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1949
AN EXPERIMENTAL STUDY OF
THE EFFECTS OF CO-OPERATION
AND COMPETITION UPON
GROUP PROCESS

MORTON DEUTSCH

In a previous article in this Journal
(2) a theory of co-operation and com-
petition was outlined and then applied
to the functioning of small groups.
The theoretical development proceeded
along the following steps: (i) the social
situations of co-operation and com-
petition were defined; (ii) some of the
logical implications inherent in the
definitions were pointed to; (iii) with
the introduction of psychological
assumptions, some of the psychological
implications of the definitions of the
two objective social situations were
then drawn; (iv) the psychological
implications, with the aid of additional
assumptions, were then applied to
various aspects of small-group function-
ing to develop a series of hypotheses
about the effects of co-operation and
competition upon group process; and
(v) finally, the concept of group was
defined and linked with the concept of
co-operation, thus making the preceding
theoretical development with respect to
coop-eration relevant to group concepts.

In the present article an experimental
study of the effects of co-operation and
competition upon group process will
be reported. The study has two
purposes: (i) to provide evidence
directly relevant to the hypotheses
about group functioning that were
developed in the preceding article and
thus indirectly to provide the basis for
evaluation of the theory of co-operation
and competition from which these
hypotheses were developed; (ii) to
stimulate the use of experimental
methods in group research by demon-
strating once again, in the spirit of the
successful pioneering studies (7, 5, 4)
conducted by members of the Research
Center for Group Dynamics, that
experimental methods are both feasible
and rewarding in the investigation of
group problems.

The article is divided into the follow-
ing four sections: (I) The Experimental
Design; (II) The Measuring Instruments;
(III) The Experimental Results, and
(IV) Summary and Conclusions. To

1 For Part I of this paper, see Human Relations, Vol. II, No. 2. The author is indebted to Professor
Ronald Lippitt, his thesis sponsor, who was constantly encouraging; to Professor Leon Festinger,
for many constructive suggestions in the design of the experiment and analysis of the results;
to Professor Maas Haire, who was instrumental in obtaining the subjects for the experiment;
to Dr. Gordon Hearn, who materially assisted in many ways; and to the staff and students of the
Research Center for Group Dynamics for many stimulating discussions. I am particularly
indebted to the observers: they include Mimi Guerrero, Dorothy Raphson, Anita Kassen,
Barbara Myers, Gil Krueke and Arthur Bryant. Perhaps, most of all, deep gratitude is owed to
the M.I.T. students who, participating in the experiment, let themselves in for more than they
bargained and yet persevered, almost to a man, till the end of the experiment.
obtain an over-all perspective of the experiment and its results, it is suggested

I: THE EXPERIMENTAL DESIGN

(a) Background considerations
In setting up the experiment to test the hypotheses developed in the preceding article, it was necessary to have the following: (i) intelligent and reasonably well-adjusted subjects who would regularly attend experimental sessions over a period of time; (ii) some degree of control over the goals the subjects strove for (so as to be able, through manipulation of these goals, to place the subjects in co-operative or competitive situations); (iii) a readily observable situation.

After much preliminary investigation it became obvious that the somewhat unorthodox Introductory Psychology course offered by the Industrial Relations Section at the Massachusetts Institute of Technology might provide the means by which the conditions above could be satisfied. Through the excellent co-operation of the Industrial Relations Section it became possible to make the experimental sessions an integral part of the psychology course. Regular attendance was thus assured; the experimenter-instructor's control over grades and assignments also provided the necessary degree of control over the goals of the subjects.

Questions of economy and of responsibility to the students, however, required certain limitations: (i) that the number of groups be limited; (ii) that the number of students in a group be relatively small; (iii) that the content of group meetings be relevant to "Introductory Psychology"; (iv) that "experimentation," questionnaire administration, etc., be limited to the amount that could be tolerated by the subjects and to an amount which would permit achievement of the course objectives.

(b) Subjects and Matching of Groups
At the first meeting of the various Introductory Psychology sections, it was announced that the department was interested in doing research on its Introductory Psychology course and that, as part of this research, it was planning to form some small sections to be composed of five students and one instructor. It was asserted that the experimental sections would meet once weekly as a substitute for the regularly scheduled three one-hour meetings. Nothing specific was stated about the research except that it was research which had the purpose of improving the Introductory Psychology course. Volunteers were requested and, fortunately, more than enough volunteers were obtained.

The fifty odd volunteers were then divided into ten tentative groups on the basis of their available meeting times. Though this very much limited the possibility of matching personalities as well as groups, some flexibility still remained because of the large overlapping that existed among the time schedules of the various subjects.

All the volunteers were administered the following tests: "The A-S Reaction Study," "Wide Range Vocabulary Test" and the University of California Ideology questionnaires. On the basis of these tests and other face-sheet data about the individuals, the most deviant students were eliminated as subjects. After this elimination no freedom existed, in terms of the time schedules for group meetings, for shifting of subjects from group to group.

The next step was to match pairs of groups. The following procedure was used: each group, at its first meeting together, was told, "You are to be constituted as a board of human relations experts. As experts, each week you will be presented a human relations problem. Your job is to analyze and discuss the problem and to formulate, in letter form, some written recommendations." They were then presented with a human relations problem, having to do with a question of discipline in a children's camp. A total of fifty minutes for the discussion and writing of recommendations was allowed. Each of the groups was rated by the experimenter on a nine-point scale in terms of the productivity of their discussion of the problem presented to them. Groups were then paired off in terms of these ratings and by a random procedure one group of each pair was assigned to the 'co-operative' treatment and the other to the 'competitive' treatment.

The rationale of the matching of groups rather than individuals is as follows: if we accept the notion that a group is not merely the sum of its parts, it is evident that matching of individuals (parts) is not a sufficient basis for matching groups—groups have to be matched as functioning entities. The rationale for using the experimenter's judgment as the sole criterion for matching was one of expediency. He was the only experienced observer available for such ratings; during these first meetings, the other observers were still in the process of being trained.

(c) The Experimental Instructions
After the first week, during which time the groups were paired, one of each pair was exposed to a co-operative situation, the other was exposed to a competitive situation. The co-operative and competitive instructions which created the experimental variables are presented below.

I. Instructions Read to the Co-operative Groups
(i) Puzzle Problems
Every week you will be given a puzzle to solve as a group. These puzzles are, in effect, tests of your ability to do clear, logical thinking as a group. Your effectiveness in handling the problem will be evaluated by ranking you as a group in comparison with 4 other groups who will also tackle the same problems. Each of the 5 groups will be ranked—the group that works together most effectively will receive a rank of 1, the next most effective group will receive a rank of 2, the least effective group will receive a rank of 5. The ranks each group receives on the weekly problems will be averaged—at the end of it all we should be able to have a pretty good picture of each group's ability to do clear, logical thinking.

To motivate you to contribute your best efforts, we will have a reward. The group that comes out with the best average will be excused from one term paper and will receive an automatic ""H"" for that paper. That is, if your group receives the highest rank all of you will get excused from one term paper and will receive an automatic ""H."

You are to come out with one solution as a group. When you have decided as a group that you have reached a solution, let me know by handing me your answer written on this answer sheet.

(ii) Human Relations Problem
There are two principal factors determining your grade for this course.

2 It should be understood that "pure" co-operative and competitive situations (see preceding article) were not created by the instructions. Other goals, related to such needs as recognition and affiliation, made the co-operative situation partly competitive and the competitive situation partly co-operative. Nevertheless, other things held constant, the instructions were such as to make the co-operative situation relatively more co-operative than the competitive situation and the competitive situation relatively more competitive than the co-operative situation.

