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Intra-Group Power Relations, Strategy, and Decisions in Inter-Triad Competition *

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ABSTRACT

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Ten pairs of triads of each sex engaged in competition for monetary rewards in a Multiplication Game and a Matching Game. In each of these games, there were 12 contests, four each of three power-patterns. In each event, the two groups cast two votes, (1) which of three alternatives to enter into competition against the choice of the other group, (2) how to allocate a bonus, if they won. Players had the number of votes represented by their weights, in the power-pattern for that event. In comparison with the Board Game used in previous experiments, these triads reached a very high proportion of "triple alliances", typically arriving at consensus without regard to power-differences. A comparison of Winning and Losing Groups strongly suggests that skill and decision-making efficiency are both highly significant factors in winning. These results may be interpreted in terms of the development of intra-group cooperation under conditions of inter-group competition.

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Perhaps no problem in social psychology has aroused more consistent interest than the question of how competitive and cooperative conditions affect performance. Periodic reviews of the subject (e.g., Dashiell, 1935; May and Doob, 1937; Murphy, Murphy and Newcomb, 1937; Deutsch, 1962.) have indicated the variety of conditions which must be taken into account, such as age, sex, social class, motivational characteristics of participants, the character of the incentive or goal, and the internal properties of the interaction situation. Most of the available research has been preoccupied with two general issues; namely, (1) the comparative efficiency of competition versus cooperation is group work or problem solving; and (2) the psychological effects upon individuals of competitive versus cooperative interaction. It should be noted, especially, that nearly all of these investigations have focused upon intra-group situations, rather than inter-group relations.

That is, competition has signified individuals striving to attain a defined goal, whereas cooperation has meant a body of individuals inter-related by virtue of their efforts to accomplish a common task or goal. Very little attention has, so far, been given to inter-group behavior, although this matter has become an active concern of social scientists interested in international conflict (see, for example, almost any issue of the Journal of Conflict Resolution.)

Since this study deals with inter-group competition, we shall not attempt to review investigations with primarily an inter-individual significance, except as they bear directly upon our results. Chiefly important are previous experiments on coalition-formation in triads, out of which the present study arose, and the work of Deutsch, to which reference will be made later.

Two major interests characterize the study of coalitions in intra-group competition, namely, the effects of various power-relationships among competitors, and the identification of basic strategies that determine the character of decisions. Theoretical developments with regard to triads have been presented elsewhere (Vinacke and Arkoff, 1957; Uesugi and Vinacke, 1963; See, also, Gamson, 1961, and Thibaut and Kelley, 1959, pp. 191-219.) Particularly influential has been the formulation of intra-triad power patterns presented by Caplow (1956; 1959), which suggests that individuals reach agreements that correspond to their relative strength--either as it is perceived (Vinacke, 1962) or as it exists in actual fact (Kelley, and Arrowood, 1960.) Since these findings are essential to the plan of the present experiment, it is well to describe at this point how intra-triad power relationships may vary. Previous reports, as well as articles by Caplow, have developed some seven variations, but they really fall into four

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Type of Pattern	Distribution of Power			Description	Typical Coalitions
	Players				
	A	B	C		
I	1	1	1	A = B = C	Any
II	4	3	2	A > B > C; A < (B+C)	BC
III	3	1	1	A > B; B = C	
				A > (B+C)	None

Under "Typical Coalitions" are shown the outcomes predicted by Caplow's analysis, and those which have generally been found to occur in significant frequency. Pattern II raises some interesting questions, when viewed solely from the standpoint of which pair can win or lose. In fact, any pair can actually defeat the third by establishing a coalition. However, the two weaker players can readily perceive themselves as having a disadvantage relative to the stronger one, and therefore may decide to ally in order to overcome the greater power of the stronger member. Kelley and Arrowood (1960) demonstrated that this outcome is especially likely when each player actually gains by the power he holds. For instance, if players are paid commensurately with their strength, but can gain additional reward by alliance, then the two weaker players are likely to establish a coalition. Putting it concretely, suppose that each player receives as many points as he has power, but can obtain all or part of a bonus of two points by bargaining. In this case, players B and C will possess 3 and 2 points, respectively, to A's 4. By allying, they can share two more points. Were they to arrive at a 50/50 deal, then B could tie A and C could at least equal B's initial gains. Although we have not employed the bonus-condition in previous experiments, it has nevertheless regularly been found (Vinacke, 1962) that the two weaker players significantly often ally against the stronger, leading to the proposition that coalitions depend upon perceptionsof the players. An additional consideration is often apparent, also. The stress of bargaining, with the possibility of reaching an impasse, renders the BC outcome as a convenient solution, since it has a readily-understood basis in "fairness", and perhaps, generally in interpersonal behavior.

In practice, it turns out that the seeming simplicity of outcomes shown above, does not adequately describe what occurs. For example, it makes no provision for triple alliances, especially common in female groups (and males may employ it, also, sometimes to equalize the standing among players in order to maximize competitiveness). Nor does it sufficiently take into account the fact that alliances in the all-powerful pattern (III) are far from infrequent (ranging from one-sixth to three-fifths of the outcomes).

