch and pull the other string, but only pull one string at a time." The children practiced moving the pointer to one target spot and then practiced moving the pointer to the other target spot.

Following this, either six paper tokens or six pairs of paper tokens were placed on the table. Children in the GR conditions were told that they could choose one prize for every two coins that they



Form 1

Form 2

Figure 5. Forms of Cooperation Board for Experiment VI

obtained. Children in the other conditions were told that each token was worth one prize. The children were questioned to assertain whether the token-prize relationship was understood, and they were given an opportunity to see the prizes from which they could choose. One of the three following reward contingencies was then explained.

> Group Reward (GR). Six pairs of paper tokens were placed in view of the children. "There will be two coins each time. The game will be played six times (E pointed to coins). If the pointer touches both spots, here and here, before I say 'stop,' you will each get one coin, one for you and one for you. If the pointer does not touch both spots before I say 'stop,' if only one spot is touched for example, no one will get a coin."
>
> Individual Reward Unlimited (IRU). Six pairs of paper tokens were placed in view of the children. One child's name was printed on one target spot and the other child's name was printed on the other target spot. "There will be two coins each time. The game will be played six times (E pointed to coins). If the pointer touches the spot with your name on it before I say 'stop,' you will get one coin. Each person whose spot is touched before I say 'stop' will get a coin. If the pointer does not touch your spot before I say 'stop,' you will not get a coin that time."
>
> Individual Reward (IR). Six paper tokens were placed in view of the children. One child's name was printed on one target spot and the other child's name was printed on the other target spot. "There will be only one coin each time. The game will be played six times (E pointed to coins). If the pointer touches here (spot with name of child 1) first, child 1 (name) will get the coin. If the pointer touches here (spot with name of child 2) first, child 2 (name) will get the coin. If the pointer does not touch any spot before I say 'stop,' no one will get that coin."

All of the children were told that talking was allowed and that they could play the game any way they wished. The time limit for each trial was 15 seconds. All pairs played the Cooperation Board game for 12 trials. For trials 7-12 all pairs played form 2 of the Cooperation Board game with instructions for the IR reward contingency. Instructions and procedure prior to trial 7 varied for the seven experimental

conditions listed below. Each condition is listed according to the reward contingency and form of game that was used on trials 1-6 for the children in that condition.

1. Group Reward (form 1)
2. Group Reward (form 2)
3. Individual Reward (form 1)
4. Individual Reward (form 2)
5. Individual Reward Unlimited (form 2)
6. Group Reward (form 1), Switched Pairs
7. Individual Reward (form 1), Switched Pairs

The children in the Switched Pairs (SP) conditions had different partners on trials 7-12 than on trials 1-6. The procedure for these conditions involved having first one and then another pair in the same condition play the game for trials 1-6 only. Following this, one child from the first pair and one child from the second pair returned to the experimenting room to form a new pair for trials 7-12. Then the remaining children, one from each original pair, were tested for trials 7-12.

For trials 1-6 in conditions IR (form 1) and IR (form 1) SP, each child's name was printed on the target spot that was on the far side of the board from that child. This meant (see form 1 in Fig. 5) that a child could move the pointer to the other child's target, but he could contribute nothing toward moving the pointer to his own target.

Following the sixth trial, the children in all but one condition were told "Now the game will be changed." Then the instructions for the IR (form 2) situation were given. Children in the IR (form 2)

condition were simply told "Now the game will be played six more times."

After the twelfth and final trial, each child was allowed to choose at least two prizes. The prizes available on trials 1-6 were different from the prizes available on trials 7-12, and prizes for kindergarteners were different than the prizes for fifth graders. The prizes, the manner of dispensing the prizes, and the instructions designed to keep Ss from discussing the experiment were the same as that described in the procedure section of Experiment IV.

Results

Trials 1-6

There were five different experimental treatments to be compared for trials 1-6. Although the children in the two Switched Pairs conditions received the same treatment for trials 1-6 as children in the two comparable groups where pairs were not switched, all of these groups were considered as separate conditions in the analysis of the results for trials 1-6. It was important, for the study of the effects of prior experiences, to show that children in the SP groups had experiences on trials 1-6 that were similar to the experiences of children in the comparable groups where pairs were not switched. For this reason, seven reward contingency groups were compared.