3 As "H" at M.I.T. is the highest grade obtainable.
Experimental Study of Effects of Co-operation and Competition upon Group Process

You will be allowed a total of 50 minutes for both the discussion and the writing of recommendations. You are to write your recommendations in letter style, on this form which I have provided.

You will be notified when you have only 20 minutes, 10 minutes, and five minutes left.

At the beginning of the experiment, after reading the instructions, the experimenter asked if there were any questions. If any, the instructions were repeated and clarified until there was evidence of clear understanding. To all questions pertaining to the nature of the experiment or observations, the experimenter responded with a promise of full, detailed explanation at the end of the experiment. The co-operation of the subjects in not discussing problems, etc., outside of the group meetings was solicited. The same instructions were repeated at each group meeting. Subjects in both the co-operative and competitive groups were not informed about their weekly grades until the end of the experiment.

During the five weeks of experimentation, each of the groups met once weekly for a period of approximately three hours. The schedule of a meeting was as follows: (i) The experimenter read the appropriate instructions for the group. (ii) The group undertook the solution of the puzzle and worked at it until they had finished a group solution. (iii) The students then filled out a brief questionnaire while the observers made various ratings. (iv) The experimenter read the appropriate instructions for the human relations problem. (v) The group was allowed a total of fifty minutes for the discussion and writing of recommendations. (vi) The students then filled out a lengthy questionnaire. (vii) There was a 10-15 minute break. (viii) The rest of the three hours the experimenter informally lectured (encouraging active discussion) on psychological principles such as are involved in "need theory," "level of aspiration," "conflict," etc. Each of the ten groups received the same informal lectures in any given week; this similarity of content despite the latine square arrangement of problems (see (e) of this section), required that the instructor avoid discussing the human relations problem tackled by the group in the preceding hour.

It should be clear that the discussion and solution of both the puzzles and human relations problems were undertaken by the various groups without the participation of the experimenter-instructor. During these discussions he sat at a table with the other observers and functioned solely as an observer.

It should be emphasized that the only differences introduced into the three hour meetings by the experimenter-instructor were the differences in instructions read to co-operative and competitive groups. The experimenter-instructor tried to create a friendly, informal, but impersonal relationship with all groups.

(d) The Problems

The function of the problems was to provide a medium for the occurrence of group process. Not all media are alike. The process that occurs is a resultant of both the properties of the group and the properties of the group's medium or environment. The communication hypotheses, presented in the preceding article, thus make different predictions for different kinds of environments.

The background considerations, previously outlined, dictated that human relations problems be used as group tasks. In addition, for comparative purposes, it was thought that it would be interesting to have the groups confronted with problems of a rather
The human relations problems are tasks in which there are no clearly discernable 'objective' criteria of locomotion; they are tasks in which the group itself, through consensus, provides the criteria for judging locomotion. In addition, the content of these problems is likely to evoke strongly-held personal value systems among the discussants. The puzzle problems were, for convenience, chosen for contrast. Due to their objective (i.e., logically demonstrable) solutions, locomotion could take place without group consensus. This, of course, provided the possibility for relatively more individual work in the puzzles than in the human relations problems. The relative lack of ideological relevance of the content of the puzzle problems also made conflict more likely in the human relations problems.

1. A Human Relations Problem

I have noticed that a fellow I've been working with lately has been seriously worried about something. I want to help him. This is the story he told me the other day when we stopped in for a drink after work.

"I am a World War II veteran. I have been home for three months after having served two and a half years overseas. I had been married a year and a half and my son was five months old when I left. My wife and I have always been very much in love with one another. My wife is a very intelligent, sensitive person who carries with her the imprint of her father's unfaithfulness to her mother and of the shame and humiliation which she and her mother suffered as a result. Consequently, she regards faithfulness as the one indispensable condition of a successful marriage. I share my wife's conviction but feel that above all a husband and wife must always be completely frank with one another if their relationship is to be a happy one.

While I was overseas in England and France we wrote regularly to each other, but, as time went on, home seemed to become less and less real to me. During the first year or so, despite the urgings of my buddies in the squadron, I didn't have any dates. My passes were spent at Red Cross centers or around the base. I was pretty lonely, homesick, and just plain miserable. I guess I was a pain to my buddies, for one night they more or less insisted that I go along with them to a dance in town. It was fun dancing with one girl in particular who seemed to be able to follow American steps. We got pretty well acquainted and to make a long story short, one thing led to another and for the next year I spent all my passes with her. She knew I was married and that our relationship was only for the duration but she seemed to enjoy my company as much as I did hers. I never spoke of her in my letters to my wife because at first it was harmless but later it became more involved, I felt I would have to explain it to her in person for her to really understand.

When I got home three months ago I tried.

I started to broach the subject in a general way by talking of life overseas. My wife said how hcerned she had been by stories she had heard of how married men had behaved over here. She was so relieved, she said, that it hadn't happened to us. Naturally, after that, I felt that I couldn't say what I had started to say.

I suggested that he forget all about it and not tell his wife, but he said, "I feel terribly guilty and think that if I don't tell her there will always be a barrier between us which would make our marriage difficult, and yet I am afraid that if I do tell her, it will be a blow to my wife which might break up our marriage."

"My problem is further complicated by a letter I received the other day from the girl overseas in which she described the terrible conditions under which she lived and asked if I could help her out by sending food packets."

I still think that my suggestion to him is a good one, but since he doesn't seem to like it, I don't see why he just doesn't go ahead and tell his wife all about this affair.

(a) Can you give me any idea why he can't make up his mind?

(b) What do you think is the wisest thing for him to do assuming that for his own peace of mind he can't just forget the matter?

(c) What can I do to help him?

2. A Puzzle Problem (The Vicar's Daughters)

The vicar gave each of his daughters eight shillings to spend at the bazaar.

"I want each of you," he said, "to buy a present for Mrs. Brown, Mrs. Jones, Mrs. Robinson, and Mrs. Smith."

"Each present bought must cost exactly one shilling or some multiple of one shilling."

"Each of you must choose a different method of dividing her eight shillings into four separate sums."

"Each old lady's presents must have cost the same aggregate sum."

The girls carried out these instructions. Flora spent more on Mrs. Brown than on the other three ladies together. Clara spent as much on Mrs. Smith and Mrs. Robinson as Flora spent on the other two ladies.

Marie spent more on Mrs. Jones than on any of the others, and Eva similarly spent more on Mrs. Robinson.

The fifth daughter's name is Sally.

How did each girl allocate her money?

(a) The Latin Square Design

Several factors combined to make the latin square a particularly advantageous experimental design: (i) the limited number of subjects available, combined with considerations of observer economy, etc., made it impractical to consider forming more than ten experimental groups; (ii) the interest in developmental differences; (iii) the extreme difficulty of equating beforehand the various human relations problems and the various puzzles (it was, of course, necessary to be able to equate or eliminate the effect of differences due to the problems in order to be able to study development); (iv) the necessity, particularly in light of the small number of groups, of eliminating from the error variance the effect of the non-random differences introduced by differences among groups and among pairs, differences due to the effect of 'time,' and differences due to the varying problems.

