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GROUP EFFECTS ON REASONING FUNCTIONS

by

Walter Joseph Smith

A Dissertation Submitted to the Faculty of the Graduate School of Loyola University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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1952

LIFE

Reverend Walter Joseph Smith was born in Ozone Park, New York, July 11, 1913.

He was graduated from Cathedral College, Brooklyn, June, 1932, and was ordained from the Seminary of the Immaculate Conception, Huntington, Long Island, New York, June, 1938. He received the degree of Master of Arts in Psychology from Fordham University, New York, June, 1945.

From February, 1947, to September, 1949, he held a teaching fellowship at Loyola University, Chicago, and from September, 1949, to June, 1952, was instructor in psychology at the same institution.

He is the author of a series of four articles in the Journal of Religious Instruction, December, 1946, to March, 1947, on the general topic of standardized achievement tests in religion.

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

THE PROBLEM OF SOCIAL FACILITATION

Do people work better by themselves or when working with a group? This question has interested psychologists for a number of years. They have found that the answer to it is not a simple affirmative or negative. When asked in such a general way, the question cannot be answered definitely.

For much depends on the composition of the group. Allport distinguishes between the group and the crowd.

> The distinction between them is not sharply drawn, and one form is capable of passing into the other. For convenience, however, we may define a group as any aggregate consisting of two or more persons who are assembled to perform some task, to deliberate upon some proposal or topic of interest, or to share some affective experience of common appeal. Groups may be organized or unorganized. The crowd we shall distinguish from such formations by the presence of emotional excitement and the replacing of the deliberate group activities by drives of the more primitive and prepotent level.[1]

The same author goes on to distinguish between co-acting groups and face-to-face groups. In the first type the members are "primarily occupied with some stimulus other than

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1 Floyd Henry Allport, Social Psychology, [1924], 260.

one another."[2] Students in a classroom or an audience in a lecture hall belong to co-acting groups. In the face-to-face group, on the contrary, the members "react mainly or entirely to one another."[3] It is, as a consequence, necessarily small, such as a committee of five or six who are meeting to discuss some project, and who in their discussion are directly stimulating one another.

In this investigation the concern is not with face-to-face groups, but with co-acting groups. Even with this limitation, however, the question of whether or not there is social facilitation of persons in such a group cannot be definitely answered. For it seems that much depends upon the type of task which is being done. It makes a difference whether it is a sensory-motor or an intellectual task.[4]

Other factors also enter in. The attitudes assumed by the co-acting group may be such that it is really a number of individuals competing against one another. Results may then be expected to be different than they would be if attitudes of rivalry were kept at minimum, if not eliminated entirely.

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2 Ibid.

3 Ibid., 261.

4 Floyd H. Allport, "The Influence of the Group upon Association and Thought," Journal of Experimental Psychology, III, 1920, 161-174.

In addition, if the task is an intellectual one, the intellectual level of the persons involved may be expected to influence the results. There may be reason to suspect that individuals of higher intellectual ability will reason more efficiently by themselves than when they are in a group, since when they are alone they will have less distraction from their work.

Lastly, there is also the possibility of a sex difference. It may be suspected that females will be more susceptible to influences of a social nature than males.

All of these factors are involved in the situations in which social facilitation occurs or fails to occur. They all influence the results. Some cause social facilitation to take place; others tend to prevent its occurrence. As a result, before the question of whether or not social facilitation will be operative in any given situation, that situation must be accurately defined so that the varying influences of the different factors which enter into it may be clearly distinguished from one another and taken into account.

Furthermore, if it is sought to determine which of the factors present in a co-acting group situation further social facilitation, and which militate against it, there arises the additional problem of controlling all the factors except the one being investigated. In social situations and with social variables this is often practically impossible.

Nevertheless the attempt must be made to control in so far as it is possible all the social influences in the co-acting group, except the one or the few being investigated. This investigation was limited at the outset to an intellectual task: the explaining of a proverb. The type of task was thus controlled. The question is limited to the possibility of social facilitation of reasoning processes.

Secondly, the group situation was always clearly that of a co-acting group. The reasoning tasks done with a group were always done in a classroom. The group was never less than twenty individuals, all of whom were aware that everyone there was engaged in the same task.

In the third place, the directions given in the classroom were read in such a way as not to induce them to compete with one another. This does not mean that rivalry was eliminated as a variable, however. For to eliminate it entirely is, in the last analysis, impossible. There are some individuals for whom every group situation is a competitive one, no matter what directions have been given. As a result, the only control of attitudes of rivalry which was exercised by means of the directions given was this: each subject was left with his customary attitude toward a group situation. In that way each subject was left with whatever attitudes were natural to him in

a co-acting group, and it was assumed that the experimental groups tested were not significantly different in composition, with regard to attitudes of rivalry, from other normal groups of similar size which could be selected from the general population.

Lastly, sex differences were controlled by treating the results of the two sexes separately in the statistical computation.

By means of the experimental procedure followed and the statistical analysis of the results obtained, a number of separate but related problems were investigated:

1) Do people usually reason more efficiently when by themselves or when in a group in which all are working on the same reasoning task?

2) If significant differences in reasoning efficiency are found, in favor of either the solitary or the group situation, are these differences more marked in those who attained higher scores in a previously administered test of verbal reasoning, or in those whose scores were lower on the verbal reasoning test?

3) If significant differences in reasoning efficiency are found, in favor of the group situation, do those who attain the higher scores in the solitary situation benefit more by working with the group than those who attain the lower scores in the solitary situation?

4) Do people usually think more verbosely when by themselves or when in a group in which all are working on the same reasoning task?

5) If a significant difference in verbosity is found, in favor of either the solitary or the group situation, is this difference in verbosity more marked for those who attained higher scores in a previously administered test of verbal reasoning, or for those whose scores were lower on the reasoning test?

6) If a significant difference in verbosity is found in favor of the group situation, do those who attained the higher scores in the solitary situation benefit more in this regard by working in the group than those who attained the lower scores in the solitary situation?

7) Are there significant sex differences involved in the answers to the six problems to be investigated?

All of these issues have been examined previously. Some of the experimental procedures used and the statistical evaluations followed, however, were of questionable validity. As a result the conclusions reached by these studies cannot be regarded as experimentally and statistically proven. It is hoped that by the careful experimental and statistical controls adopted in this research, more definite conclusions will be able to be reached.

CHAPTER II

A REVIEW OF THE LITERATURE ON SOCIAL FACILITATION

The literature contains quite a number of experimental studies of social facilitation. But no investigation was found which dealt with the specific problems undertaken here, in the specific manner in which they were treated in this research.

For convenience in presenting the findings of the studies thus far undertaken, in so far as can be determined from published reports, the classification devised by Dashiell may be most conveniently followed.[1] Accordingly, the studies reviewed will be considered as falling into one of these four categories, even though in some instances, the classification will not be entirely appropriate.

The first type of investigation asks the question: "What is the effect upon an individual's work of the presence of quiet auditors or spectators?"[2]

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1 J. F. Dashiell, "An Experimental Analysis of Some Group Effects," Journal of Abnormal and Social Psychology, XXV, 1930, 190-199.

2 Ibid., 190.

The second type deals with this problem: "What is the effect upon an individual's work of overt vocal attitudes on the part of other persons?"[3]

The third inquires: "What is the effect upon an individual's performance of the presence of a co-working but non-competitive group?"[4]

And the fourth asks: "What is the effect upon an individual's performance of the presence of competitors working in explicit rivalry?"[5]

The Effect of Quiet Spectators Upon an Individual's Work.

Moore[6] seems to have been the first to report the results on an individual's work, of the presence of quiet spectators. Incidental to a study of emotional experiences, he gave twenty-two subjects five series of problems in mental multiplication of two place numbers. In the first series,

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3 Ibid.

4 Ibid., 191.

5 Ibid.

6 H. T. Moore, "Laboratory Tests of Anger, Fear and Sex Interests," American Journal of Psychology, XXVIII, 1917, 390-395.

stimuli were given to evoke anger; in the second, to arouse fear; in the third, sex interest; in the fourth, repulsion; and in the fifth, embarrassment in the presence of an audience. For the fifth situation the subject was seated facing a classroom of watching students.

The grand average of the times taken to solve all problems was compared with the average time taken to complete the problems in each series separately. It was found 1) that embarrassment before the group ranked third in the amount of interference it caused in the multiplication work, and 2) that work before the group produced the greatest individual differences.

Gates[7] sought to investigate four problems 1) the effect of spectators on the work of college women; 2) the different effects which may be produced by different kinds of spectators: fellow students or an instructor; 3) the reaction caused by the mere presence of the observers rather than by anything they might do in the way of friendly or unfriendly behavior; and 4) the effect of this particular audience on these particular subjects in a few simple motor and associative processes.

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7 G. S. Gates, "The Effect of an Audience upon Performance," Journal of Abnormal and Social Psychology, XVIII, 1924, 334-344.

She performed her experiment with three groups of subjects. The control group, numbering twenty-five, worked with only the experimenter present. The first experimental group, numbering twenty-six, did the first half of the tasks with only the experimenter present, but the second half in the presence of four to six attentive but quiet spectators. The second experimental group, which numbered eleven, worked with only the experimenter present during the first half of the experiment, but in the presence of twenty-seven to thirty-seven attentive but quiet spectators in the second half of the experiment.

The tasks performed with the experimenter alone present consisted of a coordination test, color naming, the Woodworth-Wells Analogies, and the number of nouns named in one minute. The tasks performed before the group were a second trial at coordination, color naming, a different form of the Woodworth-Wells Analogies, and the number of adjectives named in one minute.

No significant gains were found in the work done before the small audience, nor in the work done before the large audience, over that done before the experimenter alone.

It was found, however, that the subjects who attained the lower original scores, in all cases, gained more in the tasks performed before an audience, than the subjects who attained the higher original scores.

Travis[8] trained twenty-two subjects at an eye-hand coordination task until each reached a point where he had become as proficient as he could. Then on the experimental day each subject had five trials before the experimenter alone, and ten trials before a passive audience of from four to eight observers, none of whom were acquaintances of the subject.

When the ten highest scores obtained working before the experimenter alone were compared with the ten highest scores achieved while working before the audience, it was found that eighteen out of the twenty-two subjects or 81.8 per cent had a higher average of these scores when the work was done before the audience than when the work was done before the experimenter alone. Sixteen out of twenty-two subjects, or 72.7 per cent, obtained their highest scores while working in the presence of the audience. Three out of twenty-two, or 13.6 per cent obtained scores performing before an audience which equalled their highest scores obtained before the experimenter alone. And finally, three out of twenty-two, or 13.6 per cent, had scores obtained before spectators which were below their scores before the experimenter alone.

Nevertheless, the difference between the mean of the

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8 L. E. Travis, "The Effect of a Small Audience upon Eye-hand Coordination," Journal of Abnormal and Social Psychology 1925, 142-146.

the ten highest scores obtained before the experimenter alone and the mean of the ten highest scores obtained before the audience was not statistically significant. The critical ratio was 1.17. Neither was there a significant difference between the Mean of the highest scores obtained with the experimenter alone and the Means of the highest scores received before the audience. This critical ratio was also 1.17. Since, however, the trend toward higher scores with an audience present was so marked in the great majority of subjects, this insignificant critical ratio may be due to the smallness of the sample.

Eckdahl[9] constructed an apparatus which presented a stimulus word visually whenever the subject moved a lever. The subject's reaction word and his reaction time were then recorded on an Ediphone record. He had one hundred college students work this device, fifty going through the procedure first alone and then under the observation of the experimenter, and fifty taking the reverse order.

He found that thirty-six gave faster responses in the experimenter's presence, and sixty-three gave slower replies. When he repeated the procedure with another group, these results were confirmed. This time nineteen were faster under observation,

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9 Adolph G. Eckdahl, "The Effect of Attitude on Free Word Association," Genetic Psychology Monographs, V, 1927, 253-338.

while thirty-seven were slower. In addition, the introspective reports of the subjects showed that when they were alone they were inclined to say the first word coming to mind, whereas when they were observed they had the tendency to censor their responses.

Dashiell[10] had three students sitting at a small table, one working while the other two watched him, looking at his face or hands or pencil, but not at his work. The work consisted of multiplication problems, mixed relations or analogies, and free serial word association. The same students went through another experimental session using materials of the same type and of equal difficulty, but each working in separate rooms. Altogether, ninety-three students took part in the experiment, though they were divided into experimental groups of about fifteen.

The results indicated that the presence of quiet spectators tended to increase the speed of multiplication, of mixed relations and of serial association, but to lower the accuracy or quality of the multiplication and of the mixed relations. Tests of statistical significance were not made. Dashiell gives the reason on a footnote:

> Generally speaking, the various studies of group effects have tended to show little or nothing when the data of test results are handled in the conventional statistical

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10 Dashiell, "An Experimental Analysis of Some Group Effects," J. Abn. & Soc. Psychol., XXV, 194-195.