Cooperation trials. The measure of cooperative interaction for each pair on trials 1-6 was the number of cooperation trials out of the six possible. A cooperation trial was defined as a trial for which one or both children obtained reward. For all conditions it was impossible for any child to obtain reward without the assistance of the other

child. The mean numbers of cooperation trials as a function of grade, reward contingency, and sex are listed in Table 22.

An analysis of variance (see Table 23) suggested that the main effect of reward contingency and the Reward Contingency x Grade interaction were significant. Differences between the GR (form 1) and GR (form 1) SP groups and between the IR (form 1) and IR (form 1) SP groups did not approach significance. For kindergarteners there was no significant difference between pairs in the GR (form 1) and IR (form 1) conditions. Fifth grade children, however, were significantly more cooperative in the GR (form 1) condition than in the IR (form 1) condition (F=12.0, df=1/112, $p < .01$). Cooperative interaction was more frequent in the GR (form 2) condition than in the IR (form 2) condition for both kindergarteners (F=11.1, df=1/112, $p < .01$) and fifth graders (F=35.6, df=1/112, $p < .01$). Cooperative interaction was also more frequent in the GR (form 2) condition than in the IRU (form 2) condition for both kindergarteners (F=6.2, df=1/112, $p < .05$) and fifth graders (F=37.2, df=1/112, $p < .01$). Differences between the IR (form 2) and IRU (form 2) conditions did not approach significance for either grade level.

Differences in cooperative interaction between form 1 and form 2 of the Cooperation Board did not approach significance when the GR reward contingency was in effect. For the IR reward contingency, however, interaction was more cooperative with form 1 than with form 2 for both kindergarteners (F=16.2, df=1/112, $p < .01$) and fifth graders (F=6.2, df=1/112, $p < .05$).

The kindergarten children were more cooperative than the fifth

Table 22

Mean Number of Cooperation Trials as a Function of Grade, Sex, and Reward Contingency

Grade	Sex	Reward contingency						
		GR form 1	GR form 1 SP	GR form 2	IR form 1	IR form 1 SP	IR form 2	IRU form 2
Kindergarten	M	5.6	4.6	4.8	5.2	4.8	2.2	2.8
	F	5.2	6.0	5.0	5.6	6.0	2.8	3.4
Fifth	M	6.0	6.0	6.0	4.0	3.4	.8	.6
	F	6.0	6.0	6.0	3.0	3.8	2.6	2.6

Note. — Five pairs in each cell.

Table 23

Analysis of Variance: Cooperation Trials

Source	df	MS	F
Grade (A)	1	9.3	
Reward contingency (B)	6	46.0	17.7**
Sex (C)	1	9.3	
A x B	6	8.3	3.2**
A x C	1	.1	
B x C	6	2.1	
A x B x C	6	1.7	
Within cell	112	2.6	

**$p < .01$

graders in the IR (form 1) condition (F=6.9, df=1/112, p <.05) and in the IRU (form 2) condition (F=4.3, df=1/112, p <.05).

Cooperation scores. For the IR conditions one prize was available per trial, and it was possible for Ss to take-turns obtaining prizes over trials. For these conditions the cooperation score is a measure of the degree to which Ss obtained and equitably divided the available rewards. The cooperation score for each dyad is the number of prizes obtained by the child who obtained the fewest prizes over the six trials. Table 24 gives the mean cooperation scores for children in the IR conditions.

An analysis of variance reported in Table 25 indicated that the main effects of grade and of reward contingency were significant. Comparisons of the results for the IR (form 2) condition with the combined results for the two IR (form 1) conditions suggested that kindergarten children, but not fifth graders, were significantly more cooperative in the IR (form 1) conditions than in the IR (form 2) condition (F=11.3, df=1/48, p <.01). Inspection of Table 24 suggested that the significant difference between grade levels may be accounted for by the fact that kindergarteners were more cooperative than fifth graders in the IR (form 1) conditions.

Trials 7-12

On trials 7-12 all Ss played form 2 of the Cooperation Board with the IR reward contingency in effect. In order to examine the effects of prior game experiences, the experimental groups are identified according to the various treatments which they experienced prior to trial 7. The seven reward contingency groups studied for trials 1-6 were the seven

Table 24

Mean Cooperation Scores as a Function of Grade, Sex, and Reward Contingency

Grade	Sex	Reward contingency		
		IR form 1	IR form 1 SP	IR form 2
Kindergarten	M	1.4	2.0	.8
	F	2.2	2.8	.8
Fifth	M	1.8	1.2	.4
	F	.6	1.0	1.0

Note. — Five pairs in each cell.