Co-operative Minus Competitive

<table>
<thead>
<tr>
<th>Human Relations</th>
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</tr>
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<tbody>
<tr>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>1</td>
<td>I  A  B  C  D  E</td>
</tr>
<tr>
<td>II</td>
<td>I' B  C  D  E  A</td>
</tr>
<tr>
<td>III</td>
<td>I' B  C  D  E  A</td>
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<td>IV</td>
<td>I' B  C  D  E  A</td>
</tr>
<tr>
<td>(Subs) (Subs)</td>
<td>(Subs) (Subs)</td>
</tr>
</tbody>
</table>

Co-operative Minus Competitive

<table>
<thead>
<tr>
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<th>Meeting Number</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>1</td>
<td>I  A' B' C' D' E'</td>
</tr>
<tr>
<td>1'</td>
<td>B' C' D' E' A'</td>
</tr>
<tr>
<td>III</td>
<td>C' D' E' A' B'</td>
</tr>
<tr>
<td>IV</td>
<td>D' E' A' B' C'</td>
</tr>
<tr>
<td>(Subs) (Subs)</td>
<td>(Subs) (Subs)</td>
</tr>
</tbody>
</table>

A—A Prejudiced Incident in the Barber Shop
A'—The Liars

B—Cheating at College
B'—The Vicar's Daughters

C—World War II Vet
C'—A Case of Kinship

D—Introducing Negro Workers into a Factory
D'—A Square in Bloomsbury

E—Selecting Supervisors
E'—The Five Pedagogues

4 The human relations problems were constructed in collaboration with Dr. Gordon Hear.
The latin square design achieves its precision by arranging it so that each problem occurs only once in each column (time) and in each row (group). By subtracting from the total variance of scores the variances due to differences among groups or pairs, among time (plus psychology instruction), and among problems, we have remaining an error variance which is not enlarged by systematic variables.

In effect, in the course of this experiment, four latin squares were created: (i) Co-operative Human Relations, (ii) Co-operative Puzzles, (iii) Competitive Human Relations, (iv) Competitive Puzzles.

In addition to the above four latin squares, four more were formed, in the process of analyzing the data, by subtracting Competitive from Co-operative latin squares and by subtracting Human Relations from the Puzzle latin squares. The focus of this study will be primarily upon the Co-operative-Competitive latin squares; the other data will be reported more fully in an article currently in preparation (3).

While the latin square design is efficient in many respects, it should be noted that for certain purposes the design is uneconomical. Thus, it becomes difficult to study the interrelationship among variables with such a small number of groups. A case study approach is handicapped by the different sequence of problems experienced by each group. Consequently in this study no attempt will be made to equate the interrelationships among variables or will the case study approach be used in an attempt to explain differences among groups.

II: MEASURING INSTRUMENTS

For convenience, one can classify the instruments used in this study into two categories: A. Instruments used by Observers; B. Instruments used by Subjects.

A. Instruments used by the Observers

For most of the experiment there were two observers. The following tasks were assigned respectively to the different observers: (i) 'Functions Observation Sheet,' (ii) 'Phase Observation Sheet,' (iii) 'Communications Observation Sheet,' (iv) 'The Style Observation Sheet,' and a clinical, descriptive recording of group process. All four observers, in addition, filled out the 'Over-all Rating Scales' after each problem was discussed.

Only the data collected from the 'Functions Observations' and from the 'Over-all Rating Scales' are being reported here.

1. The Functions Observations Sheet.

The job of the observer was to categorize each participation of the members in terms of the following: (i) who spoke (or gestured); (ii) to whom the remark was addressed; (iii) the intent of the participant; and (iv) length of the participation. Arbitrarily it was decided to use the utterance to define a unit of participation, with the exception that if more than one function distinctly occurred in any utterance two or more categorizations would be made. To provide the possibility of cross-analysis with other instruments, a new 'recognition-seeker,' 'self-defender,' and 'self-observer.'

The observer, using this instrument, was trained for approximately thirty hours before observing the experimental group meetings. Several steps were involved in the training process: (i) familiarization with the categories and their definitions; (ii) familiarization with the observation sheet and the location of categories on the sheet; (iii) learning to perceive the intent or purpose of the participant; (iv) acquiring skill in the rapid perception and recording of intent in the discussion group situation: (v) familiarization with the kind of content likely to occur in the experimental discussion groups.

2. The Over-all Rating Scales were rated by each observer at the end of each problem. These are a series of nine-point rating scales. The rating scales covered such things as group discussion productivity, individual discussion productivity, group orientation, self-centeredness, involvement, communication difficulties, attentiveness, acceptance-rejection, etc. All of the rating scales apply to the entire discussion of any given problem.

Due to the fact that the subjects filled out rather lengthy questionnaires at the end of the discussion of the human relations problems, it became possible to use the following procedure in the rating of such discussions: (i) first each observer independently made ratings; (ii) then the observers compared and discussed their various ratings, making explicit their reasons for making each rating; (iii) finally the observers each made re-ratings.
independently—sometimes changing their original ratings, sometimes leaving them alone. In statistical computations the averages of these second ratings have been used. There were several reasons behind the use of this procedure—it was thought that: (i) the discussions of the ratings would provide an excellent method for mutual sharpening of perceptions; (ii) this method would facilitate the formation of common standards for judgment and thus make cross-analysis more feasible; and (iii) ratings obtained by this method would probably be the most reliable and most valid.

Lack of time at the end of the puzzle problems prevented inter-observer discussion of ratings; consequently the ratings used in the statistical computations for the puzzles are averages of the independent ratings of the observers.

In considering the various ratings, we should keep in mind that it was impossible to maintain any absolute standards. The ratings more or less presumed a standard of judgment based on experience with groups of Introductory Psychology students. Thus, the emphasis throughout will be primarily on the direction of the obtained differences rather than on size of the differences.

The results themselves give prima facie evidence that the observing instruments have sufficient reliability for many of the present purposes. The validity of the observations and ratings, however, cannot be directly determined from the results. One of the primary questions that may arise with respect to the validity of the observations may be concerned with a possible bias among the observers. Thus, if the observers were disposed to see the co-operative groups as being better than the competitive groups, any significant results might be a reflection of this predisposition rather than of real differences.

There is no simple way to insure that the observers had no such predisposition. However, two kinds of evidence support the belief that the observers did not bias their observations in terms of any preconceptions about co-operation and competition: (i) impromptu statements from the observers to the effect that if they were allowed to keep the instructions in mind they would have a better interpretive frame of reference for their observations. In addition, in rather candid sessions at the end of the experiment, the observers attested that their observations were not influenced by knowledge that a group was "coo" or "comp" (the terms used by the experimenters in referring to the two types of groups during the course of the experiment); (ii) the second kind of evidence is indirect but, nevertheless, quite convincing. Data collected from the subjects strongly agree with the results from data collected by observers. Since there is no reason to suspect the subjects of bias (they didn't know what the experiment was about), this is good indication of lack of bias in the observers.

B. Instruments used by the Subjects

1. The Weekly Questionnaire: At each meeting after the discussion of the Human Relations problems, the subjects filled out a questionnaire. The items on the questionnaire consisted for the most part of rating scales which roughly paralleled those in the observers' Over-

...
Grading method preferred:

<table>
<thead>
<tr>
<th></th>
<th>Co-operative</th>
<th>Competitive</th>
<th>No preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Indiv co-op</td>
<td>11</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>By Indiv comp</td>
<td>6</td>
<td>11</td>
<td>3</td>
</tr>
</tbody>
</table>

Since there is no reason to suspect that these differences existed at the beginning of the experiment, one can conclude that roughly the same percentage of individuals were satisfied with the method of grading to which they were exposed.

Clearly, then, the instructions ‘get over’ to the subjects in both kinds of groups and further they ‘get over’ in such a way as to seem satisfactory to approximately the same percentage in both groups. The importance of this latter point lies in the possibility that if disapproval of the grading system occurred in sufficient strength, the nature of the social situations might have been changed markedly enough to make the experimental variables impotent.

(b) Perceived Interdependence

One of the basic hypotheses of this study, Hypothesis I, asserts that Indiv Co-op will perceive themselves to be more promtively interdependent than will Indiv comp. Table I presents some relevant data.