> procedure. When the test scores of the individuals are treated to show, e.g., their mean and their average deviation, often little comes to light. Yet when the individuals are counted in terms of how many show one or another difference within his own test results, certain directions among these small differences may become marked. Consider, for instance, the fact that in one of the studies of Travis ('25) he found the differences between group averages of the ten scores made by all individuals before an audience and of the ten best scores made alone to be "statistically unreliable," yet 18 out of the 22 individuals, or 81.8 per cent had higher individual score averages in the former.[11]

Ichheiser[12] had four hundred fourteen- and fifteen-year-old boys put together Blumenfeld's block-assembly test. There were two types of procedure. In the first, each subject put the cube together twice in succession in a closed room and alone. Both working times were recorded. In the second, each subject again put the cube together twice in succession, the first time alone as before, but the second time in the presence of the experimenter, who said on this occasion, "Now I would like to see how you do this," and then assumed a convenient position and a pleasant attitude and simply observed the work.

The results indicated that observation by the experimenter decreased the efficiency of the subjects by 46 per cent.

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11 Ibid., 195.

12 G. Ichheiser, "Ueber die Veraenderung der Leistungsbereitschaft durch das Bewusstsein einen Zuschauer zu haben," Psychotechnische Zeitschrift, V, 1930, 52-53.

In addition, introspective reports of the subjects indicated that being observed was experienced as an unpleasant and disturbing factor which unfavorably influenced the accomplishment of the task.

Burri[13] undertook her study primarily because of its relationship to the apparent difficulty experienced by some students in reciting before a class. She divided sixty introductory psychology students randomly into three groups of twenty each.

The first constituted the control group. They learned the material and recited it before the experimenter alone.

The second was experimental group I. They learned the material before the experimenter alone, but recited it and relearned it before an audience of four persons who paid no attention to them.

The third was experimental group II. They learned the material before the experimenter alone, but recited and relearned it before an audience of four persons who watched attentively and kept track of their responses.

The material used was fifteen pairs of words. They were learned by means of a hand operated memory drum, giving

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13 Clara Burri, "The Influence of an Audience upon Recall," Journal of Educational Psychology, XXII, 1931, 683-690.

three-second exposures. The list was presented once and then the subject was immediately tested for recall with the words presented in a different order than the original. This procedure continued until the subject was able to give one perfect repetition.

The recitation and relearning for all groups took place twenty-four hours later. Subjects were told at the time of learning under what conditions they would be expected to recall and relearn.

Retention was measured in three ways: 1) the number of words recalled; 2) the number of trials necessary for relearning; and 3) a saving score which was equivalent to:

$$1 - \left(\frac{\text{trials to relearn}}{\text{trials to learn}}\right)100.$$

The efficiency with which material was retained, by all three measures of retention, was greatest when recitation was in the presence of the experimenter alone.

Recitation before an attentive audience was found to be not significantly different from recitation before a non-attentive audience, but recall before the non-attentive audience was consistently better than that before the attentive audience.

Even the expectancy of recitation before an audience has a detrimental effect, for it significantly increased the time of learning.

Pessin[14] sought to discover whether social and mechanical stimulation influence memory, and if so, whether favorably or unfavorably. To do so he investigated both learning and retention. His subjects were sixty college students. They memorized three lists of nonsense syllables, each list consisting of seven three-letter syllables. They were mechanically presented one at a time for one and one half seconds. Subjects had to anticipate the next syllable on the list.

Learning took place under three different conditions: 1) the control condition, in which they were alone and undisturbed; 2) a second condition, in which they were mechanically distracted by the simultaneous flashing of a light and sounding of a buzzer fifty-four times per minute; and 3) the social condition, in which they were in the presence of a passive spectator. These conditions were rotated among the subjects in order to eliminate the influence of practice.

The learning was scored in terms of errors made, and also in terms of repetitions necessary before the attainment of one perfect anticipation.

The results showed that the control situation, with

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14 Joseph Pessin, "The Comparative Effects of Social and Mechanical Stimulation on Memorizing," American Journal of Psychology, XLV, 1933, 263-270.

neither mechanical nor social distraction, was the most favorable to learning. When scored in terms of errors the solitary and undistracted situation was significantly superior to the observed situation at the 5 per cent level of confidence. When scored in terms of repetitions necessary for the attainment of one perfect anticipation, the solitary and undistracted situation was significantly superior to the observed situation at between the 5 and the 2 per cent levels of confidence.

In order to determine the differential effects on retention, the subjects were randomly put into three groups, which then returned after one, two, and three days for relearning. The Ebbinghaus method of savings was used for computing the results.

It was found that after one day the material learned in the presence of an observer was found to be greater, but not significantly so. The same results were obtained after two days. But after three days the material learned in the social situation was found to be significantly greater at the 1 per cent level of confidence.

As a consequence it was concluded that learning was not as efficient, but that retention was better when learning of nonsense syllables took place before a passive spectator.

Pessin and Husband[15] took up the problem of the influence of one or two spectators on human maze learning. They used a ten turn multiple-U high-relief finger maze. It was learned in three different situations: 1) blindfolded and with only the experimenter present; 2) blindfolded and in the presence of one or two spectators who were known to the subject; and 3) with vision allowed but the maze hidden from the subject and in the presence of one or two spectators in full view of the subject. A separate group of thirty college students was put through each of these experimental situations.

The poorest average performance, whether measured by trials, errors or time, was given in the situation where the subject was both blindfolded and observed. The best average performance, according to all three methods of measurement, took place in the situation where the subject had vision (though not of the maze) and was observed. But none of these differences was statistically significant, nor did they even remotely approach significance.

Great differences in variability were also noted however, and these, while not statistically significant, were large enough to indicate a trend toward greater variability of per-

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15 Joseph Pessin and Richard W. Husband, "Effects of Social Stimulation on Human Maze Learning," Journal of Abnormal and Social Psychology, XXVIII, 1933, 148-154.

formance in the social situations.

The Effect of Overt Vocal Attitudes on the Part of Other Persons

The first study published in the literature on this specific problem is one by Donald A. Laird.[16] He had eight fraternity pledges do a series of motor tasks; tapping, the three-hole-test for coordination, and a test of steadiness, under two conditions. In the first condition, they were quietly observed by their fraternity brothers-to-be; but in the second, they were razzed by the same group.

It was found that under the razzing: 1) steadiness was lessened in all subjects; 2) steadiness standing (involving the body as well as the arm muscles) was more affected than steadiness sitting; 3) coordination was decreased, but not so much as steadiness; 4) the rate of tapping and fatigue from tapping were little affected; and 5) individual differences appeared, in that some subjects did better at tapping and showed better coordination under razzing, others did better only in tapping, and three decreased their efficiency in all tests.

The Effect of the Presence of Competitors Working in Explicit Rivalry

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16 Donald A. Laird, "Changes in Motor Control and Individual Variations under the Influence of 'Razzing,'" Journal of Experimental Psychology, VI, 1923, 236-246.

Since the specific problem of this investigation is the effect of a co-acting group rather than a group working in explicit rivalry, the studies of the effects of rivalry will be treated next, and the literature more directly concerned with co-acting groups considered last.

The earliest research in the whole field of social facilitation was reported just before the turn of the century by Triplett.[17] He used as subjects forty children, eight to seventeen years of age, and put them to the task of turning fishing reels as fast as they could, individually and in competing pairs. He found that twenty experienced favorable stimulation, ten unfavorable, and ten neither one nor the other. Some small sex differences also appeared. The proportion of girls influenced positively by competition was greater than the proportion of boys similarly affected. The gross amount of positive influence was also greater in girls. Triplett concluded that the presence of another person participating simultaneously in a contest has the effect of freeing latent energy not ordinarily available for use.

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17 N. Triplett, "The Dynamogenic Factors in Pacemaking and Competition," American Journal of Psychology, IX, 1897, 507-532.

Möede[18] used as subjects seventeen school boys twelve to fourteen years of age. The activities were speed of tapping with a pencil and strength of grip as measured by a hand dynamometer. The boys performed the tasks under three different conditions: 1) alone; 2) in competing pairs; and 3) in competing groups of five students each.

The results for speed of tapping were 1) that in working with the group the average speed increased 1.3 per cent; 2) that the faster tappers were slowed by working with the group, whereas the pace of the slower tappers was quickened; and 3) that when two of the faster tappers were set in competition with one another, the scores of both increased, showing that rivalry is more likely to increase scores when the competitors are approximately equal in performance than when one is markedly superior.

The results for strength of grip were 1) that rivalry between two boys produced an average score 10 per cent higher than that for work alone; 2) that the mean variation was 3.4 per cent less in rivalry between two than in isolation; 3) that the average score for rivalry between groups is greater than

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18 Walther Moede, "Der Wetteifer, seine Struktur und sein Ausmass," Zeitschrift fuer Paedagogische Psychologie, XV, 1914, 353-368.

both the average score achieved alone and that achieved by competing pairs; and 4) that the mean variation is lower in rivalry between groups than it is for either work in isolation or work in competing pairs.

Whittemore[19] was interested also in the influence of rivalry on performance. The task he selected was to print with individual rubber types, impressing each separately, several paragraphs selected from newspapers. The subjects had to take the letters individually from their compartments, ink the faces, and then stamp them on a piece of paper. Twelve subjects were used, in groups of four each.

The subjects were found to do more work when competing with one another than when not competing, with the least speedy subjects profiting most from competition. But all subjects' quality of performance tended to fluctuate more during competition. Thus the subjects worked faster but did poorer work when competing than when not competing.

Hurlock[20] turned her attention to "the value of group

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19 Irving C. Whittemore, "The Influence of Competition on Performance: An Experimental Study," Journal of Abnormal and Social Psychology, XIX, 1924, 236-253.

20 Elizabeth B. Hurlock, "The Use of Group Rivalry as an Incentive," Journal of Abnormal and Social Psychology, XXII, 1927, 278-290.

rivalry as an incentive to increased efficiency in school work, not only from the point of view of the effect upon the quantity and quality of the work, but in its relation to age, sex and individual differences."[21] Seventy-three boys and eighty-two girls, pupils in the fourth and sixth grades, were used as subjects. The tasks assigned were Hurlock's modifications of the arithmetic section of the Courtis Research Tests in Arithmetic. There were five tests, each containing thirty problems, all of equal difficulty, to be used in five experimental sessions.

In the first session all the children were tested together, having been told only that they were to take an arithmetic test, and urged to do their best. On the basis of the scores achieved in this session they were divided within each grade into a control and a rivalry group, but so as to have an equal number of boys and girls in each group. For the rest of the sessions the control groups were told only to do the problems as quickly and accurately as possible. The rivalry group was further divided into two sub-groups of equal age, ability and sex distribution. It was impressed upon these subjects that their groups were equal in ability and that each had an equal chance of winning. Before the second and following ses-

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21 Ibid., 278.

sions, results were discussed, the winning group was praised and the losing group was urged to work harder in the test immediately to follow. The reactions of the children showed that intense enthusiasm and a spirit of competition had been generated.

It was found 1) that the average score of the rivalry group was significantly higher every day of competition and on the last day was 41 percent higher, beyond practice effect, than the control group; 2) that there was only a slight difference between the boys and the girls, and that this was in favor of the girls; 3) that the younger children responded more to the rivalry than did the older; 4) that the children of inferior ability benefited more by the incentive than did the children of superior ability; 5) that there was a small increase in accuracy for the rivalry group, but a small decrease for the control group; and 6) that the rivalry group which was defeated on the first day of competition never overcame the initial defeat, but were below the other section throughout the experiment.

Dashiell[22] investigated the problem of rivalry also.

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22 Dashiell, "An Experimental Analysis of Some Group Effects," J. Abn. & Soc. Psychol., XXV, 190-199.

He had ninety-three subjects work on multiplication, mixed relations and free serial word associations, They were seated around large tables, and instructed to compete with each other since their scores would later be compared.

He found 1) that the speed of all three operations was increased by the competitive situation over both the speed achieved in isolation and that in a co-acting but non-competitive group, or in a definite rivalry situation.

The Effect of the Presence of a Co-working but Non-competitive Group

Mayer[23] seems to have been the first to conduct an investigation on this problem. He had fourteen school boys averaging twelve years of age take five types of test in a co-working group and alone. The tasks included writing from dictation, mental arithmetic, written arithmetic, learning nonsense syllables and completion of written sentences by writing in words which had been omitted. No attempt was made to eliminate rivalry as a factor, and some was undoubtedly in the group situation.

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23 August Mayer, "Ueber Einzel - und Gesamtleistung des Schulkindes," Archiv fuer die Gesamte Psychologie, I, 1903, 276-416.