Table 25

Analysis of Variance: Cooperation Scores

Source	df	MS	F
Grade (A)	1	6.6	6.6*
Reward contingency (B)	2	5.4	5.4**
Sex (C)	1	.2	
A x B	2	1.9	
A x C	1	2.5	
B x C	2	.5	
A x B x C	2	2.1	
Within cell	48	1.0	

*$p < .05$

**$p < .01$

prior experience groups for trials 7-12. The results from trials 1-6 for Ss in the IR (form 2) condition were also included in the present analysis in order to compare groups having prior game experiences with a group having no prior game experience.

Cooperation scores. Again, the cooperation score for each dyad is the number of prizes obtained by the child who obtained the fewest prizes over the six trials. If the children in a given dyad obtained all of the available prizes and shared them equally, that dyad would be assigned a cooperation score of 3. Table 26 lists the mean cooperation scores as a function of grade, sex, and prior game experience.

The pairs in the IR (form 2) Prior Game condition were the same pairs as those in the No Prior Game condition since these were the pairs that played form 2 of the Cooperation Board game twice, with the IR reward contingency in effect both times. Because these two conditions were not represented by independently selected samples, the results for the IR (form 2) Prior Game condition were excluded from the analysis of variance reported in Table 27. The results for the No Prior Game condition were included in the analysis of variance.

As shown in Table 27, the analysis of variance indicated that none of the main effects approached significance and that only the Grade x Sex interaction was significant. Simple effects tests suggested that fifth grade boys were significantly more cooperative than kindergarten boys (F=9.50, df=1/112, $p < .01$). Since it was expected that the effect of prior game experience would be significant for fifth graders, simple effects tests were performed for the fifth grade data. The effect of prior game experience was significant for fifth graders (F=2.31,

Table 26

Mean Cooperation Scores as a Function of Grade, Sex, and Prior Game Experience

Grade	Sex	Prior game experience							
		GR form 1	GR form 1 SP	GR form 2	IR form 1	IR form 1 SP	IR form 2	IRU form 2	No prior game
Kindergarten	M	.6	.8	.8	.6	.8	1.8	1.2	.8
	F	1.2	1.0	1.4	1.6	1.8	.2	1.8	.8
Fifth	M	2.8	2.2	1.6	2.8	1.6	1.2	.6	.4
	F	1.6	1.0	1.0	1.6	.4	1.2	1.4	1.0

Note. — 1. Five pairs in each cell.

2. Pairs repeated across IR (form 2) and No prior game conditions.

Table 27

Analysis of Variance: Cooperation Scores

Source	df	MS	F
Grade (A)	1	3.97	
Prior game (B)	6	1.71	
Sex (C)	1	.00	
A x B	6	2.49	
A x C	1	11.57	7.51**
B x C	6	.78	
A x B x C	6	1.56	
Within cell	112	1.54	

Note. — The IR (form 2) condition was excluded from this analysis.

**$p < .01$

df=6/112, p <.05), but further tests suggested that the effect was significant only for fifth grade boys (F=3.03, df=6/112, p <.01). Comparison of Table 26 with Table 22 suggested that interaction among fifth grade boys for trials 7-12 was more cooperative for groups having the prior experience of cooperating, than for groups having either no prior game experience or the prior experience of a non-cooperative interaction.

A separate analysis of cooperation scores was made in order to examine the effects of grade and sex for only those conditions in which Ss had been cooperative on trials 1-6. Table 28 lists mean cooperation scores as a function of grade and sex with results collapsed over the three GR and the two IR (form 1) conditions. The analysis of variance reported in Table 29 showed that the effect of grade and the Grade x Sex interaction were significant. Comparisons between grade and sex groups suggested that fifth grade boys were more cooperative than fifth grade girls (F=10.2, df=1/96, p <.01) and were also more cooperative than kindergarten boys (F=19.1, df=1/96, p <.01) and girls (F=5.6, df=1/96, p <.05). Also, kindergarten girls were more cooperative than kindergarten boys (F=4.0, df=1/96, p <.05).

Disparity in outcomes. Table 30 lists (1) the proportion of pairs having unequal outcomes over trials 7-12 and (2) the mean disparity in numbers of prizes for those pairs having unequal outcomes. The data in Table 30 is collapsed for the seven prior experience groups and for sex because differences due to these effects did not approach significance. A chi-square test indicated that the proportion of pairs having unequal outcomes was greater for kindergarten children than for fifth graders (χ^2=7.0, df=1, p <.01).