The data reveal that group-centeredness (‘we-feeling’) was rated by the observers to be considerably higher in the co-operative groups for both the puzzles and the human relations problems. The ratings of the subjects, in the questionnaire pertaining to the human relations problem, give the same results. The Indiv co-op give themselves credit for more ‘group-feeling’ than do the Indiv comp. These differences with respect to ‘group-centeredness’ and ‘group-feeling’ are significant at the 1% level for both the puzzles and human relations problems. Thus, if we accept these measures as appropriate empirical co-ordinations, the evidence gives support to the first part of the Hypothesis (perceived promotive interdependence).

The second part of the hypothesis (Indiv comp will perceive themselves to be more contiently interdependent than will Indiv co-op) is partly supported by the same evidence that supports the first part of the hypothesis. Thus, the competitive group members were rated to be more self-centered by the observers; likewise, the Indiv comp rated themselves as being more self-oriented than did the Indiv co-op. ‘Perceived co-ordinated interdependence,’ however, seems to include, in addition to ‘self-centeredness,’ the notion of ‘I versus the others.’ To measure this component, the subjects were asked (C): “How competitive with the other members in your group did you feel you were during the discussion (of the human relations problem)?”

The results obtained here are not so conclusive, though they tend to support the hypothesis (see Table 1, ‘competitiveness’). Two pairs support the hypothesis at the 1% level; one pair supports it at the 13% level; two pairs reject the hypothesis at the 14% and 23% level respectively. Somewhat surprised by the lack of clean-cut results with respect to this question, the author queried a sample of the Indiv co-op as to what they meant by ‘competitiveness’ when they made their rating. Several responded that when they indicated that they felt competitive they meant that they felt an obligation to do their equal share in helping the group to move along. Thus, it seems probable that the lack of clean-cut results is a reflection of the differing interpretations placed on the word ‘competitiveness’ by Indiv co-op. This interpretation is supported by the fact that when the question was phrased “How much did you desire to excel others?” on the post-experimental questionnaire, significant differences

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### Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem Type</th>
<th>Total</th>
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<tbody>
<tr>
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<td>H.R.</td>
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<td>Group-centeredness</td>
<td>(A)</td>
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<tr>
<td>Group-feeling</td>
<td>(C)</td>
<td>H.R.</td>
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<tr>
<td>Competitiveness</td>
<td>(C)</td>
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<tr>
<td>Desire to excel others</td>
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<td>H.R.</td>
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<tr>
<td>Desire to excel others</td>
<td>(D)</td>
<td>P</td>
</tr>
</tbody>
</table>

* The differences for three of the pairs are in the same direction as the total mean difference; these differences have p values of .01, .01, and .13 respectively. The differences for the other two pairs are in opposite direction; these differences have p values of .24 and .27.

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P = Puzzles
HR = Human Relations
(A), (B), (C) or (D) = the measuring instrument. (See note 13, p. 209).
Total M diff = Average of the differences (co-operative minus competitive) between each of the five paired co-operative and competitive groups for each of the five experimental weeks.
The sign of the mean difference can be interpreted as follows: a plus sign indicates that the co-operative groups had more of the variable than did the competitive groups; a minus sign indicates that the co-operative groups had less of the variable. (Parenthetically, it may be noted that the directions of all of the obtained total mean differences are in the directions predicted by the relevant hypotheses.)
Total p = The p value obtained by combining the p values for each of the five pairs according to the procedure described in footnote 12 (p. 209). A combined probability is given only when the direction of the differences for all five pairs is the same as that of the total mean difference.

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16 Indiv co-op refers to “individuals in the co-operative situation.”
17 Indiv comp refers to “individuals in the competitive situation.”
18 For a fuller presentation of the hypotheses being tested in this study see the preceding article.
Hypotheses numbers refer to the numbers given to the hypotheses in the preceding article.
19 Promotive interdependence may be considered as meaning co-operatively interrelated.
20 Centr interdependence as meaning competitively interrelated.

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were obtained in the direction predicted by the hypothesis. To sum up, the data support the predictions that perceived promotive interdependence would be greater among Indiv co-op than among Indiv comp. On the face of it, this hypothesis would appear to run counter to common-sense impression. Let us examine a little more closely the considerations lying at the base of the common-sense impression to see how they apply to the present experimental conditions.

There appear to be two basic notions involved in the common-sense impression: (i) that the more threatening atmosphere of the competitive situation will make it more difficult for timid individuals to participate; (ii) that co-operation implies equality of participation. There is some validity to each of these notions.

From theoretical considerations one should be able to predict that the competitive situation would be more stressful for certain kinds of individuals than would the co-operative situation. The consequence of the stress might be a restructuring of goals and a withdrawal, with the result that the withdrawn individual would no longer 'compete.' If this happened, one would expect that the homogeneity of participation would be low in competitive groups (though, under certain circumstances, the effect of partial withdrawal might be to lessen ego-vulnerability and thus permit the timid individual to participate more freely). However, the present experimental conditions operating on reasonably well-adjusted individuals with a moderate of ego-strength made withdrawal rather unlikely.

The second notion also has some validity, in the sense that there are certain kinds of group situations in which the actions or words of another cannot readily function as a substitute for one's own actions or words. For example, various kinds of self-expression, 'get acquainted,' and therapy situations might induce forces on each individual to participate without allowing much in the way of substitutability. It seems evident that the task-oriented nature of the present experimental sessions were situations which permitted substitutability.

The data presented in Table 3 provide the evidence relevant to Hypothesis 7. The variance in amount of contributions among members has been used as the measure of homogeneity of contribution. The differences between variances of paired groups were then entered as scores in the Latin square and the customary statistical treatment was made.

The data give support for the hypothesis, although the results are not conclusive. In both the puzzles and human relations problems there is greater homogeneity of participation among groups. Four out of the five pairs in the human relations problem and all of the five pairs in the puzzles go in the direction predicted by the hypothesis.

Further support is given to the homogeneity of contribution hypothesis by additional data which are directly relevant to the basic substitutability hypothesis. On the weekly questionnaire the subjects were asked to indicate the reasons they had for not offering suggestions or thoughts to the group discussion. Of the reasons checked by the subjects, the following choices were offered to the subjects: (a) Didn't think they were worth while; (b) Somebody else said pretty much the same thing; (c) Couldn't get a word in edgewise; (d) Others were talking too much; (e) Not enough time; (f) I wasn't quite sure how they'd be received; (g) The whole business didn't interest me much; (h) I usually find it a little difficult to say what I'm thinking in groups; (i) My idea wasn't relevant to what the group was discussing at the time; (j) . . . (other reasons).
TABLE 3

Differences in Homogeneity of Amount of Participation Between Co-operative and
Competitive Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem Type</th>
<th>M diff</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogeneity of Participation (B)</td>
<td>H.R.</td>
<td>-2593</td>
<td>*</td>
</tr>
<tr>
<td>Homogeneity of Participation (B)</td>
<td>P</td>
<td>-518</td>
<td>.16</td>
</tr>
</tbody>
</table>

*The differences for four of the pair are in the same direction as the total mean difference; these differences have p values of .005, .07, .13, and .67 respectively. The pair going in the opposite direction has a p value of .16.

Indiv co-op approximately 47% were in the category "Somebody else said pretty much the same thing"; only 33% of the reasons offered by the Indiv comp were in this category.

Thus, though the results are not conclusive, support is given to the hypothesis that there will be more homogeneity in amount of participation among Indiv comp than among Indiv co-op.

