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INDIVIDUAL AND SEX DIFFERENCES IN SUGGESTIBILITY

BY
WARNER BROWN

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CONTENTS

I

INTRODUCTION

What is the actual basis of the assertion that some individuals are more readily influenced by suggestion than others? Is it true that some persons possess a trait which may be called "suggestibility", while others possess a certain positiveness of character which enables them to resist suggestions? And, in particular, is it true that men are less suggestible than women? With these questions in mind, experiments were carried on from August, 1912, till May, 1914, in the Psychological Laboratory of the University of California. These experiments were all very simple. The suggestions were given in the form of printed directions concerning what seemed to be perfectly commonplace laboratory exercises. The persons who received the suggestions were all students in elementary courses in psychology, and they were asked to do things which they thought they understood, and about which they had no misgivings. Careful and systematic inquiry made it certain that none of them suspected that the experiments had anything to do with suggestion, or that there

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was anything misleading about the "directions" in which the suggestions were concealed.

The persons who conducted the experiments exercised little or no personal influence over those who took part in them. They merely handed the written directions to the subject and proceeded with the mechanical operations required by the experiment. Thus the suggestions were received by the subject while in a perfectly natural, active frame of mind, in complete ignorance of the fact that any suggestions were being made, and in the absence of the personal influence which is so conspicuous in hypnotic suggestion.

The experiments themselves were numerous, and not all of the subjects participated in all of them. Fifty-four women and twenty-nine men took part in all of the fifteen experiments of the first two groups; others took part in several of these experiments, but did not complete all. The experiments of these groups purported to discover the ability of the person, particularly the delicacy of his senses, his powers of sensory perception and discrimination, and his memory and imagination. The third group contained experiments which purported to measure two illusions of sense perception, to test the accuracy of estimate of distance and weight, and to obtain an expression of choice in matters involving a very simple esthetic preference. In this third group there were forty-one women and forty-three men. Each separate experiment involves its own peculiar difficulties and has its own points of special interest. In the following pages the experiments will be taken up one by one and the results given in turn. Special attention will be paid to sex differences wherever they appear. At the same time an effort will be made to show, whenever possible, to what extent "suggestibility" in the particular experiment is correlated with "suggestibility" in other experiments. This will inevitably involve a certain amount of forward reference. Those readers who have not sufficient interest to peruse the matter in the accounts of the separate experiments will find a summary of the more general results at the close of each chapter and in the final

chapters. In order to facilitate reference, the titles of the twenty-six experiments are given below in the order in which they were originally performed. For the systematic order of their presentation the reader may turn back to the table of contents. The first group were performed in the fall of 1912 and again in the fall of 1913. The second group were performed in the spring and again in the fall of 1913. The third group were performed in the spring of 1914.

List of the Experiments in the Order in Which They Were Originally Performed

Page	Chapter	
		*First Group**
298	II.	Least perceptible odors.
314	II.	Least perceptible electric shock.
308	II.	Least perceptible heat.
322	III.	Least perceptible change of brightness.
326	III.	Least perceptible change of pitch.
354	V.	Memory for size (squares).
		Second Group
414	X.	Preference for a single color.
361	V.	Ink-blot test of imagination.
349	V.	Recognition of form (checkerboard).
359	V.	Memory for pictures.
344	IV.	Progressive lines.
351	V.	Recognition of position (letters).
340	IV.	Progressive weights.
304	II.	Least perceptible touch.
333	III.	Least perceptible motion.
330	III.	Least perceptible change of size.
		Third Group
371	VII.	Size-weight illusion.
377	VII.	Müller-Lyer illusion.
416	X.	Preference between two tones.
402	IX.	Preferred triangle.
398	IX.	Preferred rectangle.
386	VIII.	Estimation of distance.
391	VIII.	Estimation of weight.
410	IX.	Preferred division of a line.
417	X.	Preferred color-combination.
406	IX.	Preferred proportions of a cross.

* They were performed in these three groups, but in order to simplify the presentation they have been rearranged in the order in which they are given in the table of contents, as indicated by the Roman numerals at the left.

In each experiment an attempt was made to obtain an index of suggestibility or, in other words, a number which would represent the relative suggestibility of each individual in that particular experiment. This attempt was successful in eleven of the fifteen experiments of the first two groups and in seven of the ten in the last group. In these cases the individuals were arranged in rank according to the degrees of their suggestibility, the one who yielded most readily being first and the most resistant last. When such rankings had been obtained for different experiments the correlation was calculated between the rankings in the different experiments by the formula

$$r = 1 - \frac{6 \Sigma D^2}{n (n^2 - 1)}$$

If the ranking was the same in the two experiments, i.e., if number one in one experiment was number one in the other, number two in one was number two in the other, and so on, then the coefficient of correlation would be 1.00; if there was no correspondence whatever it would be 0; and if the rank in one experiment was exactly the reverse of the rank in the other it would be —1.00.

In calculating the correlations the sexes have been kept separate. Furthermore, correlations are usually given separately for each of the persons who conducted the experiments, for it is evident that if one experimenter managed to obtain higher indices of suggestibility for his subjects than those obtained by other experimenters this fact would give rise to a coefficient of correlation which would be misleading. It would be a correlation depending on the work of the experimenter and not upon the suggestibility of the subject. But the files for the separate experimenters are in many cases too short to give reliable coefficients of correlation or reliable averages for sex differences. Moreover, there are numerous cases in which the experiments of group I were administered by one experimenter and those of group II (for the same subject) by another. General averages for all persons and correlations for the entire first division (groups I and II), without regard to experimenter, will there-

fore be found together with the other figures. In the last group of experiments separate figures for the different experimenters are not feasible, for reasons which will be produced in due time.

Careful readers will note that the total number of subjects entered for correlations does not tally, in some instances, with the total number taking part in the experiment, and that the number of subjects ascribed to an experimenter is not always the same. These discrepancies arise from the fact that correlations must be calculated on the basis of the experiment with the fewest subjects. On that account data had to be rejected from the correlations which were perfectly good for other purposes. Moreover, the calculations for different purposes were made at different times, and records were at times included which could not be used in subsequent calculations. Furthermore, there were a few cases in which the experimenters made mistakes, and in some of them the record was acceptable from one point of view but not from another (for example, giving the time but failing to note the direction of a change of pitch). In some cases all the experiments made by one person have been excluded from the general average when there was some question about the experimenter's procedure. If all of the discrepancies had been rectified, a considerable amount of valuable data must have been rejected and an enormous amount of labor would have been involved in recalculations.

The experiments were performed by the following students, all of whom were doing advanced or graduate work in the laboratory:

Miss G. Atkinson (A), all three groups of experiments.
Miss T. S. Cockcroft (C), first two groups.
Mr. L. W. Fike, last group.
Mr. A. I. Gates (G), first two groups.
Mr. W. S. Heller (He), first two groups.
Miss M. T. Hodgen (Ho), first group.
Mr. S. Ito (I), first two groups.
Miss L. Jackson (J), first group.
Miss K. M. McKee (M), first group.
Mr. F. C. Nass, last group.
Mr. Y. Sugisaki (S), first two groups.
Miss R. E. Wolf, last group.

Credit is due these students, not only for the careful manner in which they performed the experiments but also for many suggestions in planning the work, and for very helpful preliminary surveys of the data.

The plan of a group of experiments to test the possible differences in suggestibility between the sexes came from the director of the laboratory, Professor Stratton. He had a large share also in the devising of the details of the experiments and in the supervision of the experimenters. Moreover, the writer is under great obligation to him for advice and encouragement in the preparation of this report. No attempt will be made to discuss systematically in this report the original sources of the various experiments which have been made use of. We are under obligation to Scott,[1] Whipple,[2] and Chojecki[3] for calling attention to the problem of individual differences in suggestibility. From numerous experimenters, particularly Seashore,[4] several experimental devices and methods have been adopted. Above all we are indebted to Binet,[5] from whom we have borrowed freely ideas and methods, both for particular experiments and for the work in general. Some of the experiments have been taken over bodily from the work of previous investigators. A number have been modified to meet our special needs. Several were devised for the occasion, but these were not generally the inventions of one person, but resulted from co-operative planning in the laboratory.

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1 Scott, W. D., "Personal differences in suggestibility," *Psychol. Rev.*, vol. 17, 1910, p. 147.

2 Whipple, *Manual of Mental and Physical Tests*, p. 444, edition of 1910.

3 Chojecki, A., "Contribution à l'étude de la suggestibilité," *Arch. de psychol.*, vol. 11, 1911, p. 182.

4 Seashore, C. E., "Measurements of illusions and hallucinations," *Studies from the Yale Psychol. Lab.*, vol. 3, 1895, p. 1.

5 Binet, A., *La suggestibilité*, Paris, 1900.

II

FOUR TESTS INVOLVING A "LEAST PERCEPTIBLE" (IMAGINED) SENSATION

1. Odors; 2. Touch; 3. Heat; 4. Shock

Four experiments are concerned with imaginary sensations. They were all so arranged as to lead the subject to believe that he would experience a weak sensation. The force of the suggestion was probably enhanced in many cases by the thought of competition with others. In fact, the appeal, through the spirit of competition, to the pride of the student plays a conspicuous part in nearly all of the experiments. It is understood, of course, that there was no actual competition; each student was tested separately.

1. Odors[6]

The following set of typewritten instructions and explanations was handed to the subject:

DELICACY OF THE SENSE OF SMELL

It is the object of this experiment to measure the delicacy of your sense of smell.

The experimenter will let you smell comparatively strong samples of each of three odors—peppermint, wintergreen, and ethyl alcohol.

You will then be given ten bottles in succession. You are to smell of each of these carefully and report in each case whether you smell one of the odors you have just sampled, some other odor, or no odor at all.

The ten bottles referred to were conspicuously numbered from one to ten, in order. They contained distilled water. Of the three actual odors used, one was pure alcohol and the others were 15 per cent colorless solutions of essence of peppermint and essence of wintergreen in water.

A record was kept for each person showing what he reported for each of the ten bottles of water. The average results are

[6] A similar experiment is described by Seashore, *Yale Studies*, vol. 3, 1895, p. 58; by Small, M. H., *Ped. Sem.*, vol. 4, 1896, p. 177, and by Slosson, S. S., *Psychol. Rev.*, vol. 6, 1899, p. 407.

given below for women, for men, and for both, in terms of the number of answers out of the possible ten.

Answer made by subject	123 women	62 men	185 persons
"Nothing"	5.19	6.32	5.57
"Alcohol"	1.39	1.32	1.37
"Wintergreen"	1.43	1.08	1.31
"Peppermint"	1.47	0.98	1.31
Other	0.50	0.29	0.43
Total sug.	*4.80*	*3.68*	*4.43*

It is evident from this table that the differences between the odors used for the introduction of the suggestion do not affect the results to any considerable extent.