Without going into more detail, it is sufficient to point out that triads have been found to display active bargaining under conditions of intra-group competition, and that the distribution of power within the group bears a striking relation to the processes whereby decisions are reached.

As these experiments have continued, increasing attention has been devoted to the general strategies that groups appear to follow in conducting their negotiations. At this stage, the chief result has been to distinguish between the styles of play manifested by the two sexes (Bond and Vinacke, 1961; Uesugi and Vinacke, 1963). Males are characterized by an exploitative strategy, with keen competition, ruthless bargaining, and effort to arrive at as favorable a deal as possible. Females desplay an accommodative strategy, featured by avoidance of competitive bargaining, efforts to equalize outcome, and concern to be fair to everyone. Cultural background (Saunders, 1960), motivational characteristics (Chaney and Vinacke, 1960), and age (Vinacke and Gullickson, 1963) are among those conditions which influence kind of strategy, as well as sex. For these reasons, the more general formulation is preferable to linking strategy with the sex of participants. Work is presently underway, in fact, to develop measures which can be used to assess strategy independently of sex.

We find, then, that in addition to the power-relationships within the group, attitudes towards the situation have a great deal to do with intra-group competition. These considerations constitute part of the background for designing the present study.

A further point enters when we reiterate the fact that these experiments have all dealt only with intra-group competition--an approach, as pointed out above, which has also been typical of most research on competition and cooperation.

Indeed, the literature on inter-group behavior is very sparse. Perhaps the best known studies have been conducted by Sherif and his co-workers (Sherif, and Sherif, 1956, pp. 280-332; Sherif, Harvey, etal., 1961). In these experiments, groups of boys have been extensively observed in the naturalistic setting of a summer camp. Ingenious manipulations of relationships between groups permitted the investigators to create both conflict and subsequent cooperative activity to accomplish a superordinate goal. Competitive conflict was found "to solidify in-group belongingness and solidarity, to strengthen in-group attitudes, and to generate and increase attitudes of hostility toward the out-group." (Sherif and Sherif, 1956, p. 298) When the groups needed to cooperate, however, there was a reduction in tension and a general change towards more favorable judgments of the opposing group (see, also, Coser, 1956.)

A series of excellent experiments by Blake and Mouton (1961a; 1961b; 1962) has dealt with the role of in-group attitudes in inter-group competition. They find that members of groups, and their representatives, tend to define the situation in accordance with their own positions, with the consequence that rational negotiation is distinctly difficult.

Finally, it should be noted that Myers (1962) has recently compared three-man rifle teams under inter-group competition, compared to noncompetitive conditions. In this case, competition had a favorable effect on intra-group adjustment (i.e., interpersonal perception); even under conditions of relative failure, competition was better than non-competitive conditions.

A study more directly related to the present experiment has been reported by McGrath (1962). He compared the performance of 3-man rifle teams in which members had previously assigned favorable ratings to their teammates with teams composed of members who had not done so. The latter had significantly better marksmanship scores and also showed significant improvement. McGrath suggests that "for members of the (non-favorable) group success on the task was central to their situational adjustment and interpersonal relations, while for members of the (favorable) group adjustment was related to interpersonal success rather than success on the task." Generally similar findings have been reported by Fiedler (1954) for basketball and surveying teams, in which success, also, seems to be accompanied by rather less personal involvement among members, than is true for less successful teams. These results bear an affinity to research in a variety of other setting which shows that "self-oriented needs" interfere with effective group production (Cf. Marquis, Guetzkow, and Gyr, 1951). In general, it suggests that intra-group relationships influence the success of the group in competing against another group.

Procedure

Subjects. Ten pairs of triads of each sex were recruited from psychology classes, making a total of 60 males and 60 females. Although they were not paid, remuneration was provided by the monetary pay-off to be described below.

Power-Patterns. The three distributions of strength described above were employed. Counters on which were insctibed the requisite weights were presented to the Ss, who drew in turn. In this experiment, the weight determined how many votes a player could cast on either of the two decisions explained below. Furthermore, one-half of the prize was gained according to weight. The other half was to be allocated according to whatever terms were agreed upon by members of the triad. These conditions were adopted to maximize the probability that weights would influence coalitions, as suggested by Kelley and Arrowood (1960). Score was kept by assigning 100 points to the winning triad, and the Players' totals were computed following play. Each was paid 1/5¢ per point earned.

The following instructions and payoff table were given to each player in writing before play began, and it could be consulted, as desired:

General Terms. Games will be scored by the assignment of 100 points to the winning triad. Of this amount, 50 points will be divided according to the weights of the players. The remaining 50 points is a bonus to be divided according to majority vote of the members. Each member will have as many votes as his weight determines. At the end of the series of games, each player will be paid a cash prize of 1/5¢ per point. Since you will play 24 games altogether, you have a chance to earn a sizeable sum.

Assignment of points (to the winning triad in each game):

Weights	1	2	1	3	1	1	4	3	2
No. Points	16 2/3 ea.			30	10	10	22.2	16.7	11.1
Cash	3.34¢			6¢	2¢	2¢	4.4¢	3.34¢	2.2¢

Four successive games of each power-pattern were played, with all possible orders represented in each pair, and combinations of orders randomized among pairs.