Table 28

Mean Cooperation Scores as a Function of Grade and Sex, Collapsed for All GR and IR (form 1) Conditions

Grade	Sex	
	M	F
Kindergarten	.7	1.4
Fifth	2.2	1.1

Note. — 25 pairs in each cell.

Table 29

Analysis of Variance: Cooperation Scores

Source	df	MS	F
Grade (A)	1	9.0	6.3*
Sex (B)	1	1.0	
A x B	1	19.36	13.5**
Within cell	96	1.43	

*$p < .05$

**$p < .01$

Table 30

Proportion of Pairs with Unequal Outcomes
and Mean Disparity as a Function of Grade

Grade	Proportion of pairs with unequal outcomes	Mean disparity in rewards for pairs with unequal outcomes
Kindergarten	.47	1.6
Fifth	.24	1.1

Note. — 70 pairs for each grade.

Discussion

Trials 1-6

Kindergarten and fifth grade children were more cooperative in the GR (form 2) condition than in the IR (form 2) condition. In the previous experiments (III and IV) with the Pull-block game, the interaction of kindergarten children did not differ significantly between GR and IR conditions. The difference in results between these experiments may be explained by reference to an important difference between the games used in the experiments. For the IR conditions in the Pull-block game, it was possible for a kindergarten child to pursue personal goals and at the same time to avoid sustained blocking of the other child's progress. In fact, the kindergarten children did appear to pursue personal goals in a kind of passively cooperative manner for all experimental conditions of the Pull-block game.

For the IR (form 2) condition of the present experiment, pursuit of personal goals necessarily resulted in competitive interaction. Although the intentions of the kindergarteners in the present experiment may not have been to block one another's progress, their pursuit of personal goals and their failure to resolve the conflict of interest resulted in competitive interaction quite unlike the cooperative interaction which occurred in the GR (form 2) condition.

The results obtained for the IR (form 2) condition were congruent with results obtained for the IR conditions in Experiments I, III, and IV in showing that interaction of young children may be similar to the interaction of older children for situations in which both cooperative

and competitive cues are present. It was suggested earlier in this paper that the intellectual capacities of young children may limit their responsiveness to the need for mutual assistance and to the possibility of sharing rewards over trials. Although the intellectual capacity for cooperation should be greater for older children than for younger children, the older children may have been no more cooperative in the IR conditions because of their greater competitive responsiveness to conflict of interest and the possibility of an inequitable outcome. Further evidence for this explanation follows from the results obtained in the IRU (form 2) and IR (form 1) conditions of the present experiment.

The IRU (form 2) condition was similar to the IR (form 2) condition. The only difference was that just one prize per trial was available for the IR (form 2) condition, whereas two prizes were available on every trial in the IRU (form 2) condition and Ss could take-turns obtaining prizes on each trial. The IRU (form 2) condition was designed in order to create an IR situation where the possibility of an equitable outcome would be more obvious than in the IR (form 2) condition. Interaction was expected to be more cooperative for the IRU (form 2) condition than for the IR (form 2) condition. The results suggested, however, that the differences in cooperative interaction between these two conditions did not approach significance. And, for both kindergarten and fifth grade children, interaction was significantly more cooperative in the GR (form 2) condition than in the IRU (form 2) condition. A further interesting result was that kindergarteners were significantly more cooperative for the IRU (form 2) condition than fifth graders.

It is important to notice that although conflict of interest was

minimized for the IRU (form 2) condition by allowing both dyad members to obtain maximal reward on each trial, the IRU (form 2) condition was still a conflict of interest situation. Behavior which would result in goal attainment for one child was, at least momentarily, incompatible with the behavior that would lead to the other child's goal attainment. The IRU (form 2) condition was similar to the experimental situation in Experiment II in that for both of these situations: (1) either an equitable or inequitable outcome was possible on every trial, and (2) mutual assistance was required for goal attainment. However, unlike the situation in Experiment II, the IRU (form 2) condition was a conflict of interest situation. Kindergarteners were more cooperative than fifth graders for the IRU conflict of interest situation, but 8- to 10-year-olds were more cooperative than younger children for the comparable situation in Experiment II where there was no necessary conflict of interest.