The index of suggestibility was obtained by taking the sum of the reports for alcohol, wintergreen, peppermint, or any other specific odor. The proportion of "other" odors was small.

The table above shows that the average index of suggestibility for women is considerably higher than that for men, indicating that in this experiment the women are much more suggestible. The following figures show that the greater suggestibility of the women which appears in the average figures is confirmed by the separate findings of the different experimenters.

Experimenter	Number women	Index sug.	Number men	Index sug.
A	13	4.54	6	4.00
C	12	4.25	7	1.30
G	16	7.06	7	5.59
He	11	4.00	9	3.22
Ho	13	4.08	1	6.00
I	13	5.85	5	2.20
J	9	5.22	6	3.17
M	26	3.88	8	3.75
S	10	4.70	13	4.69
All	123	4.80	62	3.68

The difference between the sexes in this experiment stands out in spite of the fact that the various experimenters had very unequal success with the experiment. Seven of the nine experimenters find the women more suggestible than the men.

Data were taken from all comers, even persons who had, or claimed to have, "colds" which interfered with their sense of smell. The number of "colds" which seemed to develop suddenly was somewhat disconcerting to the experimenters. It will be observed, however, that in spite of the "colds" the average person is able, under mild suggestion, to smell an odor in four or more out of ten bottles of odorless water.

The distribution of the individuals according to the frequency with which different degrees of suggestibility occurred is given in the following table and in the graph (fig. 1). The graph does not follow the table exactly, but presents the same data in a more condensed and more readily comprehensible form. The graph, and all the similar ones which are to follow, are so constructed that one centimeter in altitude represents 4 per cent of the subjects. The difference between the sexes is again apparent here. Not only do the women give a smaller proportion who fail to respond to any of the suggestions, but a larger proportion of the women yield to the suggestion for each separate bottle or for a large number of bottles. Half of the women respond to the suggestion five or more times among the ten bottles, while only a third of the men do so.

There were a number of persons who refused to admit that there was any odor about any of the bottles of water. Men are about three times as apt to make such a complete resistance to the suggestion as women. Only 7 of the 123 women were thus completely immune to the suggestion, while 11 of the 62 men were.

ODORS

Frequency of Different Degrees of Suggestibility

The figures are the percentile proportion of the subjects who thought they perceived an odor in 0 bottle, 1 bottle, 2 bottles, etc., up to the whole number of 10 bottles.

Bottles	Women	Men	Bottles	Women	Men
0	5.0%	16.4%	6	16.5%	11.5%
1	11.6	8.2	7	10.7	4.9
2	6.6	14.8	8	7.4	6.6
3	9.9	11.5	9	3.3	3.3
4	12.4	14.8	10	7.4	3.3
5	9.1	4.9			

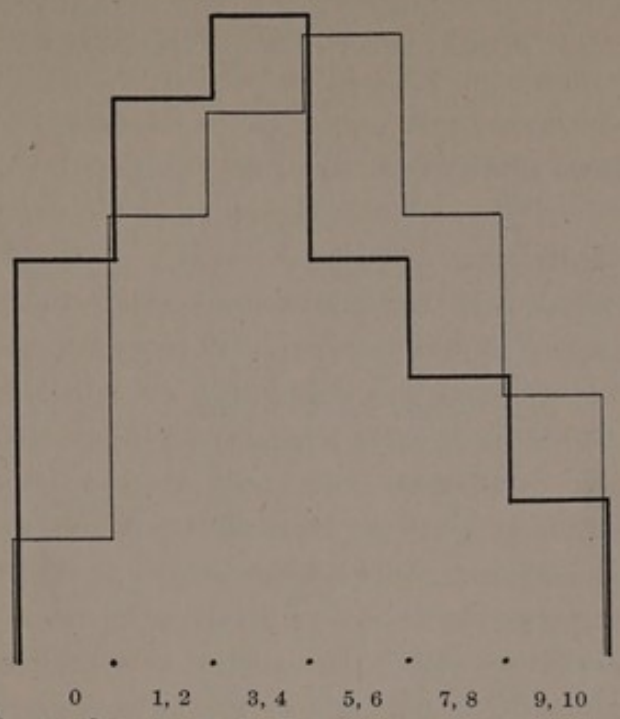

Fig. 1—Odors. Light line, women; dark line, men.

It was found that the effectiveness of the suggestion increased regularly from bottle to bottle up to the eighth bottle. More persons yielded to the suggestion on the eighth bottle than on any other one. Very few yielded on the first or second, and very few yielded on the very last.

The correlation between suggestibility in this experiment and suggestibility in nine other tests is shown in the following table. The tests with *Touch*, *Heat*, and *Shock* rest upon a suggestion in terms of "least perceptible" sensations; those in *Change of Brightness*, of *Pitch*, of *Size*, and of *Motion* rest upon a suggestion of least perceptible change; those with *Progressive Weights* and *Lines* rest upon a suggestion of continuity.

The entries opposite "All" in this table do not refer to the total number of subjects of all the experimenters. As has been explained, some of the subjects who took part in one or another experiment did not take part in others, or perhaps their work was rejected in some experiments but not in others. But there

Correlations Between Suggestibility in the Experiment With Odors and Suggestibility in Nine Other Tests

Women

Experimenter	Number cases	Touch	Heat	Shock	Brightness	Pitch	Size	Motion	Lines	Weights
A	14	.....	.35	.07	—.05	—.31	.....	.....	.....	.....
C	12	.....	.73	.27	—.11	—.12	.....	.....	.....	.....
G	16	.....	.09	.38	—.87	.15	.....	.....	.....	.....
He	11	.....	—.05	.05	.20	.06	.....	.....	.....	.....
Ho	13	.....	—.35	—.41	—.14	.00	.....	.....	.....	.....
I	13	.....	.00	—	.33	—.30	.....	.....	.....	.....
J	9	.....	—.15	—.03	—.35	.35	.....	.....	.....	.....
M	24	.....	.23	—.20	.33	—.11	.....	.....	.....	.....
S	10	.....	.18	—.60	.00	—.32	.....	.....	.....	.....
All	54	—.01	.11	—	.05	—.10	.08	—.28	.28	.18

Men

Experimenter	Number cases	Touch	Heat	Shock	Brightness	Pitch	Size	Motion	Lines	Weights
A	6	.....	.54	.14	.55	.25	.....	.....	.....	.....
C	7	.....	.03	.45	—.32	.57	.....	.....	.....	.....
G	7	.....	.88	.43	.11	.40	.....	.....	.....	.....
He	9	.....	.18	—.37	—.28	.19	.....	.....	.....	.....
Ho	1	.....	—	—	—	—	.....	.....	.....	.....
I	5	.....	—.30	—	.50	.75	.....	.....	.....	.....
J	6	.....	.89	.49	.57	—.40	.....	.....	.....	.....
M	8	.....	.63	.11	—.22	.18	.....	.....	.....	.....
S	13	.....	.86	.32	.37	—.05	.....	.....	.....	.....
All	29	.23	.26	—	.40	.16	.39	.14	.24	.16

were 54 women and 29 men who completed all the nine experiments of this division. Correlations have been made out for these 54 women as a single group, regardless of who performed the experiment, or whether it was performed at the same sitting or at a different sitting, and so for the 29 men. These are the correlations which are entered opposite "All" in this and subsequent tables. The correlations which are filled out for the separate experimenters are for pairs of tests which were performed at a single sitting and by that experimenter. The columns which are not filled out for the separate experimenters

are for pairs of tests which were performed at a different sitting and, usually, by different experimenters. Blanks occur where the work of some experimenter must be rejected. The column for *Shock* is not filled out opposite "All" because the methods of different experimenters were not sufficiently uniform to warrant the computation of a correlation.

There is some evidence of positive correlation. When the larger groups of students are considered who, under the heading "All", were experimented upon by various experimenters, it appears that five of the eight tests give positive correlations for women and that the whole eight give positive correlations for men. When the smaller groups are considered, all of the members of which were experimented upon by a single person, the women show fifteen positive and seventeen negative correlations, while the men in these small groups show twenty-four positive and seven negative correlations. While positive correlations seem to predominate, it will be observed that the figures are not high. The difference between the correlation figure for the men and that for the women is characteristic of most of the tests; for some reason the men's correlations are regularly higher.

The correlations do not seem to be any higher with tests involving the same general type of suggestion (*Touch, Heat, Shock*) than with tests of an entirely different nature. Nor does the amount of correlation seem to depend to any great extent upon the presence of the same operator for the two tests. The figures at the foot of the open columns, which represent pairs of tests in which the two tests were usually administered by different experimenters and at different times, seem to be about the same as those at the foot of the filled columns, in which the same experimenter carried on both tests at the same sitting.

The essential findings concerning the *Odors* experiment are:

1. Women are considerably more suggestible than men.

2. A low but (at least for men) positive correlation is found between this test and other tests.

3. The correlation is much stronger for men than for women.

2. Touch[7]

The typewritten directions which were handed to the subject were as follows:

LEAST PERCEPTIBLE WEIGHT

You will see a set of small cork weights, some of which are so light that they can not be felt at all. It is the purpose of this experiment to find the lightest of this set of weights which you can feel on the tip of the middle finger. When the experimenter says "ready" you are to see whether you can feel the weight or not and report to the experimenter immediately.

The cork weights were cylindrical in shape and two millimeters in diameter. They were suspended by a silk thread. The subject was shown that one of these weights aroused no sensation when placed upon the finger-tip, while another weight, which was heavier, was clearly perceptible. The subject then thrust his hand through a slit in a curtain and let it lie upon the table. The perceptible weight was applied four times with a signal "ready" each time. Then the signal "ready" was given ten times with the same intervals between, but no stimulus was applied to the finger. Suggestibility is measured by the number of positive answers for the ten trials. In the following table the number of subjects and the number of positive answers for the ten trials of each subject are given for each experimenter separately..

Experimenter	Number women	Index sug.	Number women	Index sug.
A	19	1.53	10	1.40
C	9	1.11	5	1.20
G	19	3.05	6	3.83
He	10	2.10	18	0.89
I	12	2.08	8	1.75
S	10	2.80	11	1.09
All	69	2.16	58	1.46

It will be seen that the average figures show a considerably higher index of suggestibility for the women than for the men.

[7] A similar experiment is described by Seashore, *Yale Studies*, vol. 3, 1895, p. 56. Small, *Ped. Sem.*, vol. 4, 1896, p. 184, employed a somewhat different plan.