The results indicated 1) that a greater amount of work was done in the presence of co-workers than in isolation; 2) that there were fewer errors in the group than in the individual work; and 3) that there was greater uniformity in the work of individuals under the group condition.

Allport took up the problem in 1916 and in the following few years conducted several investigations in the field. His first studies[24] were undertaken with graduate students of both sexes. The work done in the groups was performed with four or five subjects seated around the one table. The work done alone was performed with each subject in a separate room, but all working at the same time, starting and stopping at signals given by buzzers in the different rooms. The two situations were alternated so as to equalize the effects of practice, adaptation and fatigue. Rivalry was eliminated or at least reduced to a minimum by various expedients.

The tasks used were a vowel cancellation test, a reversible perspective test of attention and a multiplication test. For the vowel cancellation seven subjects were used. For the test of reversing perspective, seven subjects tried to

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24 Floyd H. Allport, Social Psychology, Boston, (1924), 265-270.

have the perspective reverse as often as possible, whereas fifteen attempted to have the perspective change as little as possible. Twelve subjects engaged in the test of multiplication.

The results showed 1) that the presence of a co-working group increased the quantity of work done by most subjects in all the tasks done; but 2) that the quality of the work was unaffected; and 3) that introspective reports indicated the presence of conflicting influences, one type urging toward greater speed and accuracy on account of the activity of co-workers, and the other type (especially noise and emotional factors) retarding both speed and accuracy.

Allport was interested also in the social facilitation of free word association, and performed four experiments in this area.[25] The subjects in both the isolation and the group situation were given sheets of paper on which to write the words as quickly as they came to mind. The task lasted three minutes.

In the first two experiments the subjects wrote every word, and eighteen subjects altogether took part. Sixteen of the eighteen wrote more words in the group than they wrote alone.

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25 Allport, Social Psychology, 270-272.
Floyd H. Allport, "The Influence of the Group upon Association and Thought," Journal of Experimental Psychology, III, 1920, 161-174.

In the third experiment they wrote every fourth association, and in the fourth every third word. In the third experiment eight subjects wrote more in the group, four wrote more alone, and two wrote an equal number of words alone and in the group. In the fourth experiment six wrote more words in the group and two wrote more alone.

Allport concluded

> An increase in speed and quantity of work under group influence seems to be as characteristic of free association as it is of other mental processes. In various experiments from 66 to 93 per cent of the subjects were facilitated by the stimulus of others doing the same task.[26]

More in line with the present investigation, Allport went into the problem of the social facilitation of thought processes, by having nine subjects write arguments, as many and as strong as they could, to disprove short passages from the works of Epictetus and Marcus Aurelius.[27] Each subject was given seventeen tests in each of the two conditions, alone and with the group.

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26 Allport, Social Psychology, 270-272.

27 Allport, Social Psychology, 272-274.
Allport, "The Influence of the Group upon Association and Thought," J. Exper. Psychol., III, 175-179.

The arguments were scored for value on a three-point scale. The most forceful and relevant statements received a score of three, those next in quality a score of two, and those of little worth a score of one.

It was found 1) that two-thirds of the subjects had a higher percentage of best arguments while working alone rather than while working with the group; 2) that two-thirds had a higher percentage of poorest arguments while working with the group rather than while working alone; 3) that two-thirds used more words in arguments written in the presence of others than they used when alone; and 4) that therefore the presence of others influences the individual engaged in reasoning, in the direction of a more informal and verbose type of expression.

In addition to the influence of the group upon reasoning, Allport went into the problem of social influences on judgments of comparison.[28] For this purpose he had seventeen subjects judge the pleasantness or unpleasantness of ten different odors and estimate the weights of ten different objects in relation to a light and a heavy standard, alone and in a group.

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28 Allport, Social Psychology, 274-278.

He found 1) that unpleasant odors were estimated to be less unpleasant in the group than when judged by the individual alone; 2) that pleasant odors were judged less pleasant in the group than when judged alone; 3) that when judged in the group heavier weights were judged lighter than when judged in the solitary situation; 4) that the lighter weights were judged to be heavier in the group than they were judged alone; and 5) that consequently there seems to be a tendency toward social conformity on the part of the individual, which is expressed by the inclination to avoid, in a group situation, extremes of judgment which he would make more readily when alone.

Weston and English[29] used tasks which required considerable intelligence. They constructed two forms of equal difficulty by randomly dividing four intelligence tests, so that each form contained sixteen items from Thurstone's reasoning test, four from Roback's Analysis Test, four from Roback's Interpretation Test and twelve from Brigham's Opposites Test. As subjects they had ten upperclassmen, divided into two equal groups, one of which took the tests in isola-

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29 S. Burns Weston and Horace B. English, "The Influence of the Group on Psychological Test Scores," American Journal of Psychology, XXXVII, 1926, 600-601.

tion first and then with the group, the other of which followed the reverse procedure.

They found that two of the subjects did equally well in either situation, and eight did superior work in the group. The mean score of all subjects attained in the group situation was significantly greater than the mean score achieved alone.

In another experiment by the same research team, but not so well controlled, twenty-one subjects, all college students, showed slight differences on the average, in favor of work in a group situation over work done alone. The task was an intelligence test.

Singupta and Sinha[30] worked with five subjects trained in laboratory work in psychology. They eliminated the effects of practice by having each subject develop a level of efficiency from which he would deviate but little from day to day. The practice was done individually over a two week period. The task was to cancel all the A's and all the E's from newspaper copy, for three minutes.

It was found that four of the subjects increased

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30 N. N. Singupta and C. P. N. Sinha, "Mental Work in Isolation and in Group," Indian Journal of Psychology, I, 1926, 106-110.

in both amount and quality of work from 14 to 23 percent in the group work while the other increased but not so significantly. The authors believed the facilitating factors to be: 1) increased rate of movement by the perception of others moving; 2) emulation and rivalry; and 3) possibly increased attention due to the slightly distracting circumstances of working with others in a group.

Elkine recognized that society largely educates its members through social groups and asked whether the social group presents an environment favorable to mental growth or one which hinders it.[31] In an attempt to answer the question, memory for a series of seven words of one syllable and for a series of numbers of two digits, was chosen as the mental function to be tested.

The subjects were forty school children, eight to twelve years of age. The words and digits were read once to the subjects in a loud voice, and memory was measured by the amount correctly reproduced. The first trial was given individually. Each child was then required to reproduce orally the material immediately, and again on the next day.

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31 D. Elkine, "De l'Influence du Groupe sur les Fonctions de la Memoire," Journal de Psychologie, XXIV, 1927, 827-830.

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Other words and digits of equal difficulty were presented orally to the children in a group. Written reproduction was then required of them, immediately and again upon the following day. These results were then compared with the recall scores of the children in the individual situation.

Results indicated 1) that immediate memory was superior in the group situation, since the average group recall score for digits and words was 2.4 whereas the average individual reaall score was 2.1; 2) that things learned in the group are not forgotten as quickly as those learned by the individual alone, because the average group recall score for digits was 1.6 whereas the average individual recall score was 0.4 and the corresponding average scores for words were 1.1 and 0.5; 3) that these conclusions do not, however, hold for all children, since some subjects yeilded results opposite to the average trend; and 4) that the recall scores of subjects with better memory powers showed the greatest increase in the social situation.

Farnsworth[32] paired college students on the basis of the Thorndike Intelligence Test or on the basis of the

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32 Paul R. Farnsworth, "Concerning So-Called Group Effects," Journal of Genetic Psychology, XXXV, 1928, 587-594.

Otis S-A Test of Mental Ability. He then gave them other intelligence tests under two conditions -- alone and with a coworking group. Practice effects were controlled by means of the abba method. A total of one hundred ten subjects were used. They were divided into four groups of unequal size, the smallest consisting of twenty and the largest numbering twenty-six. One group was subjected to the Ohio State Test, another to the Terman Group Test, Form A, the third to the Terman Group Test, Form B, and the fourth to the Otis S-A Test, Form B.

The results showed 1) neither consistent nor significant differences between mean scores obtained alone and mean scores received in the group; but 2) a slight tendency for students working alone to obtain a relatively higher score on the more difficult items.

Travis,[33] having observed that most stutterers talk with little or no difficulty when by themselves, took up the question of whether or not a social situation also tended to interfere with or slow down their mental processes. The chain

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33 Lee Edward Travis, "The Influence of the Group upon the Stutterer's Speed in Free Association," Journal of Abnormal and Social Psychology, XXIII, 1928, 35-51.

association procedure already used by Allport[34] was adopted, and attention was given only to the quantity of associations. Ten subjects were used. The same stimulus words were employed in both conditions -- alone and in the group. Practice effects were equalized by alternation of the conditions.

The results showed 1) that eight of the ten subjects produced more associations alone than when in the group, a proportion which is significant at the .05 - .02 level of confidence; 2) that the average number of associations of all the stutterers alone is greater than their average in the group, but not significantly; and 3) that the better the stutterer was in the task of free association, the more he was helped by the solitary situation and hindered by the social situation, while the poorer he was, the less isolation helped or group work interfered.

Anderson[35] studied the relation of social facilitation to intelligence. He used five senior high school boys,

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34 Allport, "The Influence of the Group upon Association and Thought," J. Exper. Psychol., III, 159-182.

35 C. A. Anderson, "An Experimental Study of 'Social Facilitation' as Affected by Intelligence," American Journal of Sociology, XXXIV, 1929, 874-881.

sixteen years of age, with an IQ range of 125-130, and five senior high school boys, seventeen years of age, with an IQ range of 100-103. He had them do arithmetic problems involving addition, subtraction, multiplication and division, letter cancellation, and marble sorting by color. They had eight tests at each task, each test of five minutes duration. The trials took place in the middle of the afternoon, one week apart, and each subject did each type of task in isolation and with the group on each test day. The solitary and group performances were alternated to control practice effects.

It was found 1) that a greater average amount of work was done in the group situation by both groups, either taken individually or taken together, in the arithmetical computations; 2) that the brighter group and the combined groups performed a significantly greater amount of letter cancellation in isolation, but that the normal group did a slightly but not significantly greater amount in the group; 3) that all groups sorted more marbles in the group, but not significantly more; 4) that when differences were found in favor of the work done in the social situation, the group with normal intelligence was benefited more, but that when the differences were in favor of the individual work, the brighter group benefited more; 5) that variability in the amount of work done tended

to be greater in the group situation, and more so for the brighter group, but not significantly so; 6) that quality scores in arithmetic tended to be greater for both groups in the social situation, but not significantly greater; 7) that in letter cancellation there were no significant differences in quality of work, but that the brighter group tended to do worse in the social situation; 8) that in marble sorting there were also no significant differences in quality, but that the brighter group tended to do better in the social situation whereas the normal group tended to do better alone; 9) that in general those subjects who worked more quickly were also more accurate; and 10) that the faster workers tended to show greater increases in amount of work done in the group situation than the slower workers.

Dashiell[36] in the investigation previously mentioned also studied the effects of a co-acting group in the performance of multiplication problems, mixed relations or analogies and free serial word association. The work in the group was done with the subjects seated around two large tables, with the explicit directions that they were not to

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36 Dashiell, "An Experimental Analysis of Some Group Effects," J. Abn. & Soc. Psychol., XXV, 194-195.

compete with one another. Ninety-five subjects, all college undergraduates in beginning psychology courses, took part.

The results indicated 1) that speed was decreased in the social situation for all three types of task; and 2) that accuracy was lessened in the social situation for multiplication, but increased for mixed relations and analogies.

Krueger[37] administered Forms A and B of the Otis S-A Tests of Mental Ability, Higher Examination, to four groups of college sophomores, forty students per group. The procedure was such that practice effects were cancelled out and that half the subjects took Form A first and the other half Form B first. The subjects did not know the purpose of the tests but considered them routine work in the beginning course in psychology.

It was found 1) that the difference between the mean score in the tests taken individually and the mean score in the tests taken in the group, in the first administration, was slightly in favor of the group situation, but not significantly; and 2) that when the mean score of the tests taken

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37 W. C. F. Krueger, "Note Concerning Group Influence upon the Otis S-A Test Scores," Journal of Educational Psychology, XXVII, 1936, 554-555.

individually and the mean score of the tests taken in the group, for the second administration, were compared, the individual work was superior, but again not significantly so. Hence it was concluded that no group effects were found.

Abel reported a study of social facilitation at the Convention of the American Psychological Association.[38] Its purpose was described as twofold: 1) to measure the effect of working in pairs or alone, on speed, accuracy and pressure in tracing a simple paper and pemcil maze with no blind alleys; and 2) to compare performances at two different levels of intelligence.