Game-Situations. In contrast to the simple board game employed in previous experiments which is well-suited to intra-group competition, it was necessary to devise situations in which two groups could compete against each other. Furthermore, the games had to provide for the power-patterns under investigation. Finally, the sex differences which have emerged indicated the desirability of including conditions appropriate for both sexes. This requirement is not easy to meet--and it probably was not entirely successful--but by using two different games, preliminary steps in this direction could be taken.

A multiplication game rppresented one kind of contest. It consisted of a series of four-place problems. to which Ss had to guess the answers. The problems used all 10 digits, in an approximately equal distribution. The experimenter (E) simply exposed each problem on a large card, clearly visible to all participants. Following a 30-second inspection, each S wrote his estimate of the answer on a small card. It was stipulated that no more than one zero could be used, as a means to minimize identical guesses. Two minutes were allowed for duscussion after which each triad in the pair voted on one of its three alternatives. As stated above, each player had as many votes as his weight. In addition, the members of each triad voted on how to allocate the bonus, if they should win. Again, votes corresponded to weight. E then announced the correct answer, and the winner was determined. Records were kept of the transactions, votes, and outcome. A separate experimenter administered each triad in the pair.*

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*Mrs. Dora Shu-Fang Dien served with admirable competence as the second experimenter.

A matching game was used as the other situation. It was similar to the game called "matching pennies", familiar to most boys. At the start of each game, the members of each triad drew one of three chips on which were inscribed the names "Elk", "Seal", and "Bear". Two minutes were allowed for duscussion, after which the players voted for one of the names, and also on allocation of the bonus. The names chosen were then announced and the winner was determined, depending upon whether the objective was to "match" or "non-match" the opposing group. These objectives were alternated between the two triads of a pair, and announced in advance in each game.

Order of the two situations was alternated in successive pairs of triads, with each kind of game occurring in a separate experimental session.

Thus, the procedure may be summarized, as follows:

Steps	Multiplication Game	Matching Game
1.	Draw weight counters	Same
2.	Expose problem, 30"	Draw name counters
3.	Ss write estimates (E copied during Step 4)	E records choices
4.	Two minutes discussion	Same
5.	Vote on answers	Vote on name
6.	Vote on bonus	Vote on bonus
7.	Correct answer announced and winner determined	Names announced and winner declared.
8.	Amount of winnings recorded	Same

Preceding play, after the conditions of weights, scoring, and payment, had been presented, the game to be played was fully explained, including all the foregoing steps. These instructions were administerdd orally, in standard fashion, and questions were answered, avoiding, of course, any direction concerning how players were to make their decisions. In point of fact, the opportunity to form coalitions was made quite explicit.

A few comments are in order concerning certain special features of these games. The Multiplication Game can readily be seen to depend at least in part upon skill, that is, ability in arithmetic insofar as the accuracy of estimates are considered. Thus, such points can be investigated as the extent to which groups tend to choose the best alternatives open to them and the degree to which especially skillful members of the group influence decisions. On the other hand, the Matching Game appears to be a matter solely of luck, with a triad having a one-third chance of winning when matching is necessary and a two-thirds chance when non-matching is required. Therefore, there should be no particular skill involved. Furthermore, the Multiplication Game was expected to have a greater interest for male groups, whereas the Matching Game ought to be relatively more appealing to females. We have found considerable evidence in previous experiments that females prefer to leave matters of winning and losing to chance, rather than to the direct pitting of one person's resources against another's. (And here we might even speculate that the Matching Game may permit the alleged feminine "intuition" to operate.)

Results

It will be recalled that two kinds of problems were posed above, namely, the influence of variations in intra-group power upon decisions in inter-group competition, and the differences between winning and losing groups. It will be convenient to consider each of these matters in turn.

Effect of power-variations. With respect to the first issue, the picture is gratifyingly clear. We can determine the result of voting for the two decisions demanded, namely, on choice of entry against the choice of the opposing group, and on the allocation of the bonus. In previous experiments, three types of outcome have occurred. (a) There may be failure to arrive at coalition, most frequently in the all-powerful (3II) pattern, where none is logically to be expected. (b) There may be the typical two-person alliance, described above. Or (c) there may be the establishment of triple alliances. Both the no-coalition and triple-alliance outcomes have been more common in female than in male groups.

In the present experiment, no-coalition was extremely rare. Occasionally, instead of voting, a group might decide by tossing a coin, or adopt some other device to avoid the necessity to vote. Since all of these instances follow after consensus of the group, they are included in the triple-alliance category. Two-person alliances were also infrequent. Only triple alliances are typical of the decisions in this inter-group competition. Table 1 presents the pertinent data, by sex, power-pattern, and winning

Insert Table 1 here

compared to losing groups in the two games. For the sake of comparison, there is shown also the incidence of triple alliances in the Board Game. It can be seen that the great majority of the 40 triads in this experiment reached triple alliances in more than half of the games. In the Board Game, on the other hand, only two of 30 male triads formed any triple alliances, and only four of 30 female triads formed triple alliances in more than 25% of the games. By Chi Square, all the differences from the Board Game are significant at better than the 1% level (and all but one are significant at better than the .001 level.) These results are quite similar for both the Multiplication and Matching Games and also for winning compared to losing groups of both sexes. In general, there is an interesting tendency for losing female triads to arrive more often at triple alliances than do winning groups, but this does not attain significance. However, the female losing triads do differ significantly from male losing triads under the all-equal power pattern in the multiplication game. (P = .01.)