This average is, however, probably too high, for there are two experimenters who find men more suggestible, and if we take out the data obtained by experimenter He., who obtained in this experiment extreme differences between the sexes, the average indices become 2.17 and 1.73 for women and men respectively. This figure is probably a reliable measure of the greater suggestibility of the women in this experiment.

Here, as with the *Odors*, there are relatively more men who refuse to admit any positive touches in the series of ten. There were 22 men out of 58 who thus rejected the suggestion *in toto*,

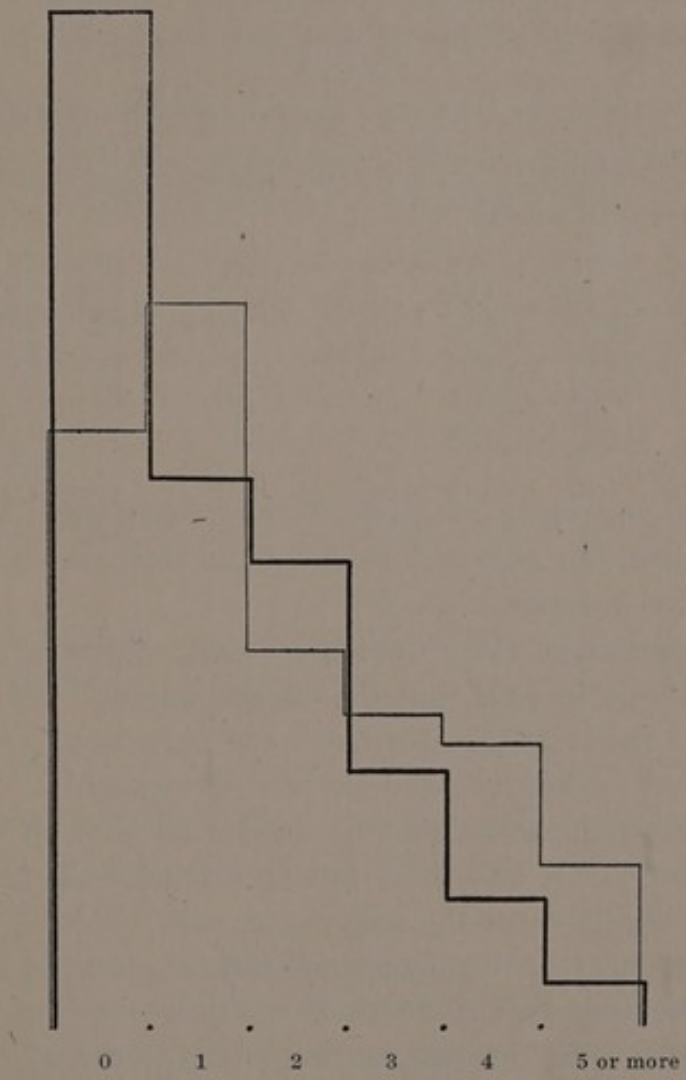

Fig. 2—Touch. Light line, women; dark line, men.

and there were only 16 women among 79 who did so. But ten of these men were under the direction of experimenter He., and if we exclude his data we find 12 men among 40 and 15 women among 69, that is to say, one man among 3.3 refuses to yield to the suggestion and one woman among 4.6.

The graphic representation of the relative frequencies of the different degrees of suggestibility (fig. 2) shows the same general type of distribution for both sexes. But the distribution is much more scattered for women than for men. Not only do fewer women fail on all ten trials, but more women respond positively to a large proportion of the ten trials.

TOUCH

Frequency of Different Degrees of Suggestibility

The figures are the percentile proportion of the subjects who thought they perceived a touch in no case, in 1 case, in 2 cases, etc., up to the whole number of 10 trials.

Trials	Women	Men	Trials	Women	Men
0	24.4%	41.4%	5	2.6%	1.7%
1	29.5	22.4	6	1.3	0
2	15.4	19.0	9	1.3	0
3	12.8	10.3	10	1.3	0
4	11.5	5.2			

Positive answers were given three or more times by a third of the women, but only one in six of the men gave as many as three positive answers.

A comparison of the graphs for *Touch* with those for *Odors* (p. 301) shows at once that the suggestion in *Touch* is not as effective as the suggestion in *Odors*, in spite of the very great similarity of method between the two experiments. While the average person imagines that he detects an odor in 4.4 of the 10 bottles of water, he admits feeling a touch only 2.6 times in 10 trials. Apparently the suggestion with odors is about 1.7 times as effective as the suggestion with slight pressure on the finger. The suggestion of touch was entirely rejected by almost three times as many persons, in proportion to the whole number taking part in the test, as rejected the suggestion of odor. Com-

paratively few individuals responded as many as five times to touch, although half of the women and a third of the men responded five or more times to odors.

The correlation between the suggestibility of the various persons in the touch experiment and their suggestibility in other tests is given in the following table. A statement of the general nature of these other tests has already been given (p. 301). As was explained before, the filled columns of the tables are for tests which were given by the same experimenter and at the same sitting with the one for which the correlations are made out (now *Touch*) and the open columns are for tests which were made at a different sitting and, generally, by different experimenters.

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE EXPERIMENT WITH TOUCH AND SUGGESTIBILITY IN NINE OTHER TESTS

Women

Experimenter	Number cases	Odors	Heat	Brightness	Pitch	Size	Motion	Lines	Weights
A	19	.....	.....	.....	.....	.01	.24	—.06	—.24
G	19	.....	.....	.....	.....	—.10	.22	.44	.05
He	9	.....	.....	.....	.....	.19	.45	—.06	.68
I	12	.....	.....	.....	.....	.12	—.33	.42	—.08
S	11	.....	.....	.....	.....	.07	.06	.47	.04
All	54	—.01	.35	.15	.27	.04	.07	.14	—.13

Men

Experimenter	Number cases	Odors	Heat	Brightness	Pitch	Size	Motion	Lines	Weights
A	10	.....	.....	.....	.....	.16	—.05	.06	—.20
G	6	.....	.....	.....	.....	.20	.14	.03	—.46
He	18	.....	.....	.....	.....	.33	.51	.33	.08
I	7	.....	.....	.....	.....	.34	.57	.08	.24
S	11	.....	.....	.....	.....	.35	—.40	.18	.08
All	29	.23	.19	.42	.15	.30	.19	.17	.11

Of the twenty correlations for the separate experimenters, fourteen of the women's and sixteen of the men's are positive. In the correlations for the larger groups where the data from several experimenters are combined only one case (*Progressive*

Weights, for women) is clearly negative; one case (*Odors,* for women) is practically zero. On the whole, it seems proper to say that there is a distinct positive correlation between the results of this test and those of other tests, but that the actual amount of the correlation is not great. No particular test seems to be more closely related than another to this test, at least not conspicuously so.

The general results of this experiment may be stated as follows:

1. Women generally yield more readily than men to a suggestion of light touch.

2. Persons who yield readily to this form of suggestion will be apt to yield to other forms of suggestion.

3. The correlation between this test and others is higher for men than for women.

3. Heat[8]

The instructions were as follows:

LEAST PERCEPTIBLE WARMTH

It is the purpose of this experiment to determine the smallest amount of heat which you can feel with your finger.

Wait until the box has been heated by the electric current for one minute. Then let the index finger follow the indicator slowly into the hole until you feel the least perceptible warmth from the heated coil within.

If you do not feel the warmth the first time allow the current to heat the box for another minute and then try again. If you still fail to feel the warmth it means that your sense of temperature is not sufficiently delicate and the experiment must be given up.

The box contained a small hole into which the finger could be inserted. Within this hole the finger came in contact with a piece of velvet attached to a flat disc. The disc was attached to the short arm of a lever of which the other arm extended out-

[8] The experiments of this type by Seashore, Small, Guidi, and Scott are discussed by Whipple in his *Manual of Mental and Physical Tests,* pp. 423–428 of the edition of 1910. The method here adopted is a variation of that of Guidi ("Recherches expérimentales sur la suggestibilité," *Arch. de psychol.,* vol. 8, 1908, p. 49). Guidi's method was also employed by Chojecki, *Arch. de psychol.,* vol. 11, 1911, p. 182.

side the box in the form of a pointing indicator which could be moved along a scale on the outside of the box. As the indicator moved along the scale the disc within the box moved farther in and permitted the finger to be inserted farther. The box was covered with dead black paper and was loaded with lead to make it heavy enough to justify the "coil within." There was an incandescent electric light on the top of the box. The wire from this light passed in and out of the box in a conspicuous manner, but produced no heat within the box.

At first we allowed the subject to insert his finger into the box as fast as he liked, pushing the indicator along by the pressure which he exerted against the disc. Under these conditions we recorded both the time and the extent to which the finger was inserted into the box. This involved the difficulty that some persons pushed the finger in very rapidly while others proceeded in a very gingerly fashion. Later the indicator was moved along the scale by the experimenter at a uniform rate, allowing the finger to enter only as fast as it moved. In either case suggestibility was measured by the time (or distance) of insertion before the heat was reported. As both methods of scoring were used with a considerable number of persons it is possible to make a comparison of the rankings obtained by time and by distance. The following table gives the correlation between the ranking according to *time* and according to *distance*.

HEAT EXPERIMENT—CORRELATION BETWEEN THE RANK ACCORDING TO DISTANCE ON THE SCALE AND ACCORDING TO TIME

Experimenter	Number cases, women	Cor.	Number cases, men	Cor.
G	16	.77	7	.46
He	11	.90	9	.88
M	26	.99	8	.90
J	9	.93	6	.86
Ho	11	.78	None	

As the correlations are quite high for all of the experimenters, it is evident that either method of scoring will give practically the same ranking that would be obtained by the other method.

It may be of interest to note that this statistical result is a direct contradiction of the casual observations of all of the experimenters. The experimenters all thought that if a subject pushed in rapidly his score would show a high reading on the scale and a short time. The result proves that this "observation" was an inference, and that in fact those who push in rapidly stop before they have got far in, so that their record shows a low reading of the scale as well as a short time. However, the method later adopted of controlling the movement so that the finger can go in only one degree of scale per second of time seems, on the whole, a preferable method so far as the score is concerned.

The following table gives the significant facts regarding sex differences in this experiment. It shows for each experimenter the number of subjects tested and the proportion of them who failed to respond to the suggestion on the first trial. It also shows the average time required for the response of those who did yield to the suggestion.