Two groups of forty girls each were selected. The groups were equated for age, in that all were between fifteen and seventeen years, and also for educational and socio-economic background. But both groups were of subnormal intelligence, the lower having an IQ range of 50 to 59, the higher an IQ range of 70 to 79.

Each subject went through four experimental periods with twenty trials per period, and with a procedure by means of which practice effects were controlled. Scoring was in

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38 Theodora M. Abel, "The Influence of Social Stimulation on Motor Performance at Different Intelligence Levels," Psychological Bulletin, XXXIV, 1937, 739-740.

terms of time per trial with a penalty for errors, i.e., not staying between the lines.

The conclusions were: 1) that all subjects did better in pairs, the high group markedly so; 2) that the greater frequency of social stimulation, the better the performance; 3) that the high group did decidedly better than the low group except when working individually before social stimulation had taken place; 4) that more errors were made by both groups when working in pairs; 5) that the high group made more errors than the low group; 6) that pressure increased inversely with speed and directly with accuracy; and 7) that the high group increased pressure more when working individually after working in pairs.

A similar investigation which may be a reworking of the same data was reported by Abel the following year.[39] It proposed to study the relative influence of social facilitation on simple motor performance at two different subnormal intelligence levels. Again the material used was a paper and pencil maze with no blind alleys, scoring was done in terms of time, with a penalty for errors, and the work

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39 Theodora M. Abel, "The Influence of Social Stimulation on Motor Performance at Different Levels of Intelligence," American Journal of Psychology, LI, 1938, 379-389.

done alone and in pairs.

The groups used were much as before. The lower intelligence group consisted of thirty-eight girls with an IQ of 50-59 as measured by the Otis S-A intermediate scale, an MA below 13 on the Pintner Non-Language Mental Ability Test, and a chronological age of fifteen or sixteen. The higher group was composed of thirty-six girls with an IQ of 70-79 on the Otis, an MA above 13 on the Pintner Non-Language, and a chronological age of fifteen or sixteen. The groups were equated for socio-economic background.

Each subject went through four experimental sessions of twenty trials each. The first period was not counted in the results, and was regarded as practice; so also were the first trials in each succeeding session. Practice effects were controlled by the experimental procedure adopted.

The results showed: 1) that both groups profited from the influence of working in pairs; 2) that the more intelligent subjects profited more than the less intelligent; 3) that more frequent social stimulation in an initial series makes for superior performance in a later series, even without social stimulation, and that this is true for both the higher and the lower intelligence groups; 4) that pressure in the

tracing, as measured by the number of carbon impressions made, is not influenced by social facilitation; 5) that in the higher group, the slower partner excelled the faster partner much more frequently under the conditions of working in pairs than was the case for the subject of lower subnormal intelligence.

The following year Abel reported another investigation.[40] In this the two partners worked on different tasks. One traced a simple pencil and paper maze with no blind alleys, while the other placed a certain number of kitchen matches in a box, one at a time, so that the heads faced all in one direction. This latter task was not used in arriving at the conclusions.

The subjects were two groups of twenty girls each. Group I had an IQ range of 50 to 59 on the Otis S-A intelligence test and an MA below 13 on a non-language scale.

Ten of the subjects in each group had three experimental periods of twenty mazes each in which they worked alone, and a final experimental period of twenty mazes in which they worked with a partner who picked up matches and put them in

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40 Theodora M. Abel, "Social Facilitation in Different Motor Tasks," Kwartalnik Psychologiczny, XI, 1939, 162-169.

a box. The other ten subjects in each group had their first three experimental sessions with the partner doing the match task, and their final experimental session alone.

No social facilitation was found in either the higher or the lower intelligence groups. But the higher group working alone in the final period did significantly better than the higher group working with the partner in the final period.

Combining these results with those of her former experiments Abel then goes on to these further conclusions. 1) Social facilitation seems to operate only when the partners are working on the same task. 2) When the partner is working on a different task there seems to be even some inhibiting effect, though this was not noticeable in subjects of lower intelligence. 3) In subjects of greatly subnormal intelligence rivalry and competition are less likely to be operative and hence less social facilitation takes place. 4) In the case of partners working on different tasks rivalry and competition are not operative at all, and no social facilitation takes place. 5) Hence it seems that the mere perception of others working is a relatively insignificant factor in social facilitation.

Mukerji[41] worked with thirty-one children from an English elementary school. Their ages ranged from eleven years and three months to thirteen years and eight months. One of their tasks was letter cancellation. The other, which he called "naming capitals" consisted of their writing s under capital letters made of straight lines only, and c under those made wholly or partly of curved lines.

The subjects were first given the tasks in mixed groups of at least ten individuals. Then the tasks were repeated in isolation. Each task lasted five minutes and was subdivided into thirty equal intervals. All subjects had previously practiced the tasks to a point beyond which practice did not make for improvement.

Two conclusions were reached. 1) Ability in the group exceeded that in isolation by 20.0 per cent in naming capitals and by 27.7 per cent in letter cancellation. 2) The advantage gained by group work was greater for boys than for girls, although the average score in ability was greater in girls than in boys.

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41 N. P. Mukerji, "An Investigation of Ability in Work in Groups and in Isolation," British Journal of Psychology, XXX, 1940, 352-356.

Bennett[42] made a comparison between scores obtained under the individual administration and those obtained under the group administration of an intelligence test. She used the Terman Group Test of Mental Ability, Forms A and B. Her subjects were matched samples of seventh-grade children, fifty-eight boys and sixty-six girls in each group. All factors except social facilitation were either controlled or reduced to a minimum.

The results were summarized in four conclusions. 1) Comparison of the mean score received in individual administration revealed no significant differences. 2) The reliability of the Terman Group Test was approximately the same for both types of administration. 3) The validity was not significantly different in either method. 4) No significant sex differences were found.

A summary of the findings of all the investigations dealing with co-working groups is presented in Table I. From this it may be seen that the results obtained by experimenters in the field of social facilitation in co-acting groups have

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42 Mary Woods Bennett, "Factors Influencing Performance on Group and Individual Tests of Intelligence: II. Social Facilitation," Journal of Educational Psychology, XXXVII, 1946, 347-358.

served to verify the existence of this factor and to determine some of its effects upon the work of groups of individuals doing the same task. This is equally true of tasks which are more intellectual as well as of those which are more sensory-motor in nature.

However, not all investigators have found social facilitation. Some of the later investigations have yielded only negative results, particularly for work involving the higher mental functions.

Two other tendencies are noticeable also. The first is the indication that those of higher mental ability seem to be hindered rather than helped by working in the presence of a co-acting group. The other is that special groups, such as stutterers or the intellectually subnormal are affected by the social situation in a different way than the average of individuals.

TABLE I

SUMMARY OF FINDINGS FOR CO-WORKING GROUPS

Investigator	Subjects	Type of Work	Effects of the Social Situation	
Mayer	14 school boys	sense-motor and intellectual	quantity up	quality up
Allport	22 adults	sensory attention	quantity up	quality same
	12 adults	intellectual	quantity up	quality same
	40 adults	free word association	quantity up	quality not considered
	9 adults	intellectual	quantity up	quality down
	17 adults	affective judgment	unpleasant judged less so pleasant judged less so	
	17 adults	sensory judgment	heavier weights judged lighter lighter weights judged heavier	
Weston & English	10 adults	intelligence tests	quantity up	quality up
	21 adults	intelligence tests	quantity up	quality up

TABLE I

SUMMARY OF FINDINGS FOR CO-WORKING GROUPS (continued)

Investigator	Subjects	Type of Work	Effects of the Social Situation	
Singupta & Sinha	5 adults	sense-motor	quantity up	quality up
Elkine	40 school children	memory	quantity up	quality not considered
Farnsworth	110 adults	intelligence tests	quantity same	tendency to lower scores on more difficult items
Travis	10 stutterers	free word association	quantity down	better hindered more than poorer
Anderson	10 high school boys	intellectual	average group tended to do better in group superior group tended to do better alone	
Dashiell	95 adults	free word association	quantity down	quality not considered
	95 adults	intellectual	quantity down	quality up for analogies, down for multiplication

TABLE I

SUMMARY OF FINDINGS FOR CO-WORKING GROUPS (continued)

Investigator	Subjects	Type of Work	Effects of the Social Situation	
Krueger	110 adults	intelligence tests	none	
Abel	40 feeble-minded girls	sense-motor	quantity up	quality down
	40 dull-normal girls	sense-motor	quantity up markedly	quality down markedly
	38 feeble-minded girls	sense-motor	quantity up	quality up
	36 dull-normal girls	sense-motor	quantity up markedly	quality up markedly
	20 feeble-minded girls	sense-motor	none*	
	20 dull-normal girls	sense-motor	none*	
Mukerji	31 school children	sense-motor	quantity up	quality up
			more increase in boys than in girls	

* Subjects working together worked on different types of tasks

TABLE I

SUMMARY OF FINDINGS FOR CO-WORKING GROUPS (continued)

Investigator	Subjects	Type of Work	Effects of Social Situation
Bennett	248 school children	intelligence tests	none

CHAPTER III

THE EXPERIMENTAL PROCEDURE

All of the subjects were undergraduate students of Loyola University, enrolled in elementary college courses. Two classes (A and B) were made up of students in an elementary Psychology and in an elementary English course during the first summer session of 1951. Six other classes (C, D, E, F, G, and H) were composed of students in introductory Psychology courses during the first semester of the academic year 1951-1952.

All of the subjects were first given, during regular class periods, the Differential Aptitudes Test in Verbal Reasoning, Form A. Within each class they were matched person for person and separated into two equivalent groups on the basis of the scores obtained in this test. These were designated Group I and Group II within each class. The verbal reasoning scores and the Means and Standard Deviations of the matched groups are given in Appendix I.

The Differential Aptitudes Test in Verbal Reasoning was selected for this purpose since it was designed to measure

the "ability to understand concepts framed in words."[1] More than this, it was constructed for the purpose of evaluating the "ability to abstract or generalize and to think constructively, rather than at simple fluency or vocabulary recognition."[2]

Moreover the test was well standardized and is highly reliable. Over twenty thousand pupils, in grades eight to twelve in thirty different school systems of representative eastern and midwestern communities, were used in the standardization procedure. The reliability coefficient for the test in Verbal Reasoning, Form A, is .93 for boys in the twelfth grade, and .92 for twelfth grade girls,[3] the two groups for whom norms are available, which come closest to the subjects used in this research.

The abba experimental procedure was then followed;

Group I in each class explained Proverbs 1 and 3 in isolation.

Groups I and II in each class explained Proverbs 2 and 4 in the presence of co-workers.

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1 George K. Bennett, Harold G. Seashore and Alexander G. Wesman, "Differential Aptitudes Tests Manual," New York, 1947, p. A-8.

2 Ibid.

3 Ibid., p. C-5.

Group II in each class explained Proverbs 1 and 3 in isolation.

Following the administration of the verbal reasoning test and before the beginning the procedure itself, the experimenter read to each class the following instruction:

> "You are being asked to cooperate in a psychological experiment. Altogether, it will not take more than about twenty minutes of your time, outside of class. Please do not ask the purpose of the experiment, nor discuss it among yourselves at any time. Its purpose will be explained to you after the experiment is finished.
>
> "The tasks you are to do will be all the same. You are to write down as many and as clear explanations as you can think of in ten minutes, for several well-known proverbs. The proverb you will be asked to explain will be a different one each time, and will be reproduced at the top of a sheet of paper.
>
> "Two proverbs will be given to you for explanation, working by yourselves alone in a laboratory booth, and two will be done by everyone together in calss. I will time you in both instances.
>
> "Are there any questions?"

Any features of the experimental procedure which were not understood were then explained again, using the same language as originally in the above instructions.

Following this, appointments were made with the members of Group I in each class for the tasks to be done in isolation. For this, each subject was placed by himself in an enclosed

laboratory booth, and handed a sheet of paper on which was printed:

"DIRECTIONS: Explain the meaning of this proverb in as many ways as you can think of, and as clearly as you can."

Beneath this, in capital letters, appeared the proverb.

As he handed the subject the paper, the experimenter said:

> "You remember what the task is. You are to explain the meaning of the proverb in as many different ways as you can think of, and as clearly as you can. You have ten minutes. I will stop you when time is up."

The subject was then left alone in the booth. Time was kept with a stop watch. The subject was stopped after ten minutes and given a second sheet of paper, made up the same as the first, but with a different proverb. Taking the first paper as he handed the subject the second, the experimenter said:

> "Here is another one. Again you have ten minutes, and I will stop you when your time is up."

The subject was timed to exactly ten minutes as before, by means of a stop watch, and when the time had elapsed, the experimenter took his paper, thanked him and dismissed him.

After all of the subjects in Group I of any class had completed the tasks in the individual situation, both groups were given the other two proverbs to explain during a regular class period. Each subject was given, face down, a sheet of paper

containing the following:

"DIRECTIONS: Explain the meaning of this proverb in as many different ways as you can think of, and as clearly as you can.