3. Specialization (Hypotheses 8 and 9)

A cursory inspection of the data collected by the functions observations sheet revealed that to test Hypothesis 8 (specialization with respect to function) it would be necessary to treat the data via the Latin square. Individuals varied too much in functions from meeting to meeting to permit any combination of the data for treatment in terms of the five sessions. This placed the experimenter in a dilemma, since he had the impression that the functions data were not sufficiently reliable to make it worth while to engage in the refined analysis necessary for the test of this hypothesis. The lack of reliability is of significance primarily due to the small number of participations that any individual would have in a given category per meeting. Observer error in mixture with the small frequencies would make it most difficult to demonstrate significant differences.

As was expected, the data revealed no clear-cut significance (though with respect to all functions there is, on the average, greater specialization of functioning within co-operative groups than within competitive groups). The actual p's were not computed because on inspection it was clear that the error variance would be too large to permit of any significance.

The evidence relevant to specialization with respect to content or activity (Hypothesis 9) is much more clear-cut. Table 4 presents the data. The results definitely indicate that with respect to the job of writing the letter of recommendation, asked for in the human relations problems, there were significantly more instances of division of labor in the co-operative groups than in the competitive groups. Faced with the problem of achievement in a limited amount of time, co-operative members were able to organize themselves so as not to duplicate each other's efforts. Substitutability of one for the other permitted the members to divide up the job into its different aspects and allowed the various members to work on these components simultaneously.

In the competitive situation writing procedure generally followed either of these two extremes: (i) one man was assigned the job, usually on the basis of a rotation scheme, and the other members took an active part in supervising the writing. The getting of ideas into written form was seen as a path, thus everyone was actively concerned with what was being written. Since the number of pages, always less than five, prevented the possibility of any compromise-"we each do one"—due to lack of substitutability it was necessary for all to focus on the same activity. As a consequence, it was rare that two members were writing simultaneously. When two or more recorders are shown in the competitive groups, their time of writing did not overlap much. (ii) A conscientious member took the form and wrote up recommendations while the others discussed. The discussants showed no interest in the write-up, never examining it, their whole attention being directed to the discussion. The written product was, more or less, considered to be an irrelevant side issue for some 'conscientious' soul to handle. It was not seen as a necessary path, thus it was perfectly permissible for anyone who wished to do so to take over the function of writing.

Similar data were not, unfortunately, collected for the puzzle problems. The experimenter, however, had the definite impression that a 'formal' decision to take different approaches to the group problem occurred not infrequently in the co-operative groups but did not occur at all in the competitive groups.

(d) Motivation

Hypothesis 12 asserts that the directions of the forces operating on Indiv co-op should be more similar than the directions of the forces operating on Indiv comp. If this hypothesis is correct, one should expect greater speeds in group locomotion for the competitive groups. The data with respect to locomotion are presented under 'Productivity' (Part g, this section); the data give strong support to the hypothesis.

The validity of the hypothesis presupposes the validity of the basic hypothesis with respect to positive individuality. The following questions (C). "How did you react to the ideas or suggestions of others?" and "How
TABLE 5

Differences Between Co-operative and Competitive Groups on Data Relevant to the Motivation Hypotheses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem Type</th>
<th>Total</th>
<th>M</th>
<th></th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of Other’s Ideas</td>
<td>(C)</td>
<td>H.R.</td>
<td>+ .78</td>
<td>.081</td>
<td></td>
</tr>
<tr>
<td>Achievement Pressure</td>
<td>(A)</td>
<td>H.R.</td>
<td>+ 1.00</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Achievement Pressure</td>
<td>(A)</td>
<td>P</td>
<td>+ .49</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>Strength of Motivation to Achieve</td>
<td>(D)</td>
<td>H.R.</td>
<td>+ .83</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Strength of Motivation to Achieve</td>
<td>(D)</td>
<td>P</td>
<td>+ .20</td>
<td></td>
<td>not sig.</td>
</tr>
<tr>
<td>Involvement</td>
<td>(A)</td>
<td>H.R.</td>
<td>+ .15</td>
<td></td>
<td>not sig.</td>
</tr>
<tr>
<td>Involvement</td>
<td>(A)</td>
<td>P</td>
<td>+ .23</td>
<td></td>
<td>not sig.</td>
</tr>
<tr>
<td>Interest</td>
<td>(C)</td>
<td>H.R.</td>
<td>- .10</td>
<td></td>
<td>not sig.</td>
</tr>
</tbody>
</table>

* The differences for four of the five pairs are in the same direction as the mean differences; these differences have p values of .04, .15, .24, and .68. The p value for the pair going in the opposite direction is .66.

frequently was your own thinking or reaction affected by what the others were saying?” are relevant. Table 5 indicates that the Indiv co-op were affected by the ideas of others, significantly more often than were Indiv comp. Table 7 indicates, further, that the Indiv co-op were markedly more agreeable and acceptable towards the ideas initiated by others. These two sets of facts provide direct support for the basic hypothesis with respect to positive inducibility and indirect evidence for Hypothesis 12.

From Hypothesis 13 one would predict that there would be more pressure for achievement in the co-operative groups than in the competitive groups. The ratings of the observers and of the subjects both produce significant differences in the predicted direction for the human relations problem. The direction of the differences obtained for the puzzles is in line with the hypothesis, but the size of the differences is not, for the most part, significant.22 Hypothesis 15 states that there is nothing inherent in the co-operative or competitive situations which should produce differences in the strength of force operating on individuals in the respective situations. Interest or ‘involvement’ is considered to be an operational measure of total situationally relevant forces. The data of Table 5 clearly provide no basis for rejecting the hypothesis; the differences between co-operative and competitive groups with respect to involvement or interest in the problems at hand were negligible.

(e) Communication

In the preceding article hypotheses were developed with respect to four aspects of the communication process: (i) The Production of Signs, (ii) The Attentiveness of the Communicatee to the Signs Produced, (iii) The Creation of Common Signification, and (iv) the Appraisal of Signs.

(i) The Production of Signs

Hypotheses 16 and 17, in effect, assert that the volume of participation of the co-operative as contrasted to the competitive groups will be (Hypothesis 16) smaller for the human relations problem, and (Hypothesis 17) greater for the puzzles. The relevant data are presented in Table 6.

The evidence for Hypothesis 17 is clearly confirming, the difference being significant at the .1% level. The data for Hypothesis 16 are not so clear-cut. Three of the groups support, two of the groups do not. The hypothesis was derived from the basic substitutability hypothesis and some additional assumptions which included the following: the task demands are such that quantitative efforts do not seriously interfere with qualitative efforts, or that, if they do, quantity is seen to be as, or more important than, quality. The instructions which emphasized both quality and quantity may have resulted in some ambiguity of interpretation, so that the preceding assumption did not hold true for all the subjects. This, of course, would make it more difficult to demonstrate the validity of the hypothesis under scrutiny.

(ii) Attentiveness to Signs

From the basic hypothesis with respect to helpfulness it was derived that there would be less attentiveness to each other’s production of signs among Indiv comp than among Indiv co-op (Hypothesis 18). Table 6 supplies the information necessary to test this hypothesis.

The observers rate (A) Indiv co-op to be significantly more attentive to each other than the Indiv comp for both kinds of tasks. The ratings by the subjects of their own attentiveness (C) also tend to support the hypothesis.

(iii) Common Signification of Signs

Hypotheses 19 and 20 assert that there will be less common signification between communicators and communicates among Indiv comp than among Indiv co-op, or, in other words, that there would be a greater amount of communication difficulties in competitive groups than in cooperative groups. The relevant data are presented in Table 6.