This evidence supports the hypothesis that older children are potentially more responsive than younger children to both cooperative and competitive cues. It also suggests that presence or absence of conflict of interest is a particularly important determinant of cooperative-competitive interaction for older children. In Experiment II where conflict of interest was absent, older children were more responsive to cues for cooperation than were younger children. In the IRU (form 2) condition of the present experiment, where a conflict of interest was present, older children were less cooperative than younger children even though the situation contained the same cues for cooperation as were present in Experiment II.

The IR (form 1) condition was included in the present experiment in order to study the importance of the need for mutual assistance as a cue for cooperation. The instructions for the IR (form 1) and the IR (form 2) conditions were the same, but form 1 of the Cooperation Board was designed so as to make very obvious the need for mutual assistance. For the IR (form 1) condition, a child could do nothing to make the pointer move to his own target spot. Although it was also true for the IR (form 2) condition that a child could not move the pointer to his own target without help from the other child, this fact was somewhat obscured by the child's ability to move the pointer in the general direction of his own target by pulling on one string.

During the pre-game practice for the IR (form 2) condition, each child learned that pulling on a certain string moved the pointer to his target. This did not necessarily require that a child become aware of the fact that the other child also had to pull on a certain string in order for the pointer to move to the first child's target. The comments of young children in the IR (form 2) condition of an earlier study (Nelson & Madsen, 1969), and in the present study, suggested that the younger children were often unaware of the need for mutual assistance.

As expected, the mean number of cooperation trials was higher in the IR (form 1) condition than in the IR (form 2) condition for children at both grade levels. The mean cooperation scores were also higher in the IR (form 1) condition for kindergarteners, but not significantly so for fifth graders. The differences in results between the two IR conditions were not due simply to differences between form 1 and form 2 in task difficulty since children in the GR (form 1) and GR (form 2)

conditions were equally cooperative. The result of structuring the game situation so as to increase the salience of the need for mutual assistance in the IR (form 1) condition, compared to the IR (form 2) condition, was to increase cooperative interaction for the IR (form 1) condition.

A further interesting result was that kindergarteners were as cooperative in the IR (form 1) condition as in the GR (form 1) condition. Fifth graders, however, were significantly less cooperative in the IR (form 1) condition than in the GR (form 1) condition. Also, fifth graders were significantly less cooperative than kindergarteners for the IR (form 1) condition.

Increasing the salience of the need for mutual assistance for the IR (form 1) condition increased the cooperative interaction of kindergarteners to the level of the GR (form 1) condition even though the IR (form 1) condition was a conflict of interest situation where an inequitable outcome was possible. This suggests that the non-cooperative interaction of kindergarteners in the IR (form 2) condition may have resulted more from the kindergarteners' insensitivity to the need for mutual assistance than from the kindergarteners' responsiveness to competitive cues. The fact that increased salience of the need for mutual assistance did not increase cooperative interaction for fifth graders in the IR (form 1) condition to the level of the GR (form 1) condition suggests that the non-cooperative interaction of fifth graders in the IR (form 2) condition resulted, not only from insensitivity to the need for mutual assistance, but also resulted from the fifth graders' competitive responsiveness to the conflict of interest and the possibility of an inequitable outcome.

Trials 7-12

Fifth grade boys who cooperated on trials 1-6 were more cooperative subsequently when playing the Cooperation Board game in a different condition than fifth grade boys who had either no prior game experience or the prior experience of a less cooperative interaction. Collapsed results for the five prior experience conditions where Ss had been most cooperative on trials 1-6 suggested that fifth grade boys were more cooperative following the prior experience of cooperating than were fifth grade girls or kindergarteners. The fifth grade boys had not been any more cooperative on trials 1-6 than the other groups.

The results for fifth grade boys supported the findings of Experiments IV and V which indicated that for fifth graders, but not for kindergarteners, the effect of cooperating in a prior game was to increase cooperative interaction for a subsequent game. There was no obvious explanation for the nonsignificant effect of prior game experience for fifth grade girls in the present experiment.

Since the effect of prior game experience was significant only in the case of fifth grade boys, sample sizes did not permit reliable statistical tests on the differences between the Switched Pairs groups and the comparable groups where pairs were not switched. The direction of the differences were such, however, to suggest that the effect of a prior cooperative experience in increasing subsequent cooperation was only partially reduced when dyad members were switched following the prior experience game. This evidence, although not very substantial, supports the hypothesis that the prior experience of cooperating may create a cooperative set which involves both (1) attitudes favorable to

cooperation with a particular partner, and (2) more general attitudes and thoughts about the possibility of cooperating in game situations.