Results for the bonus are even more striking. Every single decision, with one exception, was a triple alliance. In most cases, the prize was divided equally, but other solutions also occurred, including allocation by weight, and assignment of the entire bonus to a single player--sometimes in simple rotation, sometimes to the individual whose answer was chosen, and sometimes merely to equalize the total reward.

Thus, inter-group competition is very different from intra-group competition. It is, of course, possible that comparison with the Board Game should not be regarded as definitive, since both the Multiplication and Matching Games may produce a high proportion of triple alliances, even under intra-group competition. We must await the collection of data, now underway, before the point can be settled. However, it would appear that the ultimate objective of defeating the other group greatly outweighs the chance to secure individual advantage. Players tend to subordinate their separate assets to the general welfare of the group. This characteristic applies to losing, as well as to winning, groups, with the possible difference mentioned above.

Thus, for all practical purposes, the relative strength of players in inter-group competition has very little, if any, influence upon decisions. Observation of the groups revealed very clearly, in fact, that almost no attention was paid to the weights. The experimenters had to keep reminding players about them, which nevertheless had little effect upon their behavior.

Winning vs. losing groups. Turning now to the other problem, a variety of comparisons are possible between the triads which won a majority of the games and those which lost a like number. For our purposes, we shall disregard variations in number of games won, and treat the results in terms of two categories. There was a winner in each of the 10 male pairs in the

Multiplication game, and nine winners with one tie in the female pairs in this game. This report will deal only with these pairs, omitting analysis of the Matching Game. It is worth noting, however, that there were only three ties (of which two were female) in this situation, which was selected because it supposedly depends upon chance. Actually, the distribution of games won resembles that for the Multiplication Game, and there appears to be a definite difference between groups which win and lose in this game. We intend to investigate this point further, since it may cast an important light upon decision-making strategy. But, for the present, only the Multiplication Game will be considered.

We have available the comparative accuracy of guessing, the distributions of guesses within the triad, and difference between available alternative answers (resourcds) and those actually decided upon.*

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*We have scrutinized, also, data bearing upon coalitions, unusual or special features of voting, etc., with some promising leads to the characteristics of winning groups, but these points will be ignored here.

In general, two kinds of factors may be identified, namely, (1) skill (in this case, arithmetical ability), and (2) decision-making efficiency (or intra-group processes.) At present, no clear distinction can be drawn between these two determinants of winning, for, at this stage, our specification of one may also involve the other. For example, the choice of the best alternative can be a function not only of effective decision-making, but also of skill in arithmetic. Nevertheless, some of the indexes to be presented appear to depend more upon one of these determinants than the other.

Consider sheer skill in arithmetic. Table 2 shows the average

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Place Table 2 about here

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error over the 12 games for each man and for the entire group. Data are given for each pair of triads, as indicated by the triad numbers (that is, groups are numbered successively, so that, for example, Numbers 20 and 19 are a pair.) In computing these figures, all estimates were rounded off to six places, to simplify calculations.

In the case of the male triads, the Winning Groups significantly more often than losing groups contain the "best man" among the six players. Furthermore, this holds for all five of the groups which won nine or more times. On the other hand, the tendency for Winning Groups to have the smallest average error is not significant; again, however, it should be remarked that all five of the most frequently winning goups produced smaller average errors. Neither characteristic is significant for female groups. Incidentally, it is quite apparent that male groups tend to have smaller average errors than female groups. By a median test, this proves to be significant for all triads combined ($X^2 = 6.76$, $P < .01$), but does not attain significance when Winning and Losing groups are separately compared.

Another indicator of skill is the possession by a triad of the best number (i.e., that estimate, among the six, which comes closest to the correct answer.) Data are given in the third column of Table 3. In both sexes, Winning Groups more often had the best number (significant at the .05 level or better.)

These three measures, then, strongly support the notion that skill (arithmetical ability) is a significant factor in winning. But these results tell only half the story, for Winning Groups win more often than would be predicted from any of these indexes. A triad does not necessarily choose the best number when it holds it, nor does the best man always come up with a good guess. Thus, we must look at other characteristics associated with decision processes within the group.

<u>Decision-making</u>. Once more, there are a number of possible ways in which groups can be compared. Several of them are presented in Table 3. A word of explanation is in order about the various entries in the table.

Place Table 3 about here

Column 3 has already been mentioned above, as showing the number of times (in 12 games) that each group held among its three estimates the number closest to the correct answer of the six in the pair of opposing triads.

The column headed "A" gives the percentage of times that this "best number" was actually selected by vote of the group (and, of course, this was usually by unanimous decision.)

Column B gives a similar score for the games in which a triad did not hold the "best number"; i.e., it shows the percentage of the time when a group chose the best of its three available numbers when the opposing group held the "best number."