The others in this room are all working on the same task as you are."

Below this in capital letters was the proverb.

As each subject received his paper he was instructed to write his name on the back, and keep it face down until given the signal to turn it over and begin. When all the subjects were ready, the experimenter gave the signal to turn the papers over and proceed with the task, started the stop watch, and said:

"Everyone in this room is working on the same task."

At the end of ten minutes, the signal was given to stop. The first papers were collected, and the second papers, made up just as the first but containing another proverb, were given to the subjects. The administration was handled exactly as before. When the ten minutes of work were completed, the papers were collected and the subjects were thanked for their cooperation.

Appointments were then made with the subjects in Group II in each class, for the individual administration. The same procedure was followed with them as with the subjects in Group I.

The proverbs used were those which are found at the

Superior Adult II level of the 1937 Revision of the Stanford-Binet Test of Intelligence, Form L:

"A bird in the hand is worth two in the bush" (Proverb I)
"You can't make a silk purse out of a sow's ear" (Proverb 2)

and also those at the same level of the 1937 Revision of the Stanford-Binet Test of Intelligence, Form M:

"The mouse that has but one hole is easily taken" (Proverb 3)
"You must not throw pearls before swine" (Proverb 4).

Since these four proverbs are found at the same level on both forms of the Stanford-Binet, and since the levels appropriate to the difficulty of all items on this test were empirically determined by administration to a large and representative sample of American children and adolescents, they may be legitimately considered as being all of approximately the same difficulty.

In order to eliminate such factors as handwriting, neatness, etc., and to make the proverbs explained individually, indistinguishable by the scorers from those explained in the group, all the papers were typed before being scored. The scoring was done by two clinical psychologists with considerable experience in the administration and scoring of the Revised Stanford-Binet, and whose work demands frequent administration and scoring of this scale.

Using the standards set by Terman and Merrill[1] they assigned a plus for every satisfactory explanation, a minus for every explanation which was unsatisfactory, and a question mark for every explanation which was doubtful, and after which, according to the Stanford-Binet procedure, they would have pursued the subject further and said to the testee "Tell me more about it."

A score of two was given for each satisfactory explanation (those marked plus) and a score of one was assigned for each doubtful explanation (those marked ?). Unsatisfactory explanations (those marked minus) received a score of zero. The total of these scores was computed for each paper and marked at its top. These were considered qualitative scores, and will hereafter be referred to as such.

The number of words written on each paper as explanations below each proverb was counted also. This number was marked at the top of each paper. These were considered quantitative scores, and will hereafter be referred to in this way.

The statistical treatment of these scores and the results of this analysis will be treated in the following chapter

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1 Louis M. Terman and Maud A. Merrill, Measuring Intelligence, Boston, 1937 , 295-296, 405-406.

CHAPTER IV

ANALYSIS OF THE EXPERIMENTAL DATA

Since all the subjects tested were students in introductory courses in Psychology and in English in the same university, it was thought that these classes could be considered as random samples of the same population. If this were true, more reliable statistics pertaining to this population would be obtained by combining all the subjects into one large group. This hypothesis (that the classes were random samples of the same population) was tested by means of analysis of variance.

One of the most valuable uses of analysis of variance is in the testing of such an hypothesis.

> The problem here is to determine whether sets of data obtained under varying conditions are sufficiently homogeneous to be regarded as belonging to the same population. Whether or not we combine distributions into larger composite distributions hinges on the answer to this question. Fisher's test of significance in connection with his analysis of variance is designed precisely to tell us whether sets of data are sufficiently different from one another for us to reject the hypothesis that they arose by random sampling from the same population.[1]

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1 J. P. Guilford, Fundamental Statistics in Psychology and Education, 2nd ed., New York, 1950, p. 236.

In order to use analysis of variance certain requirements must be fulfilled with regard to the data involved. According to McNemar, one requirement is "that we have two independent estimates of variance, which estimates are, on the basis of the null hypothesis, regarded as estimates of the same population value."[2] This requirement was fulfilled since one estimate of the variance was of that within the groups, whereas the other estimate was of the variance between groups.

The other requirement, according to McNemar, is

> that the trait or variable, in terms of the measurement units being employed, is normally distributed, but there is some evidence that moderate skewness is permissible.[3]

Normal distribution of the variables involved in the present investigation is a valid assumption in view of the evidence from so many studies that intellectual abilities are normally distributed in the general population. In the case of college students, because of the very high level of the intellectual tasks used in the present study, a distribution approximating the normal could be expected.

An analysis of variance was computed for the combined qualitative scores (i.e. for all proverbs) of the subjects in all

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2 Quinn McNemar, Psychological Statistics, New York, 1949, p. 235.

3 Ibid.

eight groups. The result of this procedure is presented in Table II.

TABLE II

ANALYSIS OF VARIANCE OF COMBINED QUALITATIVE SCORES

	d.f.	Sum of Squares	Variance	Significance
Between Groups	7	276.43	39.490	F = 1.113 (not significant)
Within Groups	160	5713.28	36.486	

The F-test indicates that these eight groups may all be considered as samples of the same population, since F equals 1.113, whereas it would have to be about 3.69 to indicate, at the .05 level of confidence, that these classes were samples of different populations.

An analysis of variance was also computed for the combined quantitative scores of the subjects in all eight groups. The result of this process appears in Table III.

TABLE III

ANALYSIS OF VARIANCE OF COMBINED QUANTITATIVE SCORES

	d.f.	Sum of Squares	Variance	Significance
Between Groups	7	440774	67967	F = 2.265 (not significant)
Within Groups	160	4448121	27801	

F is seen equal 2.265, which is far below the value required to maintain, at the .05 level of confidence, that these classes are samples of different populations. Hence an analysis of variance of the combined quantitative scores supports the hypothesis that these are all samples of the same population.

On the basis of these results, all the subjects in all eight classes were combined into one large group, now numbering one hundred sixty-eight. The scores of each individual in verbal reasoning and his qualitative and quantitative scores in the interpretation of the proverbs are given in Appendix II.

The mean scores for quality and for quantity, for work in isolation and for work with a group, were computed, and the differences between these means were tested for statistical significance. The relevant data are presented in Table IV.

The mean qualitative score for work done alone was 6.31, for work done with a group 4.50. This lessening of average quality by 1.81 score units is significant at beyond the .001 level of confidence.

The mean quantitative score for work done alone was 207.49 words, while for work done with a group it was 183.95 words. This decrease in the number of words written to explain the proverbs is also significant at beyond the .001 level of confidence.

TABLE IV

DIFFERENCES BETWEEN MEANS OF GROUP VS. INDIVIDUAL QUALITATIVE AND QUANTITATIVE SCORES

	Alone	Group	Difference	Value of "t"	Significance
Quality					
Mean	6.31	4.50	-1.81	5.85	<.001
SD	3.98	3.82			
Quantity					
Mean	207.49	183.95	-23.95	5.35	<.001
SD	84.75	86.00			

However, these means and differences between means conceal many and wide individual differences in the effect which working alone vs. working with a group had upon particular individuals. These appear to some extent in Table V, where the numbers of individuals facilitated qualitatively and quantitatively is set forth.

Whether the number of individuals facilitated, unaffected and hindered, both qualitatively and quantitatively, by working with a group, is significantly different from chance expectations was tested by means of Chi-square, which is a method of discovering whether actually observed results, expressed in the form of frequencies, are significantly different from re-

sults to be expected according to some hypothesis.[4] In this instance the hypothesis to be tested was that the number of individuals facilitated, unaffected and hindered, did not differ significantly from what could be expected by chance fluctuations among these categories.

TABLE V

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE NUMBER OF INDIVIDUALS FACILITATED, UNAFFECTED AND HINDERED, BY WORKING WITH A GROUP

	Quality	Quantity
Facilitated	49	51
Unaffected	23	2
Hindered	96	115
Chi-square	47.478	112.586
Significance (df = 2)	<.001	<.001

The Chi-square for the differences in quality is 47.478, and for the differences in quantity is 112.586. Both are well beyond the .001 level of significance.

There is, however, only doubtful justification for dividing the frequencies three ways, i. e. into facilitated, un-

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[4] Guilford, Fundamental Statistics in Psychology and Education, p. 273

affected, and hindered, especially in the area of quantitative scores, since it is much less likely that an individual will be unaffected (will write the same number of words both times) than it is that he will be either facilitated or hindered. Therefore the frequencies were also divided two ways, as shown in Table VI, into those hindered as opposed to those either facilitated or unaffected, in both quality and quantity of explanation.

TABLE VI

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE NUMBER OF INDIVIDUALS HINDERED, AS OPPOSED TO THOSE FACILITATED OR UNAFFECTED BY WORKING WITH A GROUP

	Quality	Quantity
Facilitated or Unaffected	72	53
Hindered	96	115
Chi-square	3.148	22.148
Significance (df = 1)	.10-.05	<.001

According to Table VI it is doubtful that the number of those hindered qualitatively by working with a group is significantly different from chance expectations, when it is assumed that, given only the two possibilities, an individual is as likely to be hindered, as he is to be either facilitated or unaffected, in his qualitative score. Chi-square is 3.148, which

is between the .10 and the .05 levels of confidence.

However, this assumption is not altogether justified either, for it is most probable that the true situation for qualitative scores lies somewhere in between, and may even be closer to the three-fold division than it is to the two-fold.

The opposite would be true of the chance probability of being hindered, unaffected or facilitated in quantitative scores, which are computed by simply counting the number of words written. While it is not truly to be expected that one-half the group would fall by chance into a hindered vs. non-hindered dichotomy, this is much closer to the chance probability than a three-fold division, into hindered, unaffected and facilitated, would be.

However, as is shown in Table VI, even when the quantitative scores are dichotomized into hindered vs. either facilitated or unaffected, the number of subjects hindered quantitatively when working with a group is more than chance probability, the difference from chance being significant at beyond the .001 level of confidence.

Therefore it may be concluded that working with a group interfered with the intellectual functioning of the subjects. This is so because of the significant drops in both qualitative and quantitative mean scores for work with a group, and also because a significantly greater number were hindered, both

qualitatively and quantitatively, than could be expected on the basis of chance probability.

Now that it has been established that working with a group had the effect, on the average, of interfering with the intellectual functioning of the subjects, it may be asked whether those who attained the higher scores on the Differential Aptitudes Tests: Verbal Reasoning, were differently affected than those who attained the lower scores.

For this purpose the fifty subjects who obtained the fifty highest scores on this test of verbal reasoning were compared with the fifty subjects who received the fifty lowest scores. The results of this analysis are presented in Table VII.

According to Table VII there was no significant difference between the mean decrease in quantitative scores between the subjects who obtained the fifty highest scores in the verbal reasoning test and the subjects who received the fifty lowest scores. The difference was .14, with the subjects scoring highest in verbal reasoning suffering less interference when working with a group than those who scored lowest. However, this difference may be due to chance fluctuations, since for a "t" equal to .171, P/2 is at the .50 - .40 level of confidence.

However, the fifty subjects scoring highest in verbal reasoning suffered signigicantly more interference in mean quan-

titative productivity while working with a group. The difference in mean decrease was 8.14, and "t" was 4.625. This value of "t" is significant at beyond the .001 level of confidence.

TABLE VII

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE FIFTY HIGHEST AND FIFTY LOWEST SUBJECTS ON THE VERBAL REASONING TEST IN AMOUNT OF QUALITATIVE AND QUANTITATIVE INTERFERENCE EXPERIENCED WHEN WORKING WITH A GROUP

	Fifty lowest	Fifty highest	Difference	"t"	Significance
Decrease in quality					
Mean	1.32	1.18	-.14	.171	.50-.40
SD	3.35	4.70			
Decrease in quantity					
Mean	15.44	23.58	-8.14	4.625	<.001
SD	55.92	65.51			

But the number of subjects among the fifty highest in verbal reasoning who are facilitated, unaffected or hindered by working with a group is not significantly different from the number of subjects among the fifty lowest in verbal reasoning who are similarly affected. This is brought out in Table VIII.

TABLE VIII

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE NUMBER OF SUBJECTS FACILITATED, UNAFFECTED OR HINDERED AMONG THE FIFTY HIGHEST ON THE VERBAL REASONING TEST COMPARED WITH THE NUMBER OF SUBJECTS AMONG THE FIFTY LOWEST THUS AFFECTED

	Quality		Quantity	
	Highest	Lowest	Highest	Lowest
Facilitated	50	13	13	18
Unaffected	5	7	0	1
Hindered	25	30	37	31
Chi-square	1.464		.884	
Significance (df = 2)	.50 - .30		.70 - .50	

Chi-square for the comparison of quantitative scores was .884, which is at the .70 - .50 level of confidence. Chi-square for the comparison of qualitative scores was 1.464, and is at the .50 -.30 level of confidence.