Considering all prior experience groups, the proportion of pairs having unequal outcomes for trials 7-12 was greater for kindergarteners than for fifth graders. The general result was the same for all of the prior experience conditions and for both sexes. Similar results were obtained with the Cooperation Board in Experiment II and with the Marble-pull game in Experiments I and IV. These results suggest that young children are less concerned than older children about avoiding inequitable outcomes.

Summary

In the introductory pages of this paper theoretical reasons were presented for expecting the capacity of children for both cooperation and competition to increase with age. Greater intellectual ability, incorporation of social norms about equality and justice, and acquired motives for winning and maximizing differences are some of the factors which were expected to contribute to an increasing responsiveness to situational cues for cooperation and competition. It was suggested that age differences in responsiveness to certain cues would cause older children to be (1) more cooperative than younger children in some situations and (2) more competitive than younger children in other situations. It was not possible, on the basis of these theoretical speculations, to predict age differences in cooperation and competition for situations where cues for both cooperation and competition were present.

The following situational characteristics were selected for study because of their probable importance as cues for cooperation or competition: need for mutual assistance, possibility for an equitable outcome, possibility for an inequitable outcome, and conflict of interest. Need for mutual assistance was defined as the degree to which Ss required one another's assistance in order to obtain certain material rewards. Conflict of interest was defined as a situation where Ss were interdependent such that behavior which might be instrumental to the maximal attainment of rewards for one person would also be detrimental to another person's progress toward maximal reward attainment.

The results suggested that when a situation was characterized by the presence of cues for cooperation (need for mutual assistance and possibility of an equitable outcome) and the absence of cues for competition (conflict of interest and possibility of an inequitable outcome), kindergarten children and older children interacted cooperatively (as for GR conditions in Experiments III, IV, and VI). The older children in Experiments III and IV were more efficient in cooperating than the kindergarten children.

When a situation was characterized by the presence of cues for competition and the absence of cues for cooperation as for the IR2 condition in Experiment IV, fifth grade children were far more competitive than kindergarten children.

For the situations in Experiments I, III, IV, and VI where both of the cooperation cues and both of the competition cues were present, interaction was generally non-cooperative, and equally so for all age levels. An exception occurred in Experiment IV, for the IR1 condition,

where fifth grade boys were more competitive than kindergarten boys or girls. Another exception occurred for two conditions in Experiment VI where all of the cues for cooperation and competition were present, but where the situations were designed in one case to make the need for mutual assistance particularly obvious and in the other case to make the possibility of an equitable outcome particularly obvious. For these two situations, kindergarten children were more cooperative than fifth graders.

When a situation was characterized by the presence of the cues for cooperation, the absence of conflict of interest, and the presence of a possibility for an inequitable outcome (as in Experiment II), the older children were more cooperative than the younger children.

Altogether, the results supported the hypothesis that certain situational attributes are cues for cooperation and that certain other situational characteristics are cues for competition. The results also supported the hypothesis that the potential responsiveness of children to both the cues for cooperation and the cues for competition increases with age. The relatively greater responsiveness of the older children, compared to kindergarteners, was particularly evident in Experiments III and IV where the effect of situational differences was significant for older children, but did not approach significance for kindergarten children. The fact that there was often little difference between age groups for situations where cues for both cooperation and competition were present was interpreted as the result of an interference between the cooperative and competitive response tendencies of the older children.

Older children were equally or more competitive than younger children for situations where a conflict of interest was present, and older children were equally or more cooperative than younger children for situations characterized by the absence of conflict of interest. This suggests that conflict of interest is a particularly important determinant, relative to other determinants, of cooperation and competition for older children.

Data on the proportion of pairs having unequal outcomes over trials and data on the amount of disparity in outcomes for pairs having unequal outcomes indicated that older children were more concerned about equality of outcomes than were kindergarteners. The E's observations suggested that the older child was more concerned both (1) about preventing the other child from obtaining more prizes than the first child and (2) about equalizing the outcomes after either child had obtained a prize. This data is congruent with Piaget's observations (1965) about the development of concepts of reciprocity, equality, and justice. It is interesting, and important, to notice that this concern about equality did not necessarily relate to a high level of cooperative interaction even though mutual assistance was required for goal attainment and even when an equitable outcome was possible.