Column C gives the percentage of wins when a triad held the "best number" (i.e., the percentage won of the games shown in the third column.)

Column D gives the percentage of the games won when a group chose the number held by its "best man". In effect, this score indicates the ability of a group to discriminate between good and poor estimates.

Column E is a combination of Columns A and B.

Column F represents a tentative Index to Winning Strategy. For this purpose, one point was assigned to each triad that fell above the median (the two sexes treated separately) on the scores contained in Columns A, B, C, and D.

Neither of the scores in Columns A and B significantly differentiates Winning from Losing Groups, although, for male triads there is a marked trend in this direction. Column C, however, yields a highly significant difference for both sexes, and Column D does so for male triads. The total "score" produces a significant difference for bothsexes, considerably larger for male than for female triads.

Thus, there is substantial evidence that decision-making efficiency is also related to winning. However, the Winning Groups clearly tend to excel on both this factor and skill. A simple count, comparing Tables 2 and 3 shows that seven male winning triads are superior to their losing counterparts in both respects; and one is not much different from its opponent in either respect. Among Losing male triads, three are superior on skill, but not one is superior on decision-making.

Among female Winning Groups, five are superior on both counts, one only on skill, and three principally on decision-making. Of Losing Groups, three are superior on skill, but not decision-making, and one is superior on decision-making, but not skill.

An effort further to clarify the effect of decision-making processes is presented in Table 4. This gives a detailed picture of the kinds of

Place Table 4 about here

decisions reached when the kinds of alternatives open to the triads are taken into account. Since each triad could choose any of three numbers which was matched against the choice of its opponent, there are nine possible combinations of numbers. In order to prepare Table 4, each of these possibilities was determined for each game for each triad, and the number of times that each of the two competitors in a pair could win was counted. This figure may be called "opportunities to win". Despite the fact that the Winning Groups generally have a higher proportion of opportunities (as may be deduced from Table2), there still occur substantial frequencies in the Losing Groups. These have been classified into three levels of opportunity, as shown in the table, namely, (a) when a group has 6, 7, or 8 of the winning combinations, (b) when it has 4, or 5, and (c) when it has 1, 2, or 3. Of course, if a group had all nine winning combinations, it invariably won, but such instances were few. The percentage of the times when a group won under each of the three levels of opportûnity is presented in Table 4.

It can be seen that male Winning Groups significantly more often win, no matter how many opportunities theyhad. Put another way, even when Losing Groups possess markedly greater potential for choosing a winning number, they nevertheless often fail to do so; and, further, when Winning Groups have a low potential, the Losing Groups still manage to lose by making a poor selection. The same tendency is apparent in the female triads, but is achieves significance only at intermediate degrees of opportunity. It may be concluded that Winning Groups not only make better choices, but also that Losing Groups actually make worse choices than their resources allow. That is, Losing Groups fail to win even when there is a high probability of their doing so strictly in terms of the opportunities open to them.

Like the other measures, this one, too, may reflect skill as well as decision-making efficiency, to the extent that discrimination among alternatives requires arithmetical ability. Nevertheless, it is quite clear that there are many instances in which decision-making processes play a major role in determining which triad wins. Winning Groups make a substantial number of comparatively poor decisions (i.e., even when this happens, Losing Groups appear significantly often to select an even poorer number.

Discussion

This experiment shows that inter-group competition is very different from intra-group competition. Although it will still be necessary to ascertain the role of variations in power-relationships in the two games used here, comparison with the Board Game strongly suggests that individual interests become subordinate to the larger objective of defeating the rival group. The members of the group combine their resources to this end, ignoring in large part their differences in strength. In short, what we have called "triple alliances" (perhaps better, "consensus") become the typical of the intra-group competitive situation. There is really no reason why this need be the case, for if a player possesses the power to influence a decision, and believes he is right, he could certainly cast his vote as he pleases. Instead, all members very frequently arrive at a unanimous decision.

The matter cannot be settled this easily, however. It can readily be judged that there is no advantage whatever, in the conditions of this experiment, for an individual to oppose his own interests to those of the group, because no member can gain any rewqrd unless the entire group wins. This suggests a problem for further investigation. We ought to introduce special incentives to individuals, such as offering a bonusto the person whose number wins. Indeed, it should be possible to vary this reward to see how far we can stretch the individual's resistance to following his own interests. We might conceive of two poles, at one extreme when group interest is paramount, and at the other when individual self-aggrandizement is dominant. In this experiment, perhaps, we have a situation that falls fairly close to the first of these poles.

In the meantime, it may be fruitful to interpret the results along the lines suggested by Deutsch's (1962) analysis of cooperation and competition. He desctibes the former as a situation in which "goals for the individuals are promotively interdependent" (p. 276), and the latter as one in which goals are "contriently interdependent" (p. 276). He goes on to say that, "It is possible for individuals to be promotively interdependent with respect to one goal and contriently interdependent with respect to another." (p. 277). This statement well describes the two games, in which intra-group processes in each opposing triad are evidently copperative, whereas the relations between the two groups are competitive.