Experimenter	Number women	Per cent failures	Index sug.	Number men	Per cent failures	Index sug.
A	14	50.0	9.0	6	66.7	9.3
C	14	35.7	7.9	7	42.9	8.0
G	16	12.5	22.8	6	16.7	16.8
He	11	36.4	14.5	9	44.5	10.4
Ho	14	35.7	10.6	1	100.0	.....
I	13	15.4	10.4	5	40.0	7.0
J	9	44.5	13.7	6	16.7	8.3
M	26	50.0	5.0	8	62.7	4.9
S	10	30.0	13.5	12	41.7	15.5
All	127	37.8	18.16	60	43.3	19.62

All the experimenters except one (J) report that more men than women refuse to yield to the suggestion, and in the average it appears that the men are slightly more resistant. On the other hand, five of the eight experimenters report that the men who do yield to the suggestion do so in a shorter time than the women. The fact that the average time for all the men who yield is slightly greater than the average time for all the women must not be taken too seriously. All of the experimenters who

obtained slower reactions for the women belonged to the group who worked with a fixed rate of movement. It is not improbable that this fixed rate delayed the response of the more impetuous men. At any rate, if we take only the persons who worked at their own speed, and were subject to a double score, we get the following average figures:

49 women, average time, 18.90 seconds, average scale 39.8.
18 men, average time, 15.78 seconds, average scale 32.2.

We ought also to take into consideration the data of the second trial, made one minute later with all those persons who failed to yield to the suggestion on the first trial. The second

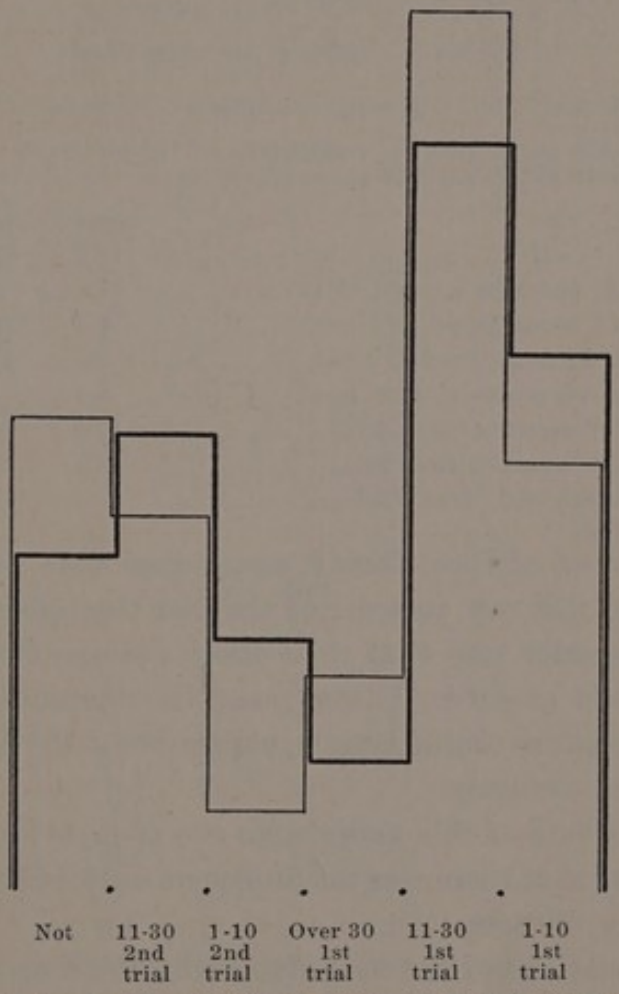

Fig. 3—Heat. Light line, women; dark line, men.

trial left only 14 per cent of the men still holding out against the suggestion, while of the women 19 per cent were still holding out. In other words, although there was a large number of men who resisted the first trial, two-thirds of them fell a prey to the second, while only half of the women who survived the first test yielded to the second.

An inspection of the graph (fig. 3) throws some light on this somewhat muddled set of data. This graph shows the distribution of the persons according to the lengths of time that they resisted the suggestion. It shows that more men resisted the first test, and that more women finally resisted both tests. In the first test a larger proportion of the women hold out for a period of thirty seconds or longer.

HEAT

Frequency of Different Degrees of Suggestibility

The figures are the percentile proportion of the subjects who confessed to feeling warmth after various intervals of time.

Time	Women	Men
Not at all	19.2	13.6
21–30 seconds, second trial	8.8	3.4
11–20 seconds, second trial	6.4	15.2
1–10 seconds, second trial	3.2	10.2
Over 30 seconds, first trial	8.8	5.1
21–30 seconds, first trial	12.8	18.6
11–20 seconds, first trial	23.2	11.9
1–10 seconds, first trial	17.6	22.0

In view of all of these facts it seems clear that men are more suggestible in this test, in spite of the fact that more men resist the first suggestion and that their gross average time of resistance is slightly greater. Fewer resist the cumulative effect of the two suggestions and a larger proportion of the men yield to the suggestion abruptly.

All of the data of this experiment are open to some criticism on the ground that there was not sufficient uniformity of method in conducting the tests.

The correlations of the heat test with the other tests will be found in the following table. The general arrangement is the

same as that observed in the case of *Odors* and *Touch*. In computing the rank for correlation the second test has been treated as if it were a direct continuation of the first, so that the shortest time recorded for the second trial takes the rank directly after the longest time for the first trial.

The correlation with *Touch* seems to be particularly high in spite of the fact that this was one of the experiments performed at a different time and by different experimenters. The correlation with *Odors* is also fairly high, as these correlations go. The results of the separate experimenters' figures indicate a relatively high positive correlation with *Heat* and *Shock*. As will be explained in the next section, the methods of adminis-

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE HEAT EXPERIMENT AND SUGGESTIBILITY IN NINE OTHER TESTS

Women

Experimenter	Number cases	Touch	Odors	Shock	Brightness	Pitch	Size	Motion	Lines	Weights
A	14	.....	.35	.34	.66	—.13	.....	.....	.....	.....
C	12	.....	.73	.45	.29	—.41	.....	.....	.....	.....
G	16	.....	.09	.09	.22	—.28	.....	.....	.....	.....
He	11	.....	—.05	.42	.44	—.23	.....	.....	.....	.....
Ho	14	.....	—.35	.32	.16	.45	.....	.....	.....	.....
I	13	.....	.00	—	—.47	—.19	.....	.....	.....	.....
J	9	.....	—.15	—.15	—.31	—.06	.....	.....	.....	.....
M	24	.....	.23	.08	.09	.01	.....	.....	.....	.....
S	10	.....	.18	—.15	.13	—.39	.....	.....	.....	.....
All	54	.35	.11	—	.07	—.29	.04	—.24	.15	.05

Men

Experimenter	Number cases	Touch	Odors	Shock	Brightness	Pitch	Size	Motion	Lines	Weights
A	6	.....	.54	—.09	.26	.26	.....	.....	.....	.....
C	7	.....	.03	.12	.65	.69	.....	.....	.....	.....
G	7	.....	.88	.44	.06	.48	.....	.....	.....	.....
He	9	.....	.18	.17	.19	.32	.....	.....	.....	.....
Ho	1	.....	—	—	—	—	.....	.....	.....	.....
I	5	.....	—.30	—	—.30	—.70	.....	.....	.....	.....
J	6	.....	.89	.60	.36	—.71	.....	.....	.....	.....
M	8	.....	.63	.12	.16	.26	.....	.....	.....	.....
S	12	.....	.86	.38	.00	—.01	.....	.....	.....	.....
All	29	.19	.26	—	.04	.06	.26	.09	.04	—.16

tering the shock experiment varied so much from one experimenter to another that it was impossible to compute a correlation for the larger groups in which the work of several experimenters would have to be combined.

Out of eight sets for the larger groups, six are positive for women and seven for men. Among the correlations for the subjects of separate experimenters there are twenty positive to fourteen negative for women and twenty-four positive to six negative for men.

The conclusions from this experiment are:

1. More men than women resist the first suggestion of heat, but fewer resist the cumulative effect of two suggestions, and the men who do not resist yield to the suggestion sooner than the women who yield.

2. There are more positive than negative correlations between this test and other tests, and there is a definite correlation between this test and *Touch*, *Odors*, and *Shock*, all of which are tests of the same general type.

3. The correlations are much more distinctly positive for men than for women.

4. Electric Shock[9]

A Dubois-Raymond induction coil was arranged on the table in front of the subject, with an oscillating reed which interrupted the primary circuit twenty times per second. Wires leading from the secondary circuit were dropped into jars of water. The subject placed his index finger in one jar and the middle finger of the same hand in the other jar. A secret key enabled the experimenter to cut out the circuit from the secondary coil without stopping the noisy interrupter, which continued to sputter on the table before the eyes of the subject. The directions were as follows:

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[9] A similar experiment was performed by Seashore, *Yale Studies*, vol. 3, 1895, p. 59.

ELECTRIC SHOCK

It is the purpose of this experiment to measure the weakest induced current which you can feel passing from one finger to the other.

You are to sit with the first and second fingers of your left hand dipped in the glasses of water which contain the electrodes. The experimenter will start the current through the primary coil and then pull the secondary coil slowly up until you feel the current distinctly. This is merely to acquaint you with the working of the apparatus.

The experimenter will then push the coil back and start it up again very slowly. You are to keep a sharp lookout for the first faint shock and as soon as you are sure that you feel it tell the experimenter to stop.

In case you do not feel the current soon enough, the experimenter may again return to the starting point. The experiment may be repeated two or three times at the discretion of the experimenter.

The subject watched the movement of the secondary coil as it was drawn up by a windlass. For the first trial the coil was drawn up with the current in action until the subject felt the shock distinctly. The second time (to measure the "least perceptible shock") the current was secretly cut out. In case of failure, another trial was made without current. In some of the work an actual shock was administered to persons who twice refused to feel the imaginary shock. This did not affect the data of this experiment, but may have influenced the suggestibility of the subject in later tests.

The index of suggestibility in this experiment can not be ascertained without knowing the point at which the current was actually felt when it was in action. The distance between this point and the point where the subject imagined he felt a "least perceptible" current, when there really was none, is taken as the measure of the suggestibility of the subject. Such a method is made necessary by the fact that different persons differ greatly in sensitivity to this form of electric stimulation. For that reason the absolute reading of the scale does not permit of any comparison between individuals with regard to suggestibility. Furthermore, we were not very successful in keeping the actual strength of the primary field constant, so that readings at different times were not precisely comparable. But this method of scoring involves a serious difficulty, for it proved to be im-

possible to get the different experimenters to adopt a uniform idea of what constitutes an actual shock which can be "clearly felt." Some waited to see their subject squirm a little before stopping the advance of the coil. Others stopped the coil on the very first indication that any current was being felt. There seems good reason to believe that the coil was sometimes stopped and a record entered for "actual shock" when no actual, but only a faintly imagined, shock had been experienced by the subject. On account of this difficulty with the method of scoring no attempt has been made to compute correlations involving the work of different experimenters.