The data reveal that the observers rated that there were significantly fewer communication difficulties among Indiv co-op than among Indiv comp for both the human relations and puzzle problems. Further support for Hypothesis 19 (no independent test of Hypothesis 20 is possible in this study) is obtained from the subjects. In answer to the question (C): “Did you find that you had difficulty in getting your ideas across to others?” the ratings of

22 Hypothesis 20 asserts that there would be more communication difficulties among Indiv comp compared with Indiv co-op, even if attentiveness were equated in both types of groups.
the Indiv co-op expressed significantly less difficulty than did the ratings of the Indiv comp. The same results were obtained in answers to the following question (C): "Did you find that you had difficulty in trying to follow or get the point of what the others were saying?" Thus, the competitive subjects experienced more difficulty with respect to the spread of common significance, both in the roles of the communicators and the communicators.

To sum up, the data provide striking support for the hypothesis being examined.

(iv) The Appraisal of Signs

Hypothesis 21 asserts that there will be more common appraisals of communications in the co-operative groups than in the competitive groups. Table 7 presents the evidence for the hypothesis.

The observers rate that there is more acceptance of each other's ideas in the co-operative groups than in the competitive groups in both kinds of tasks. Differences are significant at the 1% level or better. The ratings by the subjects also strongly support the hypothesis. In answer to the questions (C): "How did you react to the suggestions of others?" and "How did the others react to your ideas or suggestions?" the ratings made by the Indiv co-op, as contrasted with those made by the Indiv comp, indicate both significantly more agreement with the ideas and suggestions of others and perception of more agreement from other group members.

Two categories on the functions observation sheet, 'evaluator-critic' and 'follower,' also provide some relevant data, although it should be kept in mind that both categories may contain a few items which are not specifically related to the notion of 'common appraisal.' Thus, 'evaluator-critic' probably contains some items which are positive evaluations and 'follower' includes some items which connote understanding but not necessarily agreement. Nevertheless, for both categories there are significant differences between the co-operative and competitive groups on the human relations problems in the direction of the hypothesis. The differences, with
Experimental Study of Effects of Co-operation and Competition upon Group Process

Groups not only came out with more fruitful ideas for handling the problem presented to them, but also that their group discussions showed more insight and understanding of the nature of the problem being posed to them. These differences with respect to group productivity and group insight are significant for both kinds of tasks.

Average individual productivity must not be confused with group productivity. Group productivity ratings referred to the ideas that were agreed upon and accepted as a basis for action by the group. Thus, if two members of a group each had good ideas which were in conflict and no agreements were reached nor actions taken by the group, the meeting having been bogged down in conflict, group productivity was rated as being low. The same kind of distinction held for group insight in contrast with average individual insight. The ratings of average individual productivity show no significant difference for the co-operative and competitive groups on the human relations problems; for the puzzles,

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem Type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>H.R.</td>
<td>+1.70</td>
</tr>
<tr>
<td>Orientation</td>
<td>P</td>
<td>+1.92</td>
</tr>
<tr>
<td>Orderliness</td>
<td>H.R.</td>
<td>+1.99</td>
</tr>
<tr>
<td>Orderliness</td>
<td>P</td>
<td>+1.96</td>
</tr>
</tbody>
</table>

Respect to the puzzles, are in the predicted direction but are not significant.\textsuperscript{26}

(f) Orientation

From the basic hypothesis with respect to positive inducibility, it was derived that there would be more commonality of perception with respect to position and direction to the goal among Indiv co-op than among Indiv comp (Hypothesis 23). The relevant data are presented in Table 8.

The observers rated the co-operative groups to be significantly more oriented ("aware of where they are and where they are going") than the competitive groups for both kinds of tasks. The hypothesis is also given indirect support by the observers' ratings that the co-operative groups were also significantly more orderly and systematic in their approach to the various problems. The assumption here is that orientation and systematic approach are closely related.

(g) Productivity

In the present experiment many different measures can be considered to be relevant to 'group productivity.' The results obtained by these measures are summarized in Tables 9 and 10.

Hypothesis 24 asserts that, since speed of locomotion will be greater in co-operative groups, quantitative productivity per unit of time will be less in the competitive groups. The evidence in Table 9 provides striking support. Co-operative groups solve the puzzle problems more rapidly than do the competitive groups and they also produce more quantitatively on the human relations problems (words in the written letters of recommendations are taken as a crude measure of quantitative productivity).

Hypothesis 25 asserts that qualitative productivity will be higher for the co-operative groups. Clear support is given to this hypothesis by the observers' ratings of discussion productivity (Table 5) and by the judges' ratings of the written recommendations for the human relations problems (Table 10). The observers rated that the discussions of the co-operative

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem Type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion</td>
<td>H.R.</td>
<td>+1.86 .001</td>
</tr>
<tr>
<td>Discussion</td>
<td>P</td>
<td>+1.90 .01</td>
</tr>
<tr>
<td>Discussion</td>
<td>H.R.</td>
<td>+1.28 .001</td>
</tr>
<tr>
<td>Discussion</td>
<td>P</td>
<td>+1.72 .02</td>
</tr>
<tr>
<td>Time per solution</td>
<td>P</td>
<td>-7.35 minutes .01</td>
</tr>
<tr>
<td>Number of words</td>
<td>H.R.</td>
<td>+299 .001</td>
</tr>
<tr>
<td>Average Individual</td>
<td>H.R.</td>
<td>+.15 not sig.</td>
</tr>
<tr>
<td>Average Individual</td>
<td>P</td>
<td>+.58 .07</td>
</tr>
<tr>
<td>Learning from</td>
<td>H.R.</td>
<td>+.25</td>
</tr>
<tr>
<td>Grades on Term Paper</td>
<td></td>
<td>+2.85 .18</td>
</tr>
</tbody>
</table>

\* Differences for three pairs are in the same direction as the total mean differences; these differences have \( p \) values of .07, .67, and .39. The two pairs, in the opposite direction, have \( p \) values of .30 and .45.
there is a difference approaching significance favoring the Indiv co-op. The latter result is probably explained by the fact that the greater communication within co-operative groups meant that individuals were less likely to stay in blind alleys for long periods of time.

Table 10 presents the ratings of each group for each of the five different problems, as made by three different judges. Although it is evident that there is a considerable unreliability in the ratings, it is also clear that despite the unreliability there are significant differences between the paired co-operative and competitive groups. The differences between ratings of the co-operative and competitive products are significant at the .1% level. The instructions given to the judges are presented below.

You are to imagine yourself to be a psychology instructor who has given to his ten students a series of five practical problems as tests. You are to grade the ten papers for each of the five problems separately in the following manner:

Take the ten papers for any given problem and read through all. Rate each of the papers in terms of how 'helpful' (see the scale above) the insights and suggestions for actions are: try to keep from being influenced by such considerations as grammatical niceties, etc. Do not try to guess which of the groups are co-operative and which are competitive.

Hypothesis 26 states that the Indiv co-op will learn more from each other than will the Indiv comp. Table 9 indicates that the co-operative group members in three of the five pairs rated themselves as learning more from the discussion of the human relations problem than did the competitive members rate themselves.

The same kind of results are obtained when one examines the grades obtained by the individuals exposed to each of the experimental conditions. The grades being considered were those obtained on the first term paper handed in by all the subjects; the paper was due on the week of the experiment. Statistical analysis reveals that the differences are in the direction predicted by the hypothesis. However, they cannot be considered as significant.

Thus, the hypotheses (24 and 25) predicting greater group productivity for the co-operative groups have received strong support from the data, but the evidence with respect to the hypothesis predicting greater learning for the Indiv co-op is far from conclusive. Several possible explanations for this latter lack of significance are the following: (i) the discussions took place at the very beginning of an Introductory Psychology course. Perhaps at such an early stage the subjects did not have much to offer to each other since none had enough training to have crystallized his own experiences into useful approaches to such problems as were discussed; (ii) even if (i) is not valid, many students believed it to be so and felt that what they would learn, they would learn from the instructor. Thus, they were not particularly ready to have co-operative inducements by fellow members under either of the two conditions; (iii) the relative differences in learning during group discussion were so small that they were insignificant in comparison with the learnings during the regular instructional period. The assumption here is that the Indiv co-op and Indiv comp learned as much as the other during the regular instructional period.