It may further be pointed out that Deutsch's summary of the effects of cooperative conditions fits nicely the behavior found here. For example, the consensus typical of these groups, with the accompanying subordination of variations in strength and the allocation of the bonus according to common agreement, represents greater coordination of effort (than under intra-group competition), more attentiveness to fellow members of the group, more behavior directed towards helping the group to improve, etc. When there is unequal power among competitors, Deutsch points out, in citing the work of Rosenberg (Rosenberg, 1960), there is no problem "when those who have the most power to determine the outcome have equal or stronger motivation for goal attainment than those with lesser power." (p. 286) This, too, accords closely with our findings.

It may be remarked, in passing, that these distinctions between cooperation and competition also fit the difference between exploitative and accommodative strategy outlined in previous reports in this series. When accommodative strategy predominates in intra-group competition it tends to resemble cooperation. Thus, females, for whom accommodative strategy is more typical, tend to change the game into a cooperative situation! Many unusual episodes in our experiments with female triads could be cited in illustration of this point.

As we pointed out earlier, howevee, most research on cooperation and competition has been concerned primarily either with the characteristics of individual personality--their effects upon behavior, or with group-generated vs. individually produced solutions to problems. The present experiment adds a few dimensions to the small body of information about inter-group behavior.

Several clearly-defined differences have been found between winning and losing groups, pointing towards the interplay of skill and decision-making processes in the determination of success under competitive conditions. From a commonsense standpoint, any devotee of team sports recognizes the importance of both factors. What baseball team, regardless of possessing champion hitters and sterling pitchers, does not prize the gifted manager? Many a game is allegedly won by good decisions (a crucial stolen base, an intentional base-on-balls at a critical moment, or the shift of an outfielder a few steps in one direction or another, etc.)

The results reported above strongly suggest that the highly successful team is outstanding in both properties of skill and effective decision-making. This experiment, however, does not permit us to evaluate their weight, but it does suggest the hypothesis that the margin of winning may reside in the character of intra-group processes. Particularly significant, here, are the data in Table 4, which indicate that some groups lose even when they have better resources (at least in a particular game.)

It should be noted that the two factors stressed in this report are not intended to exhaust the conditions that affect winning. For instance, motivational and other personality variables have been ignored. Desire to win, for example, may be of great importance.

Another point deserves special mention. It will be recalled that the triads in this experiment were recruited in a random fashion, with the result that opposing pairs were adventitiously composed. Thus, there is no apparent reason why winning groups should constitute a sample with generally similar characteristics, except for the fact of inter-group competition (not to be discounted, of course.) Clearly, there was no control over the occurrence of either skill or decision-making ability. We need to study groups that are equated in some manner, in order to assess the importance of a defined variable. For example, we might replicate the present experiment with groups in which arithmetical ability is equalized between competing triads. Or we might somehow match groups on decision-making effectiveness. Another possibility would be to establish a league of teams, so to speak, in which each triad competes an equal number of times against each other team, thus differentiating more sharply the successful from the unsuccessful groups. In the present case, for example, we have no way of knowing whether male Triad No. 1 (see Tables 2 and 3), classified as a winning group (10 of 12 games), but markedly lower than other winning groups on indexes of skill, was successful merely because of the accident of pairing with Triad No. 2.

Further experimentation is thus demanded.

Summary and Conclusions

An experiment was conducted to determine the effects of intra-group power relationships on behavior under conditions of inter-group competition. For this purpose, a Multiplication Game and a Matching Game were devised. In each game, pairs of triads of the same sex were run in a series of 12 contests, four each of the following power-patterns: all-equal, all-different, and all-powerful, with order of patterns randomized. In each contest, triads made two decisions, (1) to choose an alternative as an entry against the choice of the opposing groups, and (2) to allocate a bonus in the event of winning. Within each triad, members had the number of votes that corresponded with their power-weights. Cash prizes were awarded, half by weight, and half as the bonus mentioned. There were 10 pairs of each sex.

Analysis of the results disclosed that the great majority of decisions of both kinds were "triple alliances" (or consensus), in contrast to the two-person alliances typical of intra-group competition.

A comparison of Winning and Losing Groups in the Multiplication Game indicated that both greater skill (in arithmetic) and greater efficiency in decision-making characterize winning. A tentative index of winning, in terms of decision-making, differentiated significantly between Winning and Losing Groups. The results were interpreted as a function of a shift towards intra-group cooperation under inter-group competition.

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Table 1. Incidence of Triple Alliances in Two Games under Inter-Triad Competition, Compared to Intra-Triad Competition in a Board Game.

MALE GROUPS

	Board Game	Multiplication		Matching	
		Winning Groups	Losing Groups	Winning Groups	Losing Groups*
N	30	10	10	9	11
% of Games					
ALL-EQUAL (111)					
76 or more	0	6	2	5	5
51 - 75	0	2	3	2	2
26 - 50	2	2	2	1	2
0 - 25	28	0	3	1	2
Note: All differences from Board Game, $P < .001$.					
ALL-DIFFERENT (432)					
76 or more	0	8	4	5	5
51 - 75	0	2	2	3	3
26 - 50	0	0	2	1	1
0 - 25	30	0	2	0	2
Note: All differences from Board Game, $P < .001$.					
ALL-POWERFUL (311)					
76 or more	0	7	5	4	4
51 - 75	0	2	3	3	2
26 - 50	0	0	1	1	4
0 - 25	30	1	1	1	1
Note: All differences from Board Game, $P < .001$.					
TOTAL					
76 or more	0	8	3	6	4
51 - 75	0	2	5	2	3
26 - 50	0	0	2	1	2
0 - 25	30	0	0	0	2

Note: All differences from Board Game, $P < .001$.