It may be noted in passing that the average point at which women are reported as feeling the actual current is considerably lower than the corresponding point for men. The difference is nearly 30 mm. on the scale of the instrument, a distance which represents, for any particular individual, a change from a just perceptible to a distinctly unpleasant sensation. This difference may be, as it purports to be, a real difference in the sensitivity of the sexes, or it may mean that the report of an actual shock was entered, in the case of the women, more times when there was no actual shock. If the latter hypothesis is correct it means that the women are more suggestible before any shock has been administered.

The following table gives the results, such as they are, obtained by the different experimenters. It will be seen that the men appear, on the average, to be better able to resist the sug-

Experimenter	Number women	Per cent failures	Index sug.	Number men	Per cent failures	Index sug.
A	14	35.7	47.8	6	16.7	25.0
C	12	50.0	78.2	7	42.8	42.5
G	16	0.0	15.8	7	14.3	9.0
He	9	22.2	25.7	5	60.0	17.5
Ho	14	7.1	95.6	1	0.0	140.0
J	8	37.5	55.2	6	33.3	131.2
M	26	3.8	74.2	8	12.5	57.1
S	8	50.0	34.8	11	18.2	18.9
All	107	20.6	57.2	51	25.5	42.6

gestion and that those of them who yield wait longer (i.e., wait for the coil to approach more nearly to its former position) before they yield. The index of suggestibility is the distance in millimeters on the scale of the instrument between the "actual" and the imaginary shock. But while the general average shows the men more resistant, that is, less apt to report the current, yet four of the eight experimenters found the contrary to be the case, namely, that a larger proportion of the women refused to give in to the suggestion.

In these scores the results of only the first trial are recorded. The second trial will be used in computing correlations, but reference to it in connection with the per cent of failures does not clarify matters. There were only a few scattering cases in

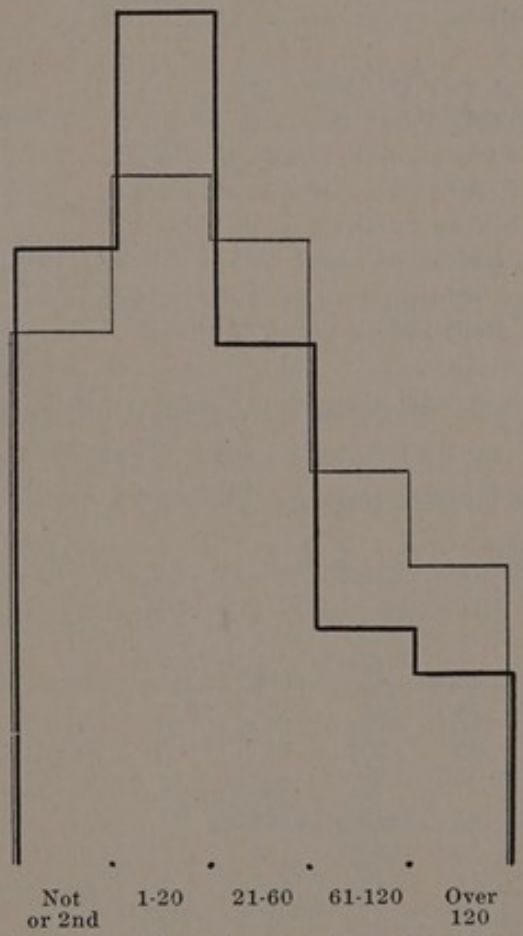

Fig. 4—Shock. Light line, women; dark line, men.

which a failure to respond to the suggestion on the first trial was followed by submission to the suggestion in the second trial.

The graphic representation (fig. 4) of the relative frequencies of different degrees of suggestibility in men and women confirms the impression that men are less suggestible in this test than women. Not only is the proportion of total resistance greater among men than among women, but a larger proportion of men wait until the coil has almost (20 mm. or less) reached the point at which they first felt the shock before yielding to the suggestion. There are fewer cases of extreme suggestibility among the men.

Frequency of Different Degrees of Suggestibility

The figures are the percentile proportion of the subjects who confessed to feeling the shock at various distances from the point where they first felt the actual shock.

Distance	Women	Men
Not at all, or only on second trial	21.5	25.0
1–20 mm. before point of actual shock	28.0	34.6
21–40 mm. before point of actual shock	16.8	13.5
41–60 mm. before point of actual shock	6.5	7.7
61–80 mm. before point of actual shock	7.5	5.8
81–120 mm. before point of actual shock	8.4	3.8
121–160 mm. before point of actual shock	5.6	5.8
161 mm. or more before point of shock	6.5	1.9

The following table gives the correlation between ranking in this experiment and ranking in four other tests, as obtained by the several experimenters. As has been explained already, it

Correlations Between Suggestibility in the Shock Experiment and Suggestibility in Four Other Tests

Experimenter	Number women	Odors	Heat	Brightness	Pitch	Number men	Odors	Heat	Brightness	Pitch
A	14	.07	.34	.10	—.29	6	.14	—.09	—.09	.03
C	12	.27	.45	.20	—.41	7	.45	.12	.43	.71
G	16	.38	.09	—.30	.22	7	.43	.44	—.54	.31
He	9	.05	.42	.39	—.13	9	—.37	.17	.83	.08
Ho	13	—.41	.32	.18	.23	1	—	—	—	—
J	9	—.03	—.15	.47	—.43	6	.49	.60	.71	—.71
M	24	—.20	.08	—.31	—.27	8	.11	.12	.69	.80
S	9	—.60	—.15	.44	.49	13	.32	.38	.12	—.29

is not possible to attempt correlations involving the work of different experimenters because of the lack of uniformity in their methods of making the record.

For women, 19 of the 32 correlations are positive, while 21 of the 28 correlations are positive for men. On the whole, this test shows a distinct tendency to correlate with the other four. The positive correlation is particularly noticeable between *Shock* and *Heat*. These two are very similar in general method and they were always given one after the other in the above order.

In conclusion it may be said that the *Shock* experiment shows that:

1. Women are more apt than men to yield to the suggestion, and they do not wait so long before yielding as do the men who yield.

2. There is a positive correlation between this test and the four others with which it can be compared.

3. The correlations are more clearly positive for men than for women.

5. Conclusions Regarding the Four Tests Involving the Idea of a "Least Perceptible" Sensation

The four tests so far described all involve the same type of suggestion. Through an appeal to pride and competitive interest the subject is led to anticipate and report as the "least perceptible" a sensation for which there is no physical basis.

A majority of the persons tested yielded to all four of these suggestions. On the whole, the test with *Odors* was the most successful of them; only one person in ten could resist it. *Touch* was resisted by 28 per cent of the persons tested, and, moreover, those who did yield in *Touch* were more cautious than in *Odors*. *Shock* succeeded with a few more (only 22 per cent resisted) than *Touch*. *Heat* was the least successful of these four tests; it failed in nearly 40 per cent of the cases. The probability that the suggestion will succeed depends to some extent upon the length of time that it is kept up, and obviously the heat sug-

gestion, to which the subject was seldom subjected for more than thirty seconds, could not be expected to influence so many persons as the suggestion of odors, which was ten times repeated and continued in all for several minutes.

All four of these tests succeed with more women than men, and in all except *Heat* they succeed to a greater *extent* also with women; but in *Heat* the women who yield hesitate longer (though the difference is not great) than the men who yield. Three (all except *Heat*) of the graphs representing the distribution of different degrees of suggestibility show not only that cases of complete immunity from suggestion are more frequent among the men but that cases of extreme suggestibility are rarer. This evidence must be considered in support of the averages, which show a greater degree of suggestibility among the women. The averages by themselves are not very reliable from a statistical standpoint. Unfortunately it is not feasible, in view of the peculiar roughness of the data, even to state the degree of reliability of the averages, but the distributions indicate that the averages are not seriously misleading. Moreover, the conclusions are supported by the fact that the general averages are confirmed by the separate findings of the individual experimenters.

To some extent the indices of correlation should enable us to determine whether there is any real relationship between the members of this reputed family of tests. *Heat* shows correlations which are comparatively high (high, that is, in view of the average magnitude of the coefficients obtained between these tests) with each of the other three, and particularly with *Shock*, its nearest theoretical relative. The relationship between *Shock* and *Touch* has not been computed for lack of suitable data. *Shock* does not appear to be related to *Odors* any more closely than to tests of a wholly different type. *Touch* is more closely related to *Heat* than to any other test, notwithstanding the fact that the tests for these two experiments were made at different times and, for the most part, by different persons. *Touch* does not correlate as closely with *Odors* as with other and different tests, in spite of the strong theoretical relationship between them.

Odor gives higher correlations with other tests than with members of its own family. So far as the coefficients of correlation may be interpreted as indicating an actual resemblance between these tests which are supposed to have a theoretical relationship, they confirm the relationship between *Heat*, *Shock*, and *Touch*, but tend to deny it in the case of *Odors*.

Since the coefficients of correlation are, in general, more apt to be positive than negative, the results so far lend color to the theory that suggestibility is a trait such that a person who is found to be highly suggestible in one test will probably prove to be more suggestible than most persons in another test. This is certainly so if, as in the present group of tests, the different tests bear a certain amount of resemblance to one another.

III

FOUR TESTS INVOLVING THE PERCEPTION OF CHANGE

1. Brightness; 2. Pitch; 3. Size; 4. Motion

The background for three of these tests is drawn from the familiar notion of a "just perceptible change." The notion of a just perceptible motion, embodied in the fourth of these suggestions, seems closely analogous to the others when it is expressed as a "just perceptible change" of position. In all four cases the subject is given an actual perception of change upon which to build up his anticipation. In all four cases the spirit of emulation is aroused. The degree of suggestibility is measured in terms of the promptness with which the subject reports the imaginary perception after he has been told to look for it. In all of the four experiments the subject was given credit for a "failure" (i.e., immunity from suggestibility) if he resisted the suggestion for as long as two minutes.

1. Change of Brightness[10]

A color-wheel was provided by means of which the proportions between the black and white sectors of a disc could be varied while the disc was in rotation. The apparatus, except the disc, was covered by a screen, and proper precautions were observed to prevent the subject from discovering that the experimenter failed, after the preliminary demonstration, to change the sectors.

The typewritten directions which were handed to the subject were as follows:

LEAST PERCEPTIBLE CHANGE IN BRIGHTNESS

It is the object of this experiment to determine how small a change in brightness you can detect.

The experimenter will first demonstrate to you the operation of the apparatus, showing how the proportion of black and white can be changed while the wheel is in rotation.