(b) Inter-personal Relations

From the basic hypothesis with respect to cathexis, it was derived that the Indiv co-op would be more friendly towards each other in the group meetings than would the Indiv comp. (Hypothesis 27). Table 11 presents the relevant data.

The observers rated that the Indiv co-op were significantly more friendly during discussions of both types of problem than were the Indiv comp, giving strong support to the hypothesis under scrutiny. It also receives partial support from the functional observation: a greater percentage of encouraging or rewarding remarks were made in co-operative groups during the discussions of the human relations problems; a significantly larger proportion of aggressive remarks were made during the competitive discussions. These differences in functions were not obtained for the puzzle problems probably because the lack of emotionally laden content in the puzzles led to a smaller percentage of emotional functions such as 'rewarding' and 'aggressing,' making it difficult to establish significant differences here.

The co-operative subjects in answer to the following question (C): "How good were the contributions of the others?" rated each other's contributions to be better than did the competitive subjects. This result can also be taken to be indicative of greater positive cathexis among Indiv co-op.

The next question of interest has to do with the extent of the generalization of the friendliness shown during the experimental meetings. In the preceding article, it was hypothesized that the extent of generalization would be a function of the strength of the goals perceived to be interdependent. Unfortunately, no really adequate measure of the strength of goals involved in the situation was taken. The following question (D): "How much did the weekly small group meetings stand out for you in contrast with the other classes you attend during the week?" is the only relevant measure. The average responses for the co-operative and the competitive members were not significantly different. On the average, the subjects rated that the weekly meetings were "Thought about some
TABLE 11

Differences Between Co-operative and Competitive Groups in 'Friendliness' and Other Related Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem Type</th>
<th>Total</th>
<th>$M$ diff</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friendliness</td>
<td>(A)</td>
<td>H.R.</td>
<td>+1.26</td>
<td>.001</td>
</tr>
<tr>
<td>Friendliness</td>
<td>(A)</td>
<td>P</td>
<td>+ .89</td>
<td>.01</td>
</tr>
<tr>
<td>How good were contributions of others</td>
<td>(C)</td>
<td>H.R.</td>
<td>+ .70</td>
<td>*</td>
</tr>
<tr>
<td>Encourager</td>
<td>(B)</td>
<td>H.R.</td>
<td>+ .96</td>
<td>**</td>
</tr>
<tr>
<td>Encourager</td>
<td>(B)</td>
<td>P</td>
<td>+ .20</td>
<td>not sig.</td>
</tr>
<tr>
<td>Aggressor</td>
<td>(B)</td>
<td>H.R.</td>
<td>~1.16</td>
<td>.01</td>
</tr>
<tr>
<td>Aggressor</td>
<td>(B)</td>
<td>P</td>
<td>~ .64</td>
<td>not sig.</td>
</tr>
<tr>
<td>Time taken to learn last names</td>
<td>(D)</td>
<td></td>
<td>~ .20</td>
<td>.06</td>
</tr>
<tr>
<td>Correctness of Spelling of Last Names</td>
<td>(D)</td>
<td></td>
<td>+ 5.3</td>
<td>.11</td>
</tr>
</tbody>
</table>

* Differences for four pairs are in the same direction as the total mean difference; these differences have $p$ values of .005, .01, .01, and .07. The other pair, in the opposite direction, has a $p$ value of .87.

** Differences for four pairs are in the same direction as the total mean difference; these differences have $p$ values of .001, .001, .01, and .07. The other pair, in the opposite direction, has a $p$ value of .57.

—more prominent in my thinking than some of my other courses but not more prominent than most of my other courses. Since the experimental group sessions were not especially prominent in the lives of the subjects, there is little reason to expect much generalization of cathexis to other areas.

Various measures were taken to test the extent of generalization: ratings of fellow members with respect to desirability as a friend, rating of amount of friendly feeling toward others, time taken to learn first and last names, correctness of spelling of last names, amount of time spent together in outside activities and kinds of activities jointly engaged in outside of class. Table 11 presents most of the evidence.

The Indiv co-op reported that they learned each other's last names sooner than did the Indiv comp; this difference is significant at the 6% level. They also spelled each other's names more correctly than did the Indiv comp; the size of this difference, however, could occur 11 out of 100 times by chance. No differences were obtained with regard to learning first names, nor were any differences obtained with respect to frequency or kinds of outside activities jointly engaged in. (Very few joint outside activities were reported.) At the end of the experiment, the Indiv co-op rated themsevles (D) as being more friendly towards each other than did the Indiv comp. These differences, however, are clearly not statistically significant. The data thus indicate that little generalization of cathexis occurred.

The relative lack of generalization was probably due to the following factors: (i) the relative lack of importance of the goals involved in the experimental manipulations; (ii) the strong restraining forces operating in the life of the students which prevented realization of any inclinations toward increased sociability which might have resulted from the experimental situation.

Hypothesis 28 states that the group and its products will be evaluated more...
highly by the Indiv co-op than by the Indiv comp. Table 12 presents the relevant data. In answer to the question (C): “Did the group help you thinking?” the ratings of the co-operative members revealed significantly more help than did the ratings of the competitive members. Similar results were obtained to answer to (C): “How good do you think the group’s product was?” Thus, the data give strong support to this hypothesis.

From the basic hypotheses with respect to facilitations and hindrances, it was derived that there would be (Hypothesis 29) a greater percentage of group functions among Indiv co-op and (Hypothesis 30) a greater percentage of individual functions among Indiv comp. The data in Table 12 support the above hypotheses with respect to the human relations problems; the data for the puzzles reveal no clear-cut significances.

This latter lack of significance is consistent with other data to be presented in a subsequent article (3) which suggest that: (i) the objectively demonstrable solution of the puzzle problems makes it more difficult for individuals to produce the rationalizations necessary for ‘civilized’ blocking or aggressive behavior; and (ii) further, a demonstrable solution compels a certain degree of agreement and acceptance, thus, in a sense, making group functions more likely. Thus, the competitive groups have a significantly greater percentage of group functions in the puzzle problems than in the human relations problems and there is a tendency for them to have a smaller percentage of individual functions on the puzzles. The same kinds of differences obtain for the co-operative groups on the two kinds of problems, but as one would expect, they are less marked.

Hypothesis 33 states that the Indiv co-op will perceive themselves as having more favorable effects on fellow members than will the Indiv comp. Three items on the weekly questionnaire provide relevant data. Table 13 indicates that the co-operative subjects saw their fellow members as reacting more positively to their ideas; the competitive members perceived that their ideas were being ignored more frequently; the co-operative members felt that their contributions would be evaluated more highly.

Hypothesis 34 asserts that there will be a greater internalization of the attitude of the generalized other by Indiv co-op than by Indiv comp. In its broadest meaning, most of the experimental data already discussed are relevant to this hypothesis. In the more restricted sense of identification with the attitudes of others, two complementary measures — the feeling of obligation to others and the desire with the respect of the others—are relevant.

Table 13 presents data which indicate that the Indiv co-op felt more obligated as members of a group to participate in a joint effort (D) than did the Indiv comp. The differences are significant at the 1% level for the human relations problem and at the 10% level for the puzzles. It is also evident that the desire to win the respect of other members (D) played more of a role in the motivation of Indiv co-op than it did in the motivation of the Indiv comp. The differences are significant for the puzzles at the 1% level and at the 9% level for the human relations problems.