However, as was brought out previously, it is theoretically more justifiable to dichotomize the frequencies of quantitative scores into hindered vs. unhindered rather than to divide them into three parts. The results of this procedure are presented in Table IX.

TABLE IX

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE NUMBER OF SUBJECTS HINDERED OR UNHINDERED AMONG THE FIFTY HIGHEST ON THE VERBAL REASONING TEST COMPARED WITH THE NUMBER OF SUBJECTS AMONG THE FIFTY LOWEST THUS AFFECTED

	Quality		Quantity	
	Hindered	Unhindered	Hindered	Unhindered
Highest	25	25	37	13
Lowest	30	20	31	19
Chi-square	.324		1.150	
Significance (df = 1)	.70 - .50		.30 - .20	

Table IX shows that the number of those among the subjects who attained the fifty highest scores on the test of verbal reasoning and whose reasoning functions were hindered either qualitatively or quantitatively when working with a group was not significantly different from the number of those so hindered among the subjects who received the fifty lowest scores in verbal reasoning. The Chi-square for differences in frequency of interference with qualitative performance was .324 which is equal to P at the .70 - .50 level of confidence. The Chi-square for differences in frequency of hinderance to quantitative productivity was 1.150, the P for which is at the .30 - .20 level confidence.

Thus the mean amount of decrease in quantitative productivity was significantly greater among the subjects who received the fifty highest scores in the test of verbal reasoning, than it was among those who received the fifty lowest scores in verbal reasoning. But the number of those suffering interference with quantitative production was not significantly greater among the subjects rating higher in verbal reasoning than it was among those scoring lower in this regard. In addition, there were no significant differences found either in mean qualitative scores nor in the number of those hindered or unhindered while working with a group, among the subjects who scored higher, as opposed to those who scored lower, on the test of verbal reasoning.

It was also determined to discover whether those who do relatively better in the solitary situation are differently affected while working with a group than those who do relatively poorer while working alone. In order to do this, the subjects who earned the fifty highest qualitative scores were compared with those who obtained the fifty lowest qualitative scores, and the subjects who gained the fifty highest quantitative scores were compared with those who received the fifty lowest quantitative scores. The results of this analysis are shown in Table X.

TABLE X

MEAN DIFFERENCES IN QUALITATIVE AND QUANTITATIVE SCORES FOR WORK WITH A GROUP, BETWEEN THE FIFTY HIGHEST AND THE FIFTY LOWEST SCORING SUBJECTS IN THE SOLITARY SITUATION

	Fifty lowest	Fifty highest	Difference	"t"	Significance
Differences in quality					
Mean	.76	-3.88	4.64	1.805	.05-.02
SD	2.42	5.14			
Differences in quantity					
Mean	-1.24	-49.08	47.84	5.04	<.001
SD	37.30	55.03			

From Table X it can be seen that those who reason relatively better while working alone suffer more interference while working with a group than those who reason relatively poorly in the solitary situation. This is true of both qualitative and quantitative scores.

The fifty lowest subjects in qualitative scores achieved alone, showed a mean gain of .76 in quality while working with a group. The fifty highest in solitary qualitative scores had a mean loss of 3.88 while working with a group. For this difference of 4.64, "t" is 1.805 and is significant at the

.05 - .02 level of confidence.

The fifty lowest subjects in quantitative scores obtained alone produced on the average 1.24 less words while working with a group. The corresponding loss in number of words for the fifty highest subjects in the solitary quantitative scores was 49.08. For this difference of 47.84, "t" is 5.04 which is significant at beyond the .001 level of confidence.

Can these significant differences be confirmed by similar findings on the number of those facilitated, unaffected and hindered among the fifty most competent and the fifty least competent subjects in the solitary situation? Table XI presents an analysis of the relevant data.

The number of individuals facilitated, unaffected and hindered, among the fifty most competent in the solitary situation, was significantly different from the number thus affected among the fifty least competent when working alone. The Chi-square for qualitative scores was 37.028, which is equal to P at well beyond the .001 level of confidence. The Chi-square for quantitative scores was 8.808, equal to P at the .02 - .01 level of confidence.

If the frequencies of individuals are divided into two parts, i.e. hindered and unhindered, rather than into two, the differences remain significant. This is shown in Table XII.

TABLE XI

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE NUMBER OF SUBJECTS FACILITATED, UNAFFECTED OR HINDERED AMONG THE FIFTY HIGHEST IN THE SOLITARY SITUATION AND THE NUMBER OF SUBJECTS AMONG THE FIFTY LOWEST THUS AFFECTED

	Quality		Quantity	
	Highest	Lowest	Highest	Lowest
Facilitated	11	26	18	23
Unaffected	1	12	1	0
Hindered	38	12	41	27
Chi-square	37.028		8.808	
Significance (df = 2)	.001		.02-.01	

TABLE XII

SIGNIFICANCE OF THE DIFFERENCES BETWEEN THE NUMBER OF SUBJECTS HINDERED OR UNHINDERED AMONG THE FIFTY HIGHEST IN THE SOLITARY SITUATION AND THE NUMBER OF SUBJECTS AMONG THE FIFTY LOWEST THUS AFFECTED

	Quality		Quantity	
	Highest	Lowest	Highest	Lowest
Hindered	38	12	41	27
Unhindered	12	38	9	23
Chi-square	25.00		7.768	
Significance (df = 1)	<.001		<.01	

Chi-square for differences of frequency of interference in qualitative scores while working with a group was 25.00, which is significant at beyond the .001 level of confidence. Chi-square for differences of frequency of hindrance in quantitative scores was 7.768, for which P is beyond the .01 level of confidence.

Therefore it may be concluded that the mean amount of qualitative interference experienced while working with a group, was significantly greater among the subjects who reasoned relatively more efficiently when alone, than it was among the subjects who reasoned relatively less efficiently when by themselves. In addition, a significantly larger number of the more capable subjects experienced interference while working with a group, than was evident among the less capable subjects.

The same results were found for quantitative scores. The productivity of the more verbose subjects while working alone, was on the average more substantially reduced while working with a group, than was the amount written by the subjects who wrote less while working alone. And also, a significantly larger number of the quantitatively more productive subjects alone, suffered a reduction in their quantitative productivity, than was experienced among the quantitatively less fruitful subjects.

The final problem is that of sex differences. In order to discover if any sex differences existed in quantitative or qualitative interference with reasoning functions in a social situation, the "t" of the differences between quantitative and qualitative mean decreases was calculated. The results are presented in Table XIII.

TABLE XIII

SIGNIFICANCE OF SEX DIFFERENCES BETWEEN MEAN DECREASES IN QUALITATIVE AND QUANTITATIVE SCORES

	Men N 68	Women N 110	Difference	"t"	Significance
Decrease in quality					
Mean	1.83	1.62	.21	.31	.40-.30
SD	4.22	3.97			
Decrease in quantity					
Mean	27.14	22.11	5.03	.56	.30-.20
SD	52.14	59.04			

The average decrease in quality scores for work with a group was 1.83 for the men and 1.62 for the women. This difference in mean decrease of .21 may be due merely to chance fluctuations however, since a "t" equal to .31 is equivalent to P/2 at the .40 - .30 level of confidence.

The numbers of those facilitated, unaffected or hindered was also computed, and tested to discover whether they are significantly different from chance expectations. These results are given in Table XIV.

The differences between numbers of men and women who were facilitated, unaffected or hindered either qualitatively or quantitatively by working with a group were found to be not significantly different from chance fluctuations. The Chi-square for differences in numbers qualitatively affected was 1.452, for which P is at the .50 - .30 level of confidence. The Chi-square for differences in frequency of individuals quantitatively affected was .217, for which P is at the .90 - .80 level of confidence.

TABLE XIV

SIGNIFICANCE OF SEX DIFFERENCES IN THE NUMBER FACILITATED, UNAFFECTED OR HINDERED

	Quality		Quantity	
	Men	Women	Men	Women
Facilitated	17	33	16	35
Unaffected	5	18	1	1
Hindered	33	59	41	74
Chi-square	1.452		.217	
Significance (df = 2)	.50 - .30		.90 - .80	

The differences between numbers of men and women hindered qualitatively or quantitatively, as opposed to those not so impeded, was also considered. These data are presented in Table XV.

When the subjects were divided into those who were hindered or unhindered, again no sex differences were found. The Chi-square for qualitative hindrance vs. non-hindrance was .781, for which P at the .50 - .30 level of confidence; and the Chi-square for interference with quantitative productivity was .077, for which P is at the .80 - .70 level of confidence.

TABLE XV

SIGNIFICANCE OF SEX DIFFERENCES IN NUMBER HINDERED OR UNHINDERED IN A GROUP

	Quality		Quantity	
	Hindered	Unhindered	Hindered	Unhindered
Men	36	22	41	17
Women	59	51	74	36
Chi-square	.781		.077	
Significance (df = 1)	.50 - .30		.80 - .70	

The conduct of this research has led to these results: 1) it was found that working with a group made for considerable interference, on the average, with the functioning of the reason-

ing powers, and this was true both of their qualitative efficiency as well as of their quantitative productivity; 2) it was found that working with a group hindered the reasoning efficiency and also the intellectual quantitative production of substantially more individuals than were either unaffected or facilitated by the social situation; 3) it was found that those who scored higher on the Differential Aptitudes Tests: Verbal Reasoning, were not differently affected qualitatively from those who scored lower on this test, but that those who scored higher suffered, on the average, more interference with their quantitative productivity than did those who scored lower; 4) it was found that those who did relatively better in the solitary situation were, on the average, impeded to a greater extent, both qualitatively and quantitatively, than those who did relatively poorer alone; 5) it was found that the number of individuals among those who did relatively better in the solitary situation and who were hindered or unhindered while working with a group, was significantly different from the number of those correspondingly affected, among the subjects who did relatively poorer in the solitary situation; 6) no significant sex differences were found.

CHAPTER V

GENERAL CONCLUSIONS

In view of the findings reported in the literature on the problems of social facilitation, the results of the present investigation were not by any means unexpected. As early as 1920 Allport [1], in one experiment involving multiplication as the task, found a lack of facilitation in the quality of the work produced by individuals while working in a group, though not an actual interference. However, in another experiment in which subjects were required to write arguments, thus involving a rather high level of reasoning powers, the same investigator found that working in a group lowered the quality of the arguments written. On the higher level of intellectual functioning, the social situation had the effect of interfering with the efficiency of the reasoning powers.

The work of Farnsworth[2] also may be regarded as in

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1 Allport, Social Psychology, p.265-270, 272-274

2 Farnsworth, "Concerning So-called Group Effects," J. Genet. Psychol., XXXV, 587-594.

agreement with the present findings. Intelligence test items were the tasks used. His subjects, one hundred ten college students, showed the tendency to miss more of the more difficult items while working in a group than they did while working alone. The tasks used in the present investigation may be regarded as on a very high intellectual plane, since they appear at the Superior Adult II level of the Revised Stanford-Binet intelligence tests.

The experiments of Dashiell[3] too, are in line, at least partially, with the results of the present study. When ninety-five subjects worked at multiplication problems, he found that the quality of the work was reduced in the social situation, but that it was increased when the task was mixed relations or analogies. This may have been because the multiplication problems used were on an intellectual plane higher than that of the tasks involving mixed relations, or perhaps on the contrary, due to the mechanical nature of the multiplication tasks, they were more affected by incidental distraction than were the items which involved reasoning and hence had more intrinsic interest.

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[3] Dashiell, "An Experimental Analysis of Some Group Effects," J. Abn. & Soc. Psychol., XXV, 194-195

Krüeger's research[4] used subjects seemingly very similar to those used in the present study, one hundred sixty college sophomores. He administered the Otis S-A Tests of Mental Ability, Higher Examination, in groups and individually, with practice effects controlled, and found no significant differences between the average score obtained in isolation as opposed to the mean score achieved in a group. The explanation of this may be that the social situation had a facilitating effect on the many rather low level items of the Otis, and that this facilitating effect struck a balance with the interference effect, caused by the group work, upon the more difficult items. However, this is purely conjecture, since no such differentiation of items was made in regard to the group effects upon them.

Bennett's study[5] of seventh-grade children is really not directly comparable to the present research, because of the wide differences which are apparent between the groups of subjects used. It is interesting to note, however, that she found no group effects, for either quantity or quality of work done, and that the tasks were intelligence test items: the Terman

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4 Krueger, "Note Concerning Group Influence upon the Otis S-A Test Scores," J. Educ. Psychol., XXVII, 554-555.

5 Bennett, "Factors Influencing Performance on Group and Individual Tests of Intelligence: II. Social Facilitation," J. Educ. Psychol., XXXVII, 347-358.