You are to sit directly in front of the wheel. The experimenter will give you a signal when you are to begin to look for a change in the brightness of the disc. The experimenter will hold a stop-watch to see how long the change continues before you notice it.

As soon as you are sure whether the disc is getting lighter or darker you are to give a signal to the experimenter to stop the motor. Ordinarily only one trial will be given.

A conspicuous change was given by way of preparation and then the actual test was begun with the word "now". No change was then made, but the time was noted until the subject thought he saw a change, either lighter or darker. This time is taken as the index of suggestibility.

The following table gives the number of subjects and the average time of resistance as obtained by each experimenter. The figures are given without regard to the question whether the subject thought the change was toward "brighter" or toward "darker". The number of persons who refused entirely to respond to the suggestion in this test was so small that it has not been entered in the table. Four women failed to respond, one with experimenter S. and three with experimenter He., and

[10] An experiment of a similar kind was tried by Seashore, *Yale Studies*, vol. 3, 1895, p. 32.

CHANGE OF BRIGHTNESS

Experimenter	Number women	Average time	Number men	Average time
A	14	23.6	6	10.7
C	12	8.2	6	19.0
G	17	9.9	6	6.5
He	10	19.0	8	16.4
Ho	9	13.4	1	8.0
I	11	10.7	6	16.0
J	7	18.4	6	18.5
M	24	14.6	8	18.3
S	9	5.5	13	10.9
All	113	13.7	60	14.0

three men, two with experimenter M. and one with experimenter He. The number of subjects given in the table is inclusive of these recalcitrants, but the average time does not, of course, include them. This same method of tabulation will be followed in each of the three experiments following.

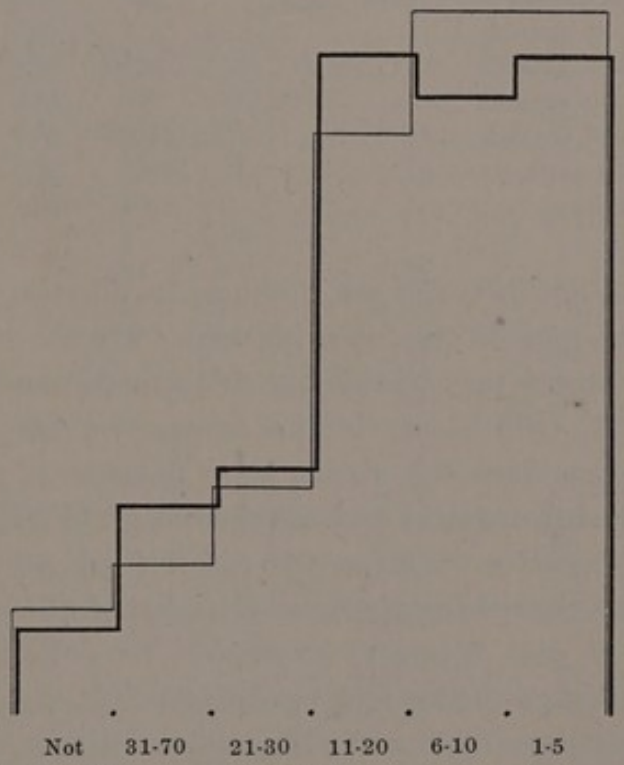

Fig. 5—Brightness. Light line, women; dark line, men.

No very marked difference in suggestibility appears between the sexes. The general average shows that the men hesitate a fraction of a second longer before yielding to the suggestion than the women, but this result is contradicted by the findings of four of the nine experimenters.

The distribution of persons according to degrees of suggestibility (fig. 5) indicates that a larger proportion of the women than of the men yield to the suggestion within ten seconds. This argues in favor of the reliability of the average figure, which shows that men resist the suggestion a little longer than women. The absolute number of persons who wholly resist the suggestion is too small to give a reliable indication of a sex difference in that direction.

Frequency of Different Degrees of Suggestibility

The figures are the percentile proportion of the subjects who confessed to seeing a change after the various intervals of time.

Time	Women	Men
Not within 2 minutes	4.2	3.3
51–70 seconds	1.7	3.3
31–50 seconds	4.2	5.0
21–30 seconds	9.2	10.0
11–20 seconds	23.5	26.7
6–10 seconds	28.6	25.0
1–5 seconds	28.6	26.7

The correlations between the rankings in this test and in the other tests are shown in the following table. On the whole, there is a tendency on the part of this test to correlate positively with the other tests. Of the correlations among the subjects of the separate experimenters, the women show twenty-one positive instances to thirteen negative and the men show twenty-two positive to eight negative. Among the correlations for the larger groups, without regard to experimenter, some of the most clearly positive (*Touch* and *Weights*) are found for tests which were made at a different sitting and by different persons. The correlation is relatively high with *Change of Pitch,* which closely resembles *Change of Brightness* in general method and which

was always given immediately after it. Yet six of the seventeen correlations by separate experimenters are negative between these two tests.

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE TEST WITH CHANGE OF BRIGHTNESS AND SUGGESTIBILITY IN NINE OTHER TESTS

Women

Experimenter	Number cases	Touch	Odors	Heat	Shock	Pitch	Size	Motion	Lines	Weights
A	14	.....	—.05	.66	.10	.20	.....	.....	.....	.....
C	12	.....	—.11	.29	.20	—.06	.....	.....	.....	.....
G	16	.....	—.87	.22	—.30	—.05	.....	.....	.....	.....
He	10	.....	.20	.44	.39	—.10	.....	.....	.....	.....
Ho	13	.....	—.14	.16	.18	.27	.....	.....	.....	.....
I	13	.....	.33	—.47	—	.21	.....	.....	.....	.....
J	8	.....	—.35	—.31	.47	—.14	.....	.....	.....	.....
M	24	.....	.33	.09	—.31	.64	.....	.....	.....	.....
S	10	.....	.00	.13	.44	.65	.....	.....	.....	.....
All	54	.15	.05	.07	—	.18	—.16	—.05	—.06	.22

Men

Experimenter	Number cases	Touch	Odors	Heat	Shock	Pitch	Size	Motion	Lines	Weights
A	6	.....	.55	.26	—.09	.14	.....	.....	.....	.....
C	7	.....	—.32	.65	.43	.04	.....	.....	.....	.....
G	6	.....	.11	.06	—.54	—.14	.....	.....	.....	.....
He	8	.....	—.28	.19	.83	.18	.....	.....	.....	.....
Ho	1	.....	—	—	—	—	.....	.....	.....	.....
I	5	.....	.50	—.30	—	.81	.....	.....	.....	.....
J	6	.....	.57	.36	.71	—.42	.....	.....	.....	.....
M	8	.....	—.22	.16	.69	.55	.....	.....	.....	.....
S	13	.....	.37	.00	.12	.66	.....	.....	.....	.....
All	29	.42	.40	.04	—	.38	.09	.39	.08	.40

The following general statement may be made regarding the *Brightness* test:

1. The amount by which women exceed men in suggestibility is very small.

2. This test correlates positively with other tests.

3. The positive correlations with other tests are much greater for groups of men than for groups of women.

2. Change of Pitch

The following typewritten directions were handed to the subject.

LEAST PERCEPTIBLE CHANGE OF PITCH

It is the object of this experiment to determine how small a change of pitch you can detect.

The experimenter will first demonstrate the apparatus to you, showing how the change of pitch is produced while the whistle is blowing.

You are to sit with your back to the apparatus, so that you can not see how great a change of pitch is being produced, and listen intently to the whistle. The experimenter will hold a stop-watch to see how long the change continues before you notice it. As soon as you are sure whether the change is up or down, that is, whether the pitch is higher or lower, you are to give a signal to the experimenter to stop the whistle. Ordinarily only one trial will be given.

The subject was shown the apparatus, which consisted of a Stern *tonvariator*, by which the pitch of the metallic whistle could be altered while the whistle was being blown from a floating tank of air. He was then seated with his back to the instrument and the whistle was started at a pitch of 420 vibrations per second. A rapid and conspicuous change of pitch was then made up to 435 and back to 420. The experimenter then refilled the air tank, started the stop-watch and said "ready", while the whistle was steadily blowing but without any change of pitch. The degree of suggestibility was measured by the time the subject waited before announcing the direction of the change of pitch which he imagined he heard.

Only 4.4 per cent of the subjects (four women and four men) failed to hear a change of pitch within the two-minute period which was allowed for the suggestion to take effect. We are not prepared to say that the pitch of this whistle does not really change while it is blowing, but if it does there is little agreement among the subjects as to the direction of the change; 59 per cent of the women thought the pitch grew higher, and 53 per cent of the men thought it grew lower. The following table shows the number of persons experimented upon by each operator and the average time of the delay before responding to the suggestion.

Experimenter	Number women	Average time	Number men	Average time
A	14	16.1	6	25.7
C	12	21.0	7	17.3
G	16	13.3	7	18.3
He	11	16.1	9	22.4
Ho	11	31.1	1	28.0
I	12	21.8	6	27.0
J	9	14.1	6	16.5
M	26	8.7	8	12.2
S	9	8.8	12	15.2
All	120	15.7	62	19.4

The general average shows that women respond to the suggestion more quickly by about three and a half seconds. Seven of the nine investigators agree in finding that women respond more quickly.

The distribution of the degrees of suggestibility (fig. 6) does not show as consistent a difference between the sexes as is shown

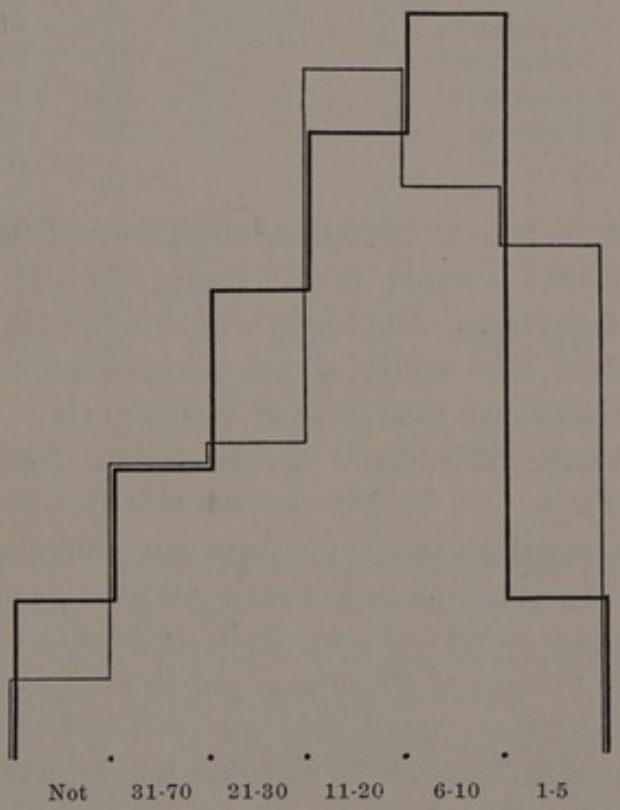

Fig. 6—Pitch. Light line, women; dark line, men.

by some of the other distributions. The men are less apt to respond within five or within ten seconds, but more men respond in from six to ten seconds. The mode for men is between six and ten seconds; yet it must be said that on the whole less men than women respond within ten seconds and that more men than women reject the suggestion for more than twenty seconds. More women than men resist for more than fifty seconds, and more men than women hold out for the entire two minutes of the test, but the absolute number of individuals concerned in these last statements is small.