Experiments IV, V, and VI were designed, in part, in order to study the effects of immediate prior experiences upon subsequent interaction in conflict of interest situations. The results suggested that for fifth graders, but not for kindergarteners, the prior experiences of cooperating led to increased cooperation for subsequent conflict of interest games. This effect was obtained even when the prior experience

game was not a conflict of interest situation and even when the prior experience game and the nature of its cooperative solution were quite different than for the subsequent game. In Experiment VI the effect of prior game experience was significant only for fifth grade boys and did not approach significance for fifth grade girls. No obvious explanation of this exception was available. For all of the experiments, the only other significant difference between fifth grade boys and girls was in the IR1 condition of Experiment IV where boys were more competitive than girls for the prior experience game, but not for the subsequent game.

The fact that fifth graders who were in a cooperative prior experience condition were generally more cooperative than fifth graders in either a competitive prior experience condition or a no prior experience condition was interpreted as follows. The prior experience of cooperating created a cooperative set or predisposition to think about the possibility of, and appropriateness of, cooperation. The rewards obtained for cooperative behavior in the prior experience games may be conceptualized as reinforcers which (1) directed the Ss' attention to the possibility of cooperating, and (2) increased the tendency of Ss to think about cooperation in the game situation. This cooperative set may have included certain attitudes and expectations of Ss about their game partners. The attitudes and expectations of Ss about their game partners may, for Ss who cooperated during the prior game, have developed in a manner which contributed to cooperative interaction in the subsequent game.

There was some evidence from Experiment VI, although not very

substantial because of small sample sizes, which indicated that the effect of certain prior cooperative experiences in increasing subsequent cooperation was only partially reduced when dyad members were switched following the prior experience game. This suggests that the cooperative set resulting from the prior experience of cooperating involved both (1) attitudes favorable to cooperation with a particular partner, and (2) more general attitudes and thoughts about the possibility of cooperating in game situations.

The finding that a prior cooperative experience increased subsequent cooperation for fifth graders only, and not for kindergarteners, added further support to the hypothesis that the capacity for cooperation increases with age. Although both age groups were typically non-cooperative in conflict of interest situations, the older children were induced to cooperate simply by creating a cooperative set during the prior game. It was a predisposition to be competitive, and not an inability to discover a cooperative solution, which resulted in the non-cooperative interaction of the older children in conflict of interest games. The fact that the cooperative interaction of younger children in the prior experience games did not generalize to the subsequent games suggests that the non-cooperative behavior of younger children in the subsequent conflict of interest games was not so much the result of a competitive predisposition, but was more the result of an inability to discover a cooperative solution.

As mentioned before, the older children were either equally non-cooperative or more non-cooperative than younger children for all of the conflict of interest situations, except after certain prior experiences.

For the IR (form 1) and the IRU (form 2) conditions in Experiment VI, the fifth graders obtained significantly fewer rewards on trials 1-6 than did the kindergarteners. For Experiment I, for the IRl condition in Experiment IV, and for the IR (form 2) condition in Experiment VI, the older children obtained less than half of the available rewards, and they obtained rewards no more frequently than did kindergarteners. For each of these conflict of interest situations, mutual assistance was required for reward attainment and an equitable outcome was possible. These results imply that the predisposition of the older children to be competitive in conflict of interest situations interfered with their problem solving capabilities and caused them to interact in a maladaptive way.

That this predisposition to be competitive is a cultural product has been demonstrated in cross-cultural studies with children (Kagan & Madsen, in press; Madsen, 1967; Madsen & Shapira, 1970; Shapira & Madsen, 1969). It may be that the predisposition to be competitive is particularly strong among children in Los Angeles because few experiences are provided where children cooperate in order to obtain rewards compared to the number of experiences where children must compete in order to obtain rewards. The experimental results reported here indicate that the simple experience of working together to obtain rewards may increase subsequent cooperation for conflict of interest situations where mutual assistance is required for reward attainment. Results from Experiment VI suggested that cooperation may also be increased, for situations requiring mutual assistance, by increasing children's awareness of the need for mutual assistance.

Assuming that it would be socially desirable for children to acquire capacities for both cooperation and competition, a more desirable balance between these behavioral dispositions might result by (1) providing more experiences where children would obtain goals through cooperative interaction, and by (2) sensitizing children to the need for mutual assistance in many conflict of interest situations.

References

Anderson, H. H. Domination and integration in the social behavior of young children in an experimental play situation. Genetic Psychology Monographs, 1937, 19, 341-408.

Azrin, N., & Lindsley, O. The reinforcement of cooperation between children. Journal of Abnormal and Social Psychology, 1956, 2, 100-102.