Thus, the evidence gives strong support for the hypothesis being examined.

(i) Odds and Ends

Table 14 reveals that at the beginning of the experiment the subjects were definitely aware of the observers as they discussed the problems (D). The consciousness of the presence of the observers, however, decreased with time so that by the third week most of the subjects were only occasionally aware of them. By the end of the experiment the subjects were, for the most part, not conscious of the observers while they discussed the problems. It is interesting to note that the competitive subjects tended to be more aware of the observers than did the co-operative subjects. The greater consciousness of the ‘I’, the awareness by

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Problem Type</th>
<th>Total M diff</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did others react to your ideas (C)</td>
<td>H.R.</td>
<td>+ .61</td>
<td>*</td>
</tr>
<tr>
<td>How frequently did others react (C)</td>
<td>H.R.</td>
<td>+ .49</td>
<td>**</td>
</tr>
<tr>
<td>How will others rate your contributions (C)</td>
<td>H.R.</td>
<td>+ .49</td>
<td>***</td>
</tr>
<tr>
<td>Strength of feeling of obligation to others (D)</td>
<td>H.R.</td>
<td>+ 2.80</td>
<td>.01</td>
</tr>
<tr>
<td>Strength of feeling of obligation to others (D)</td>
<td>P</td>
<td>+ 1.55</td>
<td>.10</td>
</tr>
<tr>
<td>Strength of desire to win respect of others (D)</td>
<td>H.R.</td>
<td>+ 1.53</td>
<td>.09</td>
</tr>
<tr>
<td>Strength of desire to win respect of others (D)</td>
<td>P</td>
<td>+ 2.38</td>
<td>.001</td>
</tr>
</tbody>
</table>

* Four pairs are in the same direction as the total mean difference; the differences for these pairs have p values of .01, .04, .12, and .36. The other pair has a p value of .92.
** Four pairs are in the same direction as the total mean difference, with p values of .01, .03, .04, and .15. The other pair has a p value of .02.
*** Four pairs are in the same direction as the total mean difference, with p values of .01, .02, .06, .11, and .35. The other pair has a p value of .33.
should be remembered however, that intra-group co-operation was produced partly by inter-group competition. Table 14 indicates that the instructions did produce significantly more motivation to excel other groups among Indiv co-op than among Indiv comp. 24

Table 14 also indicates that the Indiv co-op gave their groups credit for more improvement in effectiveness of functioning from the beginning to the end of the experiment than did the Indiv comp. It is probable that these data should be interpreted as additional support for Hypothesis 28, which asserts that the Indiv co-op will evaluate their group and its products more highly than will the Indiv comp.

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IV: SUMMARY AND CONCLUSIONS

(a) Summary of the Experiment and Its Results

In order to study the effect of co-operation and competition upon group process, ten experimental groups were established. Each group was composed of five Introductory Psychology students who were participating in the experiment as a substitute for their regular class sections. All groups met for one period of three hours, at different times of the week for six consecutive weeks. During the first week the ten groups were observed and rated as they discussed a human relations problem; the ratings of the discussion productivity were used to pair-off equated groups. Five pairs were then formed. One group of each pair was then assigned by random procedure to the co-operative treatment, the other to the competitive treatment.

The 'co-operative situation' was produced by a set of instructions which stated essentially that the group, as a whole, would be rated in comparison with the efforts of four other similarly constituted groups; the grade or reward that each member received would be the same and would be determined by the relative position of his group in contrast with the other four similar groups. The 'competitive situation' was produced by another set of instructions which stated essentially that each member would be rated in comparison with the efforts of the other four members composing his group, the grade or reward that each would receive would be different and would be determined by the relative contributions of each to the solution of the problem with which they were confronted.

Apart from the differences in instructions, all groups were exposed to similar routines during their three-hour meetings. The first part of the meeting was spent solving a Sunday supplement type puzzle, the second part of the meeting was spent discussing and writing some recommendations for a human relations problem, in the third part of the meeting the instructor-experimenter informally lectured on psychology.

Three or four observers were present during the first two parts of any meeting—each of the observers, in addition to filling out an 'Over-All Rating Sheet,' had a specific task. Many of the results presented in this study derive from the data collected by the observers. However, much information was collected from the subjects, who filled out a lengthy questionnaire every meeting after the discussion of the human relations problem and supplied additional data at the end of the experiment.

The results of the experiment are briefly summarized below.

1. The Basic Hypotheses

The evidence for the basic hypotheses is, for the most part, indirect. The data collected to provide tests for the hypotheses about group functioning, hypotheses which were derived from the basic hypotheses, are, in effect, also tests of the latter.

The data obtained in the experiment give support to the following hypotheses:

...
(i) Indiv co-op will perceive themselves to be more promotively interdependent and Indiv comp will perceive themselves to be more contingently interdependent (Hypothesis 1).

(ii) There will be greater substitutability for similarly intended actions among Indiv co-op than among Indiv comp (supported by Hypotheses 7 and 9, ambiguous in relation to Hypotheses 8 and 16).

(iii) A larger percentage of actions of others will be positively cathedec among Indiv co-op, a larger percentage of actions of others will be negatively cathedec among Indiv comp (Hypothesis 3).

(iv) There will be a greater positive inducibility among Indiv co-op than among Indiv comp (Hypothesis 4).

(v) Indiv co-op will exhibit more helpfulness and Indiv comp will exhibit more obstructiveness (Hypothesis 5).

Thus, all in all, the theory of co-operation and competition outlined in the preceding article has been given considerable backing by the present experimental investigation.

2. Group Functioning

The results, with respect to aspects of group functioning, indicated that the Indiv co-op showed more of the following characteristics than did the Indiv comp: (i) Co-ordination of Efforts; (ii) Diversity in amount of contributions per member; (iii) Sub-division of activity; (iv) Achievement Pressure; (v) Production of signs in the puzzle problem; (vi) Attentiveness to fellow members; (vii) Mutual comprehension of communication; (viii) Common appraisals of communication; (ix) Orientation and orderliness; (x) Productivity per unit time; (xi) Quality of product and of discussions; (xii) Friendliness during discussions; (xiii) Favorable evaluation of the group and its products; (xiv) Group Functions; (xv) Perception of favorable effects upon fellow members; (xvi) Incorporation of the attitude of the generalized other.

The Indiv comp showed more of the following:

(i) Production of signs in the human relations problem; (ii) Individual Functions.

No significant differences were found in the following:

(i) Amount of interest or involvement in the situation; (ii) Amount of specialization with respect to function; (iii) Amount of learning (though the trend is in favor of the Indiv co-op). Nor did the data reveal any striking developmental differences with time.

(b) Practical Implications of the Results

The practical implications of this study will not be specified in detail here. It seems evident (to the extent that the results have any generality) that greater group or organizational productivity will result when the members or sub-units are co-operative rather than competitive in their interrelationships. The inter-communication of ideas, the co-ordination of efforts, the friendliness and pride in one's group which are basic to group harmony and effectiveness appear to be disrupted when members see themselves to be competing for mutually exclusive goals. Further, there is some indication that competitiveness produces greater personal insecurity (expectations of hostility from others) than does co-operation. The implications for committee, conference, and small group functioning in general appear fairly obvious.

Also, in light of the results of this study, it seems that educators might well re-examine the assumptions underlying their common usage of a competitive grading system. One may well question whether a competitive grading system produces the kinds of inter-relationships among students, the task-directedness, and personal security that are in keeping with sound educational objectives.

REFERENCES


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BIOGRAPHICAL NOTE


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