Frequency of Different Degrees of Suggestibility

The figures show the percentile proportion of the subjects who confessed to hearing a change of pitch within various intervals of time.

Time	Women	Men
Not within 2 minutes	3.2	6.3
51–70 seconds	5.6	1.8
31–50 seconds	6.4	8.0
21–30 seconds	12.8	19.0
11–20 seconds	28.0	25.4
6–10 seconds	23.2	30.1
1–5 seconds	20.8	6.3

The absolute time of hesitation in this test is from two seconds (women) to five seconds (men) longer than in the test for *Change of Brightness.* But in spite of this fact the test succeeds just as well in that nearly all the persons tested yield to the suggestion within the time limit of two minutes.

The following table shows the correlation of other tests with *Change of Pitch.* Of the correlations obtained for the subjects of separate experimenters, the women give thirteen positive and twenty-one negative; the men twenty-two positive and nine negative. This test correlates comparatively closely with the analogous test in *Change of Brightness* and to some extent with *Size, Weights,* and *Touch,* but it does not correlate well with *Odors, Heat,* or *Shock,* in spite of the fact that the last-named tests were administered at the same sitting and by the same persons.

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE TEST WITH CHANGE OF PITCH AND SUGGESTIBILITY IN NINE OTHER TESTS

Women

Experimenter	Number cases	Touch	Odors	Heat	Shock	Brightness	Size	Motion	Lines	Weights
A	14	.....	—.31	—.13	—.29	.20	.....	.....	.....	.....
C	12	.....	—.12	—.41	—.41	—.06	.....	.....	.....	.....
G	16	.....	.15	—.28	.22	—.05	.....	.....	.....	.....
He	11	.....	.06	—.23	—.13	—.10	.....	.....	.....	.....
Ho	14	.....	.00	.45	.23	.27	.....	.....	.....	.....
I	13	.....	—.30	—.19	—	.21	.....	.....	.....	.....
J	9	.....	.35	—.06	—.43	—.14	.....	.....	.....	.....
M	24	.....	—.11	.01	—.27	.64	.....	.....	.....	.....
S	9	.....	—.32	—.39	.49	.65	.....	.....	.....	.....
All	54	.27	—.10	—.29	—	.18	.04	.16	.05	.07

Men

Experimenter	Number cases	Touch	Odors	Heat	Shock	Brightness	Size	Motion	Lines	Weights
A	6	.....	.25	.26	.03	.14	.....	.....	.....	.....
C	7	.....	.57	.69	.71	.04	.....	.....	.....	.....
G	7	.....	.40	.48	.31	—.14	.....	.....	.....	.....
He	9	.....	.19	.32	.08	.18	.....	.....	.....	.....
Ho	1	.....	—	—	—	—	.....	.....	.....	.....
I	5	.....	.75	—.70	—	.81	.....	.....	.....	.....
J	6	.....	—.40	—.71	—.71	—.42	.....	.....	.....	.....
M	8	.....	.18	.26	.80	.55	.....	.....	.....	.....
S	13	.....	—.05	—.01	—.29	.66	.....	.....	.....	.....
All	29	.15	.16	.06	—	.38	.46	.09	—.08	.38

The data of this experiment warrant the following general statements:

1. Nearly all persons yield to the suggestion of *Change of Pitch,* but women yield more quickly than men.

2. Suggestibility in this test is positively correlated, to a small extent, with suggestibility in other tests.

3. The correlations are much closer with groups of men than with groups of women.

3. Change of Size

An Aubert diaphragm was interposed between a light and a lens in such a way as to throw a bright square of light upon a translucent screen of waxed paper. The image was about 5 cm. square and its corners were placed in the vertical and horizontal axes. The instructions handed to the subject were as follows:

LEAST PERCEPTIBLE CHANGE OF SIZE

It is the object of this experiment to see how small a change of size you can notice. You will see a bright area on the screen. This can be made gradually larger or smaller. Watch it closely and as soon as you see any change of size tell the experimenter whether it is increasing or decreasing in size.

By opening the Aubert diaphragm with a rack and pinion the experimenter produced, for demonstration, a very noticeable increase in the size of the bright square. He then reduced the square to the original size and said "ready". No further change was made in the size of the square. The time was recorded from the word "ready" till the subject reported an increase or a decrease. This time was taken as the index of suggestibility. Two minutes were allowed for a failure.

This experiment was given at the same sitting with, and immediately after the completion of *Motion,* which will be described next. *Brightness* and *Pitch,* which have just been described, were given at a different sitting, and usually by different experimenters.

Experimenter	Number women	Average time	Number men	Average time
A	19	11.1	10	8.2
C	8	6.8	6	12.2
G	19	11.1	6	3.1
He	10	13.3	19	17.9
I	12	11.5	8	4.9
S	11	11.6	11	6.5
All	79	11.1	60	10.3

The sex differences in this experiment are very slight. More men resisted the suggestion completely (one in every 12 as com-

pared with one woman in 79), but the average time of resistance of the men (10.3 seconds) was less than that of the women (11.1). Four of the six experimenters agree with the average in finding that the men yield sooner than the women. The figures are given in the table on the opposite page.

The distributions according to degrees of suggestibility (fig. 7) show that the men are more apt to yield within five seconds, and also, as stated above, more apt to resist completely. The distribution is not unlike that for *Brightness,* except that a larger proportion of all the cases fall within the first ten seconds.

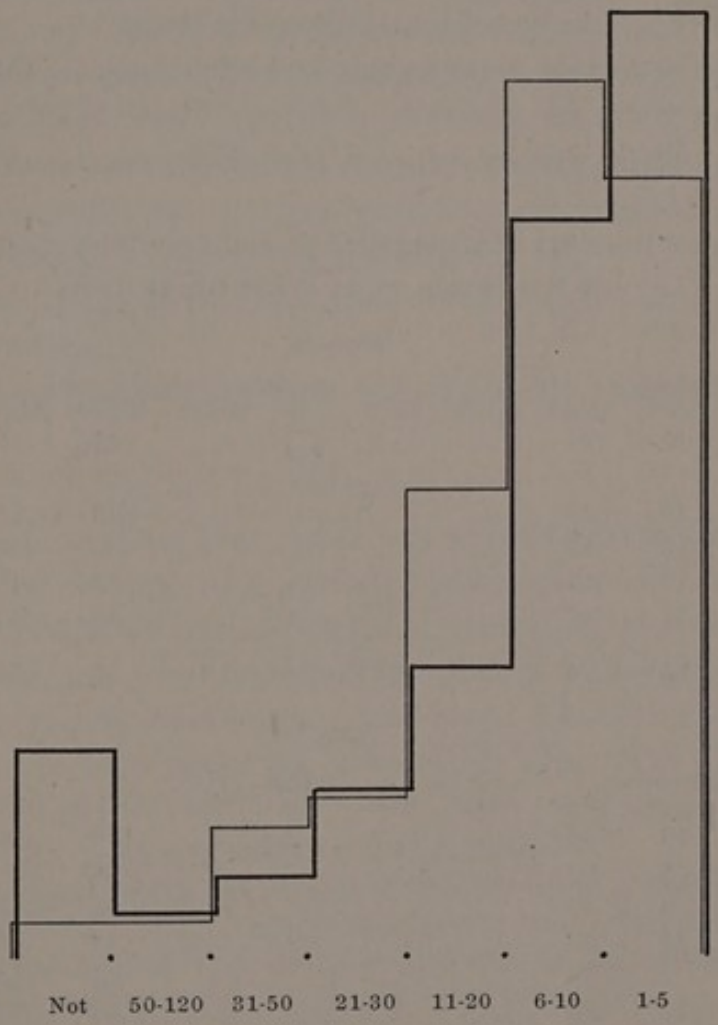

Fig. 7—Size. Light line, women; dark line, men.

Frequency of Different Degrees of Suggestibility

The figures show the percentile proportion of the subjects who confessed to seeing a change of size within various intervals of time.

Time	Women	Men
Not within 2 minutes	1.3	8.3
51 seconds or more	1.3	1.7
31–50 seconds	5.1	3.3
21–30 seconds	6.3	6.7
11–20 seconds	19.0	11.7
6–10 seconds	35.5	30.0
1–5 seconds	31.6	38.4

The absolute time which elapses before the average individual yields to this suggestion is somewhat less than for *Brightness* or *Pitch*, yet the number of total failures is larger.

The correlations between this and other tests, as shown in the following table, are generally positive. Those based on ranking 29 men and 54 women, without regard to experimenter, in this

Correlation Between Suggestibility in the Test With Change of Size and Suggestibility in Eight Other Tests

Women

Experimenter	Number cases	Touch	Odors	Heat	Brightness	Pitch	Motion	Lines	Weights
A	19	.01	.....	.....	.....	.....	.42	.49	.17
C	7	—	.....	.....	.....	.....	.21	—	—
G	19	—.10	.....	.....	.....	.....	—.13	—.21	.12
He	10	.19	.....	.....	.....	.....	.73	—.01	.21
I	12	.12	.....	.....	.....	.....	.62	.68	—.05
S	11	.07	.....	.....	.....	.....	.45	—.40	.53
All	54	.04	.08	.04	—.16	.04	.12	.06	.27

Men

Experimenter	Number cases	Touch	Odors	Heat	Brightness	Pitch	Motion	Lines	Weights
A	10	.16	.....	.....	.....	.....	.70	.04	.29
C	5	—	.....	.....	.....	.....	.98	—	—
G	6	.20	.....	.....	.....	.....	.94	—.03	—.09
He	19	.33	.....	.....	.....	.....	.83	.47	—.12
I	7	.34	.....	.....	.....	.....	.45	.84	—.34
S	11	.35	.....	.....	.....	.....	.08	.53	.09
All	29	.30	.39	.26	.09	.46	.36	.17	.22

and eight other tests give only one negative instance for the women and no negative instance for the men. The correlations for the separate experimenters, in this and four other tests, show fifteen positive to six negative cases for the women and seventeen positive to four negative for the men.