Other comparisons: No difference between Winning and Losing Groups is significant.
No difference between Multiplication and Matching is significant.

*Includes two groups which tied.

Table 1. (Continued)

FEMALE GROUPS

% of Games	Board Game	Multiplication Winning Groups	Multiplication Losing Groups*	Matching Winning Groups	Matching Losing Groups*
N	30	9	11	8	12
ALL-EQUAL (111)					
76 Or more	2	5	9	3	7
51 - 75	7	2	1	2	3
26 - 50	6	2	1	3	0
0 - 25	15	0	0	0	2

Note: Difference from Board Game significant, as follows: Multiplication, Losing Groups, $X^2 = 15.5$ ($P < .001$): Matching, Winning Groups, $P < .001$ (Exact Test), Losing Groups, $X^2 = 10.0$ ($P < .01$).

% of Games	Board Game	Multiplication Winning Groups	Multiplication Losing Groups*	Matching Winning Groups	Matching Losing Groups*
ALL-DIFFERENT (432)					
76 or more	0	5	6	6	5
51 - 75	1	2	2	1	4
26 - 50	1	2	2	0	2
0 - 25	28	0	1	1	1

Note: All differences from Board Game, $P < .001$.

% of Games	Board Game	Multiplication Winning Groups	Multiplication Losing Groups*	Matching Winning Groups	Matching Losing Groups*
ALL-POWERFUL (311)					
76 or more	0	4	9	3	3
51 - 75	1	3	1	4	2
26 - 50	0	1	1	1	0
0 - 25	29	1	0	0	2

Note: All differences from Board Game, $P < .001$.

% of Games	Board Game	Multiplication Winning Groups	Multiplication Losing Groups*	Matching Winning Groups	Matching Losing Groups*
TOTAL					
76 or more	0	6	8	4	6
51 - 75	1	3	2	4	2
26 - 50	3	0	1	0	1
0 - 25	26	0	0	0	3

[* Omitted.]

Table 1. (Continued)

Note: All differences from Board Game, $P < .001$.

Other comparisons: No difference between Winning and Losing Groups is significant.

No difference between Multiplication and Matching is signifimant.

Under All-Equal, for Losing Groups, Multiplication, Male vs. Female, $P = .01$ (Exact Test).

* Groups which tied included with Losing Groups.

Table 9. Comparison of Winning and Losing Groups in Terms

of Mean Errors (Multiplication)

MALES Group	Games Won	Winning Groups Players A	B	C	Ave.	Losing Groups Group	Games Won	Players A	B	C	Ave.
20	12	2.5	1.2x	1.7	1.8y	19	0	5.6	3.6	5.1	4.8
5	10	2.0	2.5	1.3x	1.9y	6	2	5.3	4.6	3.6	4.5
10	10	.5x	1.3	4.2	2.0y	9	2	5.2	5.7	1.5	4.1
1	10	38.1	2.7	1.1x	14.0y	2	2	26.2	12.6	40.7	26.5
12	9	4.1	2.6x	5.1	3.9y	11	3	18.3	5.0	2.9	8.7
7	8	.6x	3.5	4.3	2.8y	8	4	8.2	3.9	1.6	2.9
17	8	7.8	5.2	4.9	6.0	18	4	3.7	.7x	4.8	3.1y
4	8	1.3x	2.7	3.3	2.4y	3	4	8.6	11.6	2.4	7.5
13	7	3.0	3.7	12.2	6.3	14	5	3.0	3.3	3.4	3.2y
15	7	9.9	2.8	.7x	4.5	16	5	2.5	2.2	2.0	2.2y
FEMALES											
10	10	3.2x	13.3	3.3	6.6y	9	2	7.5	12.5	11.7	10.6
13	9	.4x	1.6	10.3	4.1y	14	3	42.4	42.7	3.8	29.6
2	8	2.3	2.4	4.4	3.0	1	4	2.9	2.0x	2.1	2.3y
7	8	11.6	13.9	4.9	10.1	8	4	16.8	4.5x	4.1	8.5y
12	8	24.9	19.5	8.9	17.8	11	4	11.2	2.2x	2.4	5.3y
15	8	9.3	4.6	3.4x	5.8y	16	4	10.7	5.8	4.0	6.8
17	8	1.9x	4.7	2.6	3.1y	18	4	26.0	8.0	6.6	13.5
20	8	7.0	4.1x	8.7	6.6y	19	4	14.4	11.9	5.3	10.5
4	7	11.7	5.5x	12.8	10.0y	3	5	11.7	16.8	19.8	16.1
5	6	7.6	10.9	10.1	9.5	6	6	16.0	64.8	15.8	32.2

Notes:

1. Occurrence of the "best man" in a pair is indicated by "x". The difference between Winning and Losing male groups is significant ($X^2 = 9.80$, $P < .01$); the difference is not significant for female groups.
2. The tendency, in both sexes, for Winning groups more often to have a lower average error (indicated by "y") fails to attain significance.