Chittenden, G. An experimental study in measuring and modifying assertive behavior in young children. Monograph of the Society for Research in Child Development, 1942, 7, No. 31.

Deutsch, M. Cooperation and trust: some theoretical notes. In M. F. Jones (Ed.), Nebraska symposium on motivation. Lincoln: University of Nebraska Press, 1962.

Deutsch, M. Socially relevant science: reflections on some studies of interpersonal conflict. American Psychologist, 1969, 24, 1076-1092.

Gallo, P. S., & McClintock, C. G. Cooperative and competitive behavior in mixed-motive games. Journal of Conflict Resolution, 1965, 9, 68-78.

Greenberg, P. J. Competition in children: an experimental study. American Journal of Psychology, 1932, 44, 221-248.

Gumpert, P., Deutsch, M., & Epstein, Y. Effect of incentive magnitude on cooperation in the prisoner's dilemma game. Journal of Personality and Social Psychology, 1969, 11, 66-69.

Harrison, A. A., & McClintock, C. G. Previous experience within the dyad and cooperative game behavior. Journal of Personality and Social Psychology, 1965, 1, 671-675.

Kagan, S., & Madsen, M. C. Cooperation and competition of Mexican, Mexican-American, and Anglo-American children of two ages under four instructional sets. Developmental Psychology, in press.

Kelley, H. H. Interpersonal accomodation. American Psychologist, 1968, 23, 399-410.

Kelley, H. H., & Stahelski, A. J. The basis in social interaction of cooperators' and competitors' beliefs about others. Journal of Personality and Social Psychology, in press.

Leuba, C. An experimental study of rivalry in young children. Journal of Comparative Psychology, 1933, 16, 367-378.

Madsen, M. C. Cooperative and competitive motivation of children in three Mexican sub-cultures. Psychological Reports, 1967, 20, 1307-1320.

Madsen, M. C. The development of cooperative and competitive behavior of children in Mexico and the United States. In M. C. Madsen (Chm.). Cultural determinants of cooperative and competitive behavior of children. Symposium presented at the meeting of the Society for Research in Child Development, Santa Monica, March 29, 1969.

Madsen, M. C., & Shapira, A. Cooperative and competitive behavior of urban Afro-American, Anglo-American, Mexican-American, and Mexican village children. Developmental Psychology, 1970, in press.

May, M. A., & Doob, L. Competition and cooperation. Bulletin No. 25, Social Science Research Council, New York, 1937.

McClintock, C. G., & Nuttin, J. M. Development of competitive game behavior in children across two cultures. Journal of Experimental Social Psychology, 1969, 5, 203-218.

McKee, J. P., & Leader, F. The relationship of socioeconomic status and aggression to the competitive behavior of preschool children. Child Development, 1955, 26, 175-182.

Mintz, A. Non-adaptive group behavior. Journal of Abnormal and Social Psychology, 1951, 46, 150-159.

Mithaug, D. E., & Burgess, R. L. The effects of different reinforcement contingencies in the development of social cooperation. Journal of Experimental Child Psychology, 1968, 6, 402-426.

Nelson, L., & Madsen, M. C. Cooperation and competition in four-year-olds as a function of reward contingency and subculture. Developmental Psychology, 1969, 1, 340-344.

Nowell-Smith, P. H. Ethics. London: Cox & Wyman, 1954.

Piaget, J. The moral judgment of the child. Translated by M. Gabain. New York: Free Press, 1965. Originally published in English by Harcourt, Brace, & Co., New York, 1932.

Piaget, J. The psychology of intelligence. Translated by M. Piercy & D. E. Berlyne. London: Routledge & Kagan Paul, 1950.

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

Radlow, R., Weidner, M. F., & Hurst, P. M. The effect of incentive magnitude and "motivational orientation" upon choice behavior in a two-person nonzero-sum game. Journal of Social Psychology, 1968, 74, 199-208.

Shapira, A., & Madsen, M. C. Cooperative and competitive behavior of kibbutz and urban children in Israel. Child Development, 1969, 40, 609-617.

Terhune, K. W. Motives, situation, and interpersonal conflict within Prisoner's Dilemma. Journal of Personality and Social Psychology Monograph Supplement, 1968, 8, No. 3, Part 2.

Vinacke, W. E. Variables in experimental games: toward a field theory. Psychological Bulletin, 1969, 71, 293-318.

Vogler, R. E. Awareness and the operant conditioning of a cooperative response. Journal of Psychology, 1968, 69, 117-127.