Group Tests of Mental Ability. While seventh-grade children are not, on the average, capable of operating on the much higher plane of mental functioning required to explain the proverbs used in the present investigation, apparently the level of their intellectual processes is high enough so that no facilitating effect is found, on the average, when material requiring the use of the higher intellectual powers is dealt with in a group.

The work of Weston and English[6], on the contrary, produced results totally at variance with those of the present investigation. Using thirty-one college students as subjects and intelligence test items as the tasks, they found improvement in quality of production in the group situation. Two explanations of this are possible. Either the intelligence test items used were of a rather low intellectual level or else these investigators just happened to get in the sample they used, a greater than usual number of individuals upon whom working with a group had a greatly facilitating effect.

Turning now from the effects which working with a group has upon the quality of the task done, and centering attention rather on the quantity of work produced, one notices that the reports are not in so much agreement on this point,

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6 Weston and English, "The Influence of the Group on Psychological Test Scores," Amer. J. Psychol., XXXVII, 600-601.

either with the present research or among themselves, as they are with regard to group effects upon quality of intellectual production. For some studies report that working with a group had the effect of increasing the quantity of work done, whereas as many others say that a lesser amount of work was put forth in the social situation.

Among the studies reporting a quantitative increase in intellectual accomplishment while working with a group, are those of Allport,[7] and of Weston and English,[8] referred to previously. The studies by Farnsworth,[9] Krueger,[10] and Bennett,[11] also reported upon before, found no significant quantitative differences. The investigation of Dashiell,[12] however, discovered

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7 Allport, Social Psychology, 265-270, 272-274.

8 Weston and English, "The Influence of the Group on Psychological Test Scores," Amer. J. Psychol., XXXVII, 600-601.

9 Farnsworth, "Concerning So-called Group effects," J. Genet. Psychol., XXXV, 587-594.

10 Krueger, "Note Concerning Group Influence upon the Otis S-A Test Scores," J. Educ. Psychol., XXVII, 554-555.

11 Bennett, "Factors Influencing Performance on Group and Individual Tests of Intelligence: II. Social Facilitation," J. Educ. Psychol., XXXVII, 347-358.

12 Dashiell, "An Experimental Analysis of Some Group Effects," J. Abn. & Soc. Psychol., XXV, 194-195.

a decrease in quantitative output, as did the present research, in work with a group.

Exactly what this means is not very clear. One explanation could be that intellectual tasks of a very high level tend to be hindered during group work, with regard to quantitative output as well as in quality of product, but that there are marked individual differences in the effect which working with a group has upon various individuals.

In this event the investigations of Allport and of Weston and English, particularly since they used a rather small number of subjects, could be thought of as having obtained their results because they just happened to get a greater proportion than usual of individuals of the type who are influenced by a social situation to greater quantitative productivity.

Those of Farnsworth, of Krueger, and of Bennett, each employing a large sample of subjects, could be considered as having discovered no significant quantitative differences because they happened to get about equal proportions of each type.

The investigation of Dashiell, together with this present one, could be viewed as having found a quantitative decrease in production for group work, because they involved tasks of higher intellectual level than did the studies which found no

such interference.

That there are wide individual differences in the effects, upon both quantitative and qualitative productivity produced by working with a group, is a fact brought out many times before, and confirmed again by this study. Some persons were facilitated by the social situation. All degrees of both qualitative and quantitative increase were found among the performances turned in by the various subjects. Others suffered interference with their reasoning processes while working with a group. And again all gradations of decrease in both quality and quantity of work appeared. A third group were affected little or not at all. No great differences, and in some instances no differences at all, existed between the quality or the amount of work they did alone, and the quality or the amount of work they produced with a group.

Other points to be considered concern the differential effects of working with a group brought out by this investigation. When those who received the higher scores on the Differential Aptitudes Tests: Verbal Reasoning, were compared with those who received the lower scores on this test, it was discovered that the subjects who scored higher in verbal reasoning suffered, on the average, significantly more interference with their quantitative production than did the subjects who scored lower on the

test of verbal reasoning. But the average difference in interference with quality of performance was not significant.

It would seem therefore that this test of verbal reasoning tends to differentiate also between varying degrees of ability for written expression of mental content, as well as between the degrees of ability to reason verbally. Those who have greater facility in written expression of their ideas, whether alone or in a group, tend to get the higher scores on this verbal reasoning test. And furthermore, those who are gifted with more ability along the line of written expression suffer more interference with this ability in a group than do those who have less of it.

An additional differential effect of working with a group must also be considered. It was found that the individuals who did qualitatively better work alone were more hindered qualitatively in their work with a group than those who did qualitatively poorer work alone. The same group effect also appeared with regard to quantitative productivity. Those who produced relatively less work alone suffered less quantitative decrease when working with a group than those who produced relatively more work alone.

This result may perhaps be regarded as opposed to that

of Anderson.[13] He compared five senior high school boys with an IQ range of 125-130 with five senior high school boys with an IQ range of 100-105, to determine whether or not working with a group produced different effects upon more intelligent subjects than it did upon subjects of average intellectual ability. He found 1) that both groups, taken individually or together, did a greater amount of arithmetical computation while working with a group than while working alone; and 2) that qualitative scores in arithmetical computation tended to be greater for both groups in the social situation, though not significantly so, than when alone.

However, the small number of subjects used in Anderson's study seems sufficient to cast doubt upon the conclusiveness of his findings. Another explanation is possible also. It may be that the higher level of intellectual functioning required in the explanation of the proverbs used in the present research was responsible not only for the greater interference with both quality and quantity of productivity, but also for the greater relative interference with the more capable subjects while working with a group. It is possible that with tasks on

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13 Anderson, "An Experimental Study of 'Social Facilitation' as Affected by 'Intelligence,'" Amer. J. Sociol., XXXIV, 874-881.

such a high level of intellectual operation, more interference with both qualitative and quantitative output is suffered, as a result of the distractions inherent in a group situation, by those who are more capable of such higher intellectual functioning. Those who are less capable of these higher intellectual processes tend, on the contrary, to do relatively poorly, whether they work alone or with a co-acting group, so that the factor of distraction in the social situation can do little to further decrease the quantity and quality of work which is poor even when performed in solitude.

The last result of the present investigation to be considered is that no significant sex differences were found. The men showed mean decreases in both qualitative and quantitative scores, while working with a group which were greater than the corresponding mean decreases in the women's scores. But the differences were not significant and are probably due to chance fluctuations in sampling.

Few other investigators have dealt with the question of sex differences in group effects. The only research reported which dealt with differences between the sexes in the effects experienced as a result of working with a co-acting group was that of Mukerji.[14] This study used thirty-one

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14 Mukerji, "An Investigation of Ability in Work in Groups and in Isolation," Brit. J. Psychol., XXX, 352-356.

children, eleven to thirteen years of age. The task was of a sense-motor nature. It was found that the improvement on performance which resulted from group work was greater for the boys that it was for the girls.

The conclusions of Mukerji's investigation, however, are not directly comparable to those of the present research. For, first of all, the subjects used were children rather than adults, and secondly, the tasks were sense-motor rather than intellectual in nature, and it has been brought out before that group effects are different for the higher intellectual processes than they are for activities of a lower order.

The first reported investigator in the field of group effects, Triplett,[15] found that girls showed slightly more improvement in a rivalry situation than did boys, on a sense-motor task. Hurlock[16] also found that girls improved slightly more than boys by means of rivalry situation. But hers were intellectual tasks: arithmetic problems.

These are the only studies reported in the literature upon group effects which give any indication that sex dif-

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15 Triplett, "The Dynamogenic Factors in Pacemaking and Competition," Amer. J. Psychol., IX, 507-532.

16 Hurlock, "The Use of Group Rivalry as an Incentive," J. Abn. & Soc. Psychol., XXII, 278-290.

ferences were observed. They are only remotely related to the results of the present study because, in the first place, they all used children rather than adults as subjects, and secondly, the last two reported dealt with the effects of a situation structured so as to enhance rivalry rather than one designed to diminish its influence.

Hence the results of the present investigation may be regarded as having confirmed some of the findings already reported in the literature. It also has tended to throw some additional light on the different type of influence which working with a co-acting group has upon tasks of varying intellectual levels. For it has shown that work which involves the functioning of the higher intellectual powers is, on the average, impeded rather than facilitated when performed with a co-acting group. It has also demonstrated that those who do best when working by themselves are on the average, more impeded by working with a co-acting group, than those who do least well when working alone.

CHAPTER VI

FURTHER IMPLICATIONS

What is there about a co-acting group which produces significant changes in the quality and quantity of a person's work when it is done in such a group? What factors are operative there which are not at work when the person is alone? Or, what factors are more operative in a co-acting group than they are when the person is working alone?

Allport[1] states that social stimulation in general has been thought of as capable of a two-fold facilitating effect. Firstly, it may expedite the initiation of actions for which a person is in readiness; and secondly, once these actions have been begun, it may increase the strength or ease or effectiveness with which they are performed. The actions involved are being executed by everyone in the group at the same time and apparently the social stimuli operative in the production of the above mentioned effects are "the sight and sound of others doing the same thing."[2] The fact that everyone around is engaged in

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1 Allport, Social Psychology, 261.

2 Ibid.

the same task makes this the thing to do, and also has the effect of making it easier for everyone to perform it more perfectly or quickly or even to do the task both more perfectly and more quickly.

There is in addition to the facilitating stimulation produced by the awareness of others doing the same task, the factor of a certain amount of rivalry, conscious or unconscious, inherent in such a situation. This seems to be so , even when the individuals have been instructed and urged not to compete. Instructions of this type may sometimes call more attention to the factor of competition, and by making some persons more aware of it, serve to strengthen rather than decrease its influence.

In addition, it cannot be supposed that the effect of rivalry will always be positive, i.e. will tend to increase the speed or accuracy of the performance. At least with some individuals in almost every situation, and with most individuals in extremely stressful situations, keen competition may serve to reduce the effectiveness with which they accomplish their work.

Hence social stimuli have not only a facilitating effect, but they may also interfere with or impede the successful accomplishment of a task. They are not unidirectional

in their operation, but may produce opposite results.

Furthermore, there are other forces in a social situation in addition to rivalry which may have the effect of retarding a person's speed of operation and of reducing the perfection of his product. Perhaps the most obvious of these are the distractions produced by the activity and the noise of one kind or another made by the co-acting group. There will be the peripheral vision of the actions of the others and of the progress which they are making, and sounds such as the scratching of pens, tapping of pencils, shuffling of feet, rustling of clothing and occasional deep respirations. Particularly in work of a high intellectual order, such distractions seem to have the effect of interfering with some individuals' performances, though apparently there are others who are stimulated to a higher degree of concentration, so that they are facilitated rather than impeded by these social distractions.

In addition it is well to remember that distraction is disturbing in proportion to the need of concentration. When the task is very difficult, as were those used in this study, the many noises incidental to a classroom situation make the high degree of concentration necessary very hard to attain. When, on the contrary, the problem is so easy and mechanical as to stimulate little intrinsic interest, the group itself may become

for some individuals, more interesting than the problem, and thus constitute a different and more appealing form of distraction. Such factors as these may account for the many discrepancies in the conclusions reached by different investigations in this area.

Another negatively operating factor would be emotional in nature. It will be found to operate particularly in a situation in which the person is deeply ego-involved and in which success and failure matter a great deal. The consciousness of the importance of a highly successful performance may militate against its accomplishment by the production of emotional blocks, which will serve to distract the person from his task and increase the time of its execution, while at the same time decreasing its perfection. In order for this to happen, the situation need not be one of explicit rivalry, where individuals in a group are directly pitted one against the other. The rivalry may be implicit, as it would be, for instance, in a group of candidates taking an admissions test for college. They would not be competing against one another, but each would be trying to reach a certain score, since those below this point are rejected, be they few or many. It may be supposed that many individuals in such a group would do better were the situation emotionally more relaxed.

It is these various factors, operating in conjuction with individual differences in ability, background and personality characteristics, which may be thought of as producing the "leveling" effect found in many studies of group vs. individual work, and in this one as well. Work in the group tends to bring the average of the better workers closer to the average of the poorer, both in quantity and in quality of product. Of this Allport[3] has written:

> The slower workers' reactions are facilitated because they are stimulated by movements made at the faster rate than their own. The more rapid lack such incitement. Rivalry also cooperates in the leveling tendency. The more rapid workers, realizing the ease with which they excel, lose interest in the competition and slacken their efforts; whereas the slower subjects, provided they are not hopelessly outclassed, are aroused to greater effort through their zeal to rival the others. This effect of rivalry must be regarded as distinct from that of the difference of social facilitation with which it is allied. The latter is merely the influence of external stimulations from the working of others, while the former represents a difference of attitude and incentive.