Table 3. Characteristics of Winning and Losing Groups

in the Multiplication Game.

Male Groups

No.	Games Won	No. Games Had Best No.	A. % Time Chose Best No.	B. % Chose Own Best Other Games	C. % Games Won When Could Win	D. % Won When Voted Best Man	E. % Chose Best + Own Best	F. "Score"*
WINNING GROUPS								
20	12	8	88	75	100	100	83	4
5	10	9	67	67	100	0	67	3
10	10	9	44	67	100	75	50	3
1	10	8	38	0	100	75	25	2
12	9	7	71	40	86	100	58	3
7	8	6	83	100	100	75	93	4
17	8	6	83	83	100	0	83	3
4	8	7	29	100	86	50	58	3
13	7	7	57	60	86	43	58	2
15	7	5	100	86	100	56	93	4
		(a)			(b)	(c)		(d)
LOSING GROUPS								
16	5	7	14	60	71	43	33	0
14	5	5	80	43	80	75	58	2
3	4	5	40	71	60	57	58	2
18	4	6	33	83	67	33	58	1
8	4	6	50	67	67	33	58	2
11	3	5	40	43	40	43	42	0
2	2	4	25	38	25	17	33	0
9	2	3	83	67	67	20	58	1
6	2	3	67	56	67	0	58	1
19	0	4	0	50	100	0	33	1

*"Score" is composed of one point for falling above the median on items A, B, and C and D. Summary of Median Tests (by Fisher Exact Test): (a) Winning vs. Losing groups, $P < .05$; (b) Winning vs. Losing groups, $P < .001$; (c) Winning vs. Losing groups, $P < .01$; (d) Winning vs. Losing groups, $P < .01$.

Table 3. (Continued)

Female groups

No.	Games Won	No Games Had Best No.	A. % Times Chose Best No.	B. % Chose Own Best Other Games	C. % Games Won When Could Win	D. % Won When Voted Best Man	E. % Chose Best + Own Best	F. "Score"*
WINNING GROUPS								
10	10	7	86	0	100	86	50	3
13	9	9	56	67	89	78	58	4
2	8	3	33	50	100	0	25	2
7	8	9	33	33	78	80	33	2
12	8	7	71	80	100	64	75	4
15	8	7	43	40	86	80	42	3
17	8	5	60	57	100	67	58	4
20	8	7	57	80	86	60	67	4
4	7	7	29	40	71	43	33	0
		(a)			(b)			(c)
TIEING GROUPS								
5	6	8	50	75	75	60	58	3
6	6	4	50	38	100	100	42	3
LOSING GROUPS								
3	5	5	20	29	60	100	25	1
19	4	5	40	0	60	60	17	1
18	4	7	29	60	57	0	42	1
16	4	5	40	43	60	17	42	0
11	4	5	40	33	80	38	50	2
8	4	5	33	57	67	40	33	0
1	4	9	33	0	44	33	25	0
14	3	3	67	67	67	50	67	2
9	2	5	20	43	40	33	33	0

*"Score" is composed of one point for falling above the median on items A, B, C, and D.

Summary of Median Tests (by Fisher Exact Test): (a) Winning vs. Losing Groups, P = .05; (b) Winning vs. Losing Groups, P < .01; (c) Winning vs. Losing Groups, P = .05.

Note: No difference between the sexes is significant, although all comparisons favor male groups.

Table 4. Winning Compared to Losing Groups in Terms of Proportion of Games Won of Opportunities to Choose Winning Number.

% Won	Male Groups 8+7+6 W	L	5+4 W	L	3+2+1 W	L	Female Groups 8+7+6 W	L	5+4 W	L	3+2+1 W	L
90-100	8	2	5	1	1	0	6	2	4	0	0	0
80-89	0	1	0	0	0	0	0	0	0	0	0	0
70-79	1	2	2	0	0	0	1	2	2	0	0	0
60-69	1	0	1	0	2	0	0	1	3	0	2	0
50-59	0	2	1	1	3	0	2	3	0	0	2	1
40-49	0	0	0	0	0	0	0	0	0	0	1	0
30-39	0	2	0	1	0	1	0	1	0	3	1	0
20-29	0	0	0	2	2	1	0	0	0	2	1	1
10-19	0	0	0	0	0	1	0	0	0	0	0	0
0-9	0	1	1	5	2	7	0	0	0	4	2	7
	10	10	10	10	10	10	9	9	9	9	9	9
P	$<.01$		$<.01$		$<.01$		n.s.		$<.001$		$<.10$	

Explanations:

In each game, the two groups can produce nine combinations of numbers. The category at the top of each column gives the number of times that one of the two numbers would win if that combination occurred. % Won is the proportion of times that a group won when a given combination could have occurred. W. and L refer to Winning and Losing Groups, respectively.