In addition to these general factors, each person brings with him to the group his own individual personality characteristics, which mark him off and make him different from every other member of the group. While he may be affected in the social situation in ways similar to some others in the group, because of some personality characteristics had in

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3 Allport, Social Psychology, 281.

common with them, he will be affected in ways entirely different from others in the group, because of personality characteristics entirely different from and even opposed to them.

Thus, for instance, there are the people who have become accustomed to doing their best work in solitude and with a minimum of distraction. They need little more incentive to work than the personal satisfaction they feel at attaining their own goals. Such individuals will probably be distracted and suffer a loss of speed and efficiency when they are required to do work, especially of a highly intellectual sort, in a co-acting group.

On the other hand, there are those who are little accustomed to working by themselves. They may start well enough but are readily distracted and find working extremely tedious. They do relatively poor work and do it rather slowly when by themselves. Now, when such people are required to perform a task along with a co-acting group, the likelihood is that the sight and sound of others working will tend to keep them more at work, and hence not conspicuously idle, than they would be when they work alone. At least their work will tend to be much less retarded by the social situation than will the work of those who do better work alone.

Most people spend a good part of their lives as members of co-acting groups. Typists, secretaries and general office workers in business firms usually work at the same or similar tasks. Factory workers, shipping room clerks, the sales force in department stores, and many other individuals in business and industry, of necessity do their work in a co-acting group. In education every classroom contains a co-acting group. Group mental and personality tests are administered in like situations. In recent years, clinical psychologists have developed the technique of group therapy.

It seems important, therefore, to consider what means will be effective to utilize to their best advantage the facilitating stimuli afforded by such situations, and to reduce to a minimum the factors which interfere with speed and efficiency.

However, with our present inadequate knowledge of how these factors operate in connection with individual personality differences, it is not possible to do more than point out that much remains to be done, and many areas need yet to be clarified before any specific recommendations can be made. There is need, therefore, for experimental studies to deal with the relationships between the facilitating and the retarding factors in co-acting groups, and individual differences in personality characteristics.

Until such time as more is known in this area, only

one specific recommendation can be made on the basis of the findings of this research. If the task is one of a high intellectual order and if the individual is one who works well alone, most likely he will be able to do a more perfect job and do it faster, if he works in solitude rather than in a room where many others are engaged in the same or similar tasks.

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APPENDIX I

MEANS AND STANDARD DEVIATIONS OF THE VERBAL REASONING SCORES ATTAINED BY THE EQUIVALENT GROUPS WITHIN EACH CLASS

Class	Group I		Group II	
	Mean	SD	Mean	SD
A N = 14	40.29	5.34	40.14	5.00
B N = 16	34.25	7.69	34.75	7.34
C N = 30	37.00	6.10	37.13	7.32
D N = 26	38.00	8.96	37.92	8.81
E N = 16	34.25	11.39	34.37	9.69
F N = 10	33.20	6.62	33.40	7.55
G N = 30	35.73	7.11	35.40	6.75
H N = 26	36.08	8.20	36.78	8.51

APPENDIX II

THE SCORES OF EACH SUBJECT ON THE VERBAL REASONING TEST AND ALSO THE QUALITATIVE AND QUANTITATIVE SCORES FOR EACH SUBJECT IN BOTH INDIVIDUAL AND GROUP WORK

Subject Class A	Verbal Reasoning	Quality		Quantity	
		Alone	Group	Alone	Group
R.L. (F)	47	7	8	306	334
J.P. (M)	47	6	14	134	131
D.B. (F)	42	5	1	150	81
J.B. (M)	40	7	2	128	124
D.A. (F)	39	11	0	133	92
E.K. (M)	36	11	10	203	149
P.B. (F)	31	4	5	139	106
K.B. (F)	47	3	6	130	223
A.J. (M)	47	5	1	188	260
T.R. (M)	41	5	3	75	144
J.B. (M)	38	15	6	203	146
J.P. (M)	38	10	3	156	88
R.B. (M)	38	4	4	41	105
J.V. (F)	32	4	0	95	83

Subject	Verbal Reasoning	Quality		Quantity	
Class B		Alone	Group	Alone	Group
T.C. (M)	44	8	16	467	442
D.C. (M)	44	11	9	215	210
M.O. (F)	42	10	14	275	277
S.O. (F)	33	8	2	450	477
P.L. (F)	32	12	4	250	265
C.R. (F)	29	4	1	407	256
S.M. (F)	28	5	12	208	187
A.M. (M)	22	4	3	194	62
P.S. (M)	46	9	12	163	122
H.H. (F)	43	17	5	311	273
S.C. (F)	41	15	1	263	172
S.P. (F)	34	13	4	226	200
J.E. (M)	31	8	8	123	137
S.C. (F)	30	0	3	280	276
C.K. (F)	28	5	5	65	72
W.P. (M)	24	8	3	156	155
Class C					
A.F. (F)	47	6	3	365	340
M.A. (M)	45	10	6	173	118
E.F. (F)	42	8	7	162	222
R.O. (M)	41	0	1	142	64
J.D. (F)	40	6	5	144	148

Subject		Verbal Reasoning	Quality		Quanity	
			Alone	Group	Alone	Group
R.O.	(M)	39	8	3	98	99
M.C.	(F)	38	2	3	124	95
B.L.	(F)	38	7	5	139	78
J.T.	(M)	37	8	6	150	202
P.R.	(F)	36	6	3	185	122
M.O.	(F)	36	5	5	156	138
L.S.	(F)	35	1	5	147	86
P.M.	(F)	31	0	4	142	129
T.J.	(F)	27	4	2	129	75
D.B.	(M)	23	0	3	227	100
L.B.	(F)	50	14	15	247	244
D.S.	(F)	47	4	4	263	211
B.R.	(F)	44	2	2	127	107
V.M.	(F)	43	13	14	205	165
V.S.	(F)	42	0	8	198	144
L.W.	(M)	38	6	8	114	104
E.G.	(F)	37	0	2	347	254
F.B.	(M)	37	10	5	326	260
B.G.	(F)	36	0	2	88	75
L.T.	(F)	36	9	3	214	245
E.E.	(F)	35	5	0	49	26
J.P.	(M)	34	14	7	262	151

Subject	Verbal Reasoning	Quality		Quantity	
		Alone	Group	Alone	Group
G.C. (F)	33	11	4	200	104
P.H. (F)	24	3	0	331	289
S.A. (F)	21	3	8	185	120
Class D					
J.O. (F)	49	21	13	289	170
P.B. (F)	42	11	11	373	195
J.P. (F)	46	5	6	169	80
E.I. (M)	45	9	3	155	36
J.L. (F)	44	13	5	124	70
L.F. (M)	43	9	12	279	165
J.K. (F)	39	2	3	196	172
D.S. (F)	38	7	4	240	90
N.B. (F)	36	9	1	227	112
J.F. (M)	35	6	0	376	319
C.L. (F)	27	15	12	288	124
A.P. (F)	23	5	5	120	128
E.S. (F)	21	0	0	120	128
W.S. (M)	49	7	9	200	310
J.C. (M)	47	2	2	89	28
G.O. (F)	46	2	3	274	202
M.A. (F)	44	2	4	220	142
M.M. (F)	43	16	11	190	170

Subject	Verbal Reasoning	Quality		Quantity	
		Alone	Group	Alone	Group
D.H. (M)	41	14	20	230	269
J.H. (F)	40	4	9	125	137
M.L. (F)	39	3	4	143	189
F.G. (F)	38	5	5	140	123
B.B. (F)	35	4	4	226	251
J.M. (F)	29	8	5	308	176
A.S. (F)	21	6	4	242	201
C.R. (M)	21	6	0	63	36
Class E					
J.S. (M)	49	10	16	217	211
P.B. (M)	44	11	15	238	199
J.O. (M)	43	6	8	229	290
D.S. (F)	39	2	2	354	318
M.H. (F)	32	2	5	272	206
N.O. (F)	28	4	4	188	146
H.C. (F)	28	4	2	165	167
J.L. (F)	11	4	0	338	332
A.G. (F)	49	11	6	282	276
L.C. (F)	43	5	5	48	102
J.S. (M)	41	0	0	200	133
P.T. (F)	37	7	6	221	197

Subject	Verbal Reasoning	Quality		Quantity	
		Alone	Group	Alone	Group
R.A. (M)	34	2	6	157	100
T.B. (M)	28	4	2	250	250
G.V. (F)	26	4	2	131	139
M.O. (F)	17	0	4	149	147
Class F					
R.M. (M)	43	7	2	235	218
D.K. (F)	38	2	2	360	217
A.J. (M)	31	3	1	164	129
M.L. (M)	30	1	2	127	163
M.Q. (F)	24	6	3	136	193
M.M. (F)	40	11	0	342	315
M.H. (F)	38	0	0	158	158
P.S. (M)	37	4	6	237	136
J.W. (F)	33	5	5	181	123
N.W. (F)	19	0	0	58	68
Class G					
R.Z. (M)	46	8	11	345	262
P.Q. (M)	45	7	4	123	104
C.C. (F)	43	5	2	206	248
A.Z. (M)	43	8	0	371	294
I.T. (F)	39	8	7	203	198

Subject	Verbal Reasoning	Quality		Quantity	
		Alone	Group	Alone	Group
J.H. (M)	38	3	1	120	66
R.K. (F)	37	6	2	262	232
J.C. (F)	37	7	2	435	417
D.D. (M)	37	1	2	108	87
A.S. (M)	35	7	3	242	209
P.B. (M)	33	4	1	152	108
S.M. (F)	29	2	0	143	215
A.K. (F)	27	2	0	239	276
R.G. (F)	26	2	0	373	260
R.R. (F)	21	2	3	226	326
J.M. (M)	45	6	6	214	162
W.C. (M)	45	7	4	180	195
L.L. (F)	43	2	4	313	249
M.L. (F)	42	9	8	213	405
P.C. (F)	38	5	0	173	190
C.M. (M)	38	6	4	290	201
C.M. (F)	37	2	2	116	103
K.F. (F)	37	6	2	239	135
S.F. (M)	35	6	3	112	118
R.C. (M)	34	6	1	276	252
A.B. (F)	32	6	4	295	238

Subjects	Verbal Reasoning	Quality		Quantity	
		Alone	Group	Alone	Group
M.V. (F)	29	4	6	296	267
G.S. (F)	27	0	0	325	316
J.S. (F)	25	0	4	164	197
J.B. (M)	24	5	2	147	138
Class H					
B.M. (F)	49	11	1	174	197
R.T. (F)	46	12	5	144	88
M.H. (F)	43	8	1	287	350
L.S. (F)	41	4	6	112	169
D.D. (F)	41	5	4	107	139
D.S. (M)	40	8	5	200	226
V.G. (M)	38	14	6	239	160
R.M. (F)	34	7	9	217	204
R.T. (M)	33	6	3	210	263
J.D. (F)	29	10	1	250	333
J.K. (F)	29	4	3	209	181
J.R. (F)	28	2	3	156	142
S.D. (F)	18	3	0	161	138
R.F. (M)	48	9	0	300	283
J.S. (F)	46	12	9	271	175
M.O. (F)	44	11	9	316	239

Subjects	Verbal Reasoning	Quality		Quantity	
		Alone	Group	Alone	Group
E.S. (M)	43	11	6	295	242
J.H. (F)	41	2	2	273	289
P.P. (F)	41	8	2	110	93
W.K. (M)	40	6	2	219	241
J.L. (F)	37	6	3	124	157
B.G. (F)	34	6	3	114	125
T.D. (F)	32	6	2	127	118
D.M. (F)	28	0	3	253	290
E.D. (M)	27	10	4	112	113
E.R. (F)	17	4	0	159	209

APPENDIX III

FREQUENCY DISTRIBUTIONS OF SCORES IN VERBAL REASONING AND OF THE SUMMED QUALITATIVE AND QUANTITATIVE SCORES

Verbal Reasoning		Qualitative		Quantitative	
Class Intervals	f	Class Intervals	f	Class Intervals	f
46-50	21	30-34	2	901-1000	2
41-45	38	25-29	6	801-900	2
36-40	43	20-24	14	701-800	1
31-35	26	15-19	20	601-700	14
26-30	22	10-14	40	501-600	23
21-25	13	5-9	54	401-500	31
16-20	4	0-4	32	301-400	34
11-15	1			201-300	47
				101-200	12
				1-100	2

APPROVAL SHEET

The dissertation submitted by Walter Joseph Smith has been read and approved by five members of the Department of Psychology.

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the dissertation is now given final approval with reference to content, form, and mechanical accuracy.

The dissertation is therefore accepted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

June 5, 1952
Date

Vincent J. Herr, S.J.
Signature of Adviser