The correlation is high with *Motion,* which was performed at the same time and by the same persons and according to an almost identical method; but it is also high with *Odors,* which was as different as possible in method, and performed at a different time and, usually, by different persons. The correlation is much closer with *Pitch* than with *Brightness,* although both of these experiments seem to rest upon much the same methods as were employed in the present experiment.

The general conclusions for this experiment may be stated as follows:

1. No clear sex difference in suggestibility appears. Although men tend to yield sooner than women to the suggestion, more men also succeed in completely resisting it.

2. There is a positive correlation between this test and nearly all of the others.

3. The correlations are much higher for men than for women.

4. Motion[11]

A strip of medium gray paper was stretched from the picture moulding to the floor in a partially darkened room. A disc of light, just bright enough to be clearly visible on the background of the paper, was projected upon the middle of the paper. The disc was 5 cm. in diameter and was about 3 meters away from the subject, a little above the level of his eyes. The directions were as follows:

LEAST PERCEPTIBLE MOTION

It is the object of this experiment to find how small a motion you can see. You will see a small circle of light on the wall. This light can be raised or lowered. Watch it closely and as soon as you see any motion tell the experimenter whether it is going up or down.

[11] The experiment of Small, *Ped. Sem.,* vol. 4, 1896, p. 182, with the toy camel bears some resemblance to this one.

For demonstration the disc was made to rise about 15 cm. by turning the crank of an elevating stand upon which the light stood. It was then lowered to the starting point. Then the experimenter said "ready" and began to turn the crank of another stand, making the same noise as that made when the light was really moved. Time was recorded from the word "ready" till the subject reported motion. The test was considered a failure if no motion was reported within two minutes. Of 79 women, only three failed to see a change within half a minute and none resisted for two minutes. Of 58 men, nine failed to see a motion within half a minute, and of these six held out beyond the two-minute limit, but it should be noted that five of the six were reported by one experimenter (He.).

Experimenter	Number women	Average time	Number men	Average time
A	19	11.0	10	13.9
C	8	9.5	5	10.4
G	19	12.0	6	5.7
He	10	10.0	19	14.5
I	12	12.9	7	6.2
S	11	8.7	11	9.0
All	79	10.9	58	10.8

The average time of resisting the suggestion is greater for the women by a very slight amount, although four of the six experimenters found the time longer for the men.

The distribution of the degrees of suggestibility, shown in figure 8, indicates that a larger proportion of the women yield to the suggestion within five seconds and that none of them resist for the whole two minutes of the test. A comparatively large proportion of the men hold out against the suggestion for the entire two minutes.

Women appear to be slightly more suggestible than men in this experiment, although the simple average gives an indication the other way.

With respect to the absolute time required before the suggestion becomes effective, and to the general form of the curves

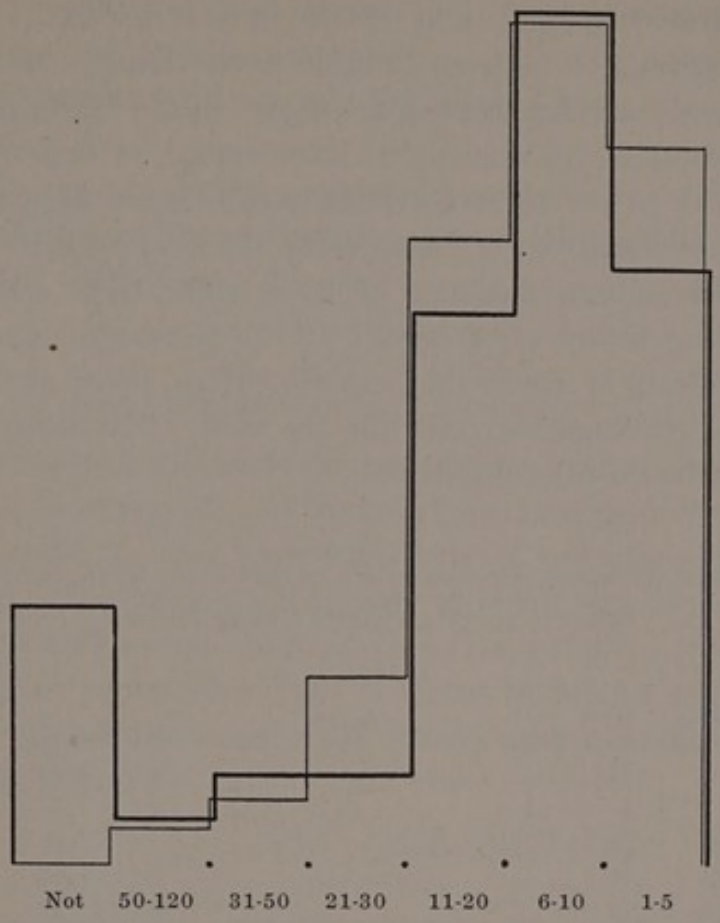

Fig. 8—Motion. Light line, women; dark line, men.

of distribution of degrees of suggestibility among individuals, this experiment tallies very closely with the one on *Change of Size*. The superficial resemblance of the two experiments seems

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects who confessed to perceiving motion within various intervals of time.

Time	Women	Men
Not within 2 minutes	0.0	10.3
51 seconds or more	1.3	1.7
31–50 seconds	2.5	3.5
21–30 seconds	7.6	3.5
11–20 seconds	25.3	22.4
6–10 seconds	34.2	34.5
1–5 seconds	29.1	24.2

to be confirmed by the data. There is also a relatively high degree of correlation between ranking in *Size* and in *Motion*.

The correlations for this test are shown in the following table. For the group of 54 women, without regard to experimenter, there are five of the eight correlations which are negative. In spite of these negative correlations for the women, there are no negative correlations for any of these eight tests among the corresponding group of 29 men. Of the separate correlations for the subjects of particular experimenters, there are sixteen positive to five negative cases for the men. The women show twelve positive to nine negative.

Correlations Between Suggestibility in the Test With Motion and Suggestibility in Eight Other Tests

Women

Experimenter	Number cases	Touch	Odors	Heat	Brightness	Pitch	Size	Lines	Weights
A	19	.24	.....	.....	.....	.....	.42	—.13	.04
C	7	—	.....	.....	.....	.....	.21	—	—
G	19	.22	.....	.....	.....	.....	—.13	—.29	—.08
He	10	.45	.....	.....	.....	.....	.73	—.19	.35
I	12	—.33	.....	.....	.....	.....	.62	—.05	—.31
S	11	.06	.....	.....	.....	.....	.45	—.60	.06
All	54	.07	—.28	—.24	—.05	.16	.12	—.20	—.24

Men

Experimenter	Number cases	Touch	Odors	Heat	Brightness	Pitch	Size	Lines	Weights
A	10	—.05	.....	.....	.....	.....	.70	—.23	.42
C	5	—	.....	.....	.....	.....	.98	—	—
G	6	.14	.....	.....	.....	.....	.94	—.03	—.20
He	19	.51	.....	.....	.....	.....	.83	.63	.09
I	7	.57	.....	.....	.....	.....	.45	.58	.13
S	11	—.40	.....	.....	.....	.....	.08	.53	.20
All	29	.19	.14	.09	.39	.09	.36	.23	.18

The only test which shows a good positive correlation with *Motion* for both men and women is *Size*. *Pitch* and *Touch* are the only others for which a positive correlation is found among

women. *Brightness* gives a high positive figure for men and a small negative figure for women.

No conclusions of much value can be drawn from this experiment:

1. Women are perhaps more suggestible.

2. While men show a positive correlation between this and most other tests, women do not.

5. The Direction of the Imaginary Change

A curious phenomenon in connection with the experiments involving the suggestion of an imaginary change is that the suggestion seems to work more effectively in one direction than in the other. For example, a change of brightness is more apt to appear as an *increase* than as a *decrease;* the disc seems to become lighter more often than it seems to become darker. The data on this point are combined for the four experiments in the following table:

	Number women	Average time	Number men	Average time	Total cases	Average time
Brightness "lighter"	64	14.5	42	13.5	106	14.4
Brightness "darker"	47	11.4	17	13.6	64	12.0
Pitch "up"	69	13.9	27	15.7	96	14.4
Pitch "down"	47	18.4	31	22.7	78	20.2
Size "increase"	46	10.6	36	10.4	82	10.5
Size "decrease"	28	12.6	16	10.9	44	12.0
Motion "up"	52	10.9	22	13.2	74	11.6
Motion "down"	24	11.4	27	9.2	51	10.2

The figures indicate a marked tendency to favor the judgment of "increase" or "up". No clear difference is apparent between the sexes with regard to this tendency, although two exceptions to the general rule are found in the masculine groups. On the whole, there is evidence that the more favored response is given with less hesitation, that is, in a shorter time, than the less favored response. Exceptions are found in the case of the women in *Brightness* and the men in *Motion*. In the latter case

the total for men and women together becomes an exception to the general rule through the magnitude of the exceptional figures for the men.

If an interpretation of this phenomenon is sought it may be found in the fact that the "increase" or "up" direction of change was always mentioned first in the directions which were put into the subjects' hands, or in the further fact that the same direction of change was always used first in giving the demonstration of an actual change before the test. The diversity of the experimental material makes it highly improbable that the phenomenon springs from purely sensory sources. Such an explanation readily suggests itself for one or another of the experiments singly, but would scarcely account for the rather uniform effects in all of the experiments together. It is possible that the preference for one judgment rather than the other depends upon a deep-seated central tendency whereby the mental machinery is prepared to give expression to one notion more readily than the other in the absence of any outer change in the situation.

6. Conclusions Regarding the Four Tests Based on the Idea of a "Least Perceptible" Change

These four experiments permit of a very close comparison, not only with respect to the form of the suggestion but also with respect to the measurement of suggestibility. They all rest upon the familiar notion of a "just perceptible change"; they are all reinforced by a demonstration of actual change, and they are all scored by the lapse of time before the suggestion takes effect.

The four experiments are all successful in securing an almost uniform acceptance of the suggestion. Moreover, the suggestion is accepted very promptly. The following table shows the average time elapsing before the subject yielded to the suggestion, the proportion of the subjects who accepted the suggestion within ten seconds, and the proportion of the subjects who refused to accept the suggestion within two minutes.

This group of experiments does not reveal a very clear sex difference in suggestibility. Considering the average time of

	Average time	Per cent yielding within 10 secs.	Per cent resisting over 2 min.
Brightness	13.8 secs.	55%	3.9%
Pitch	16.9	41	4.3
Size	10.7	68	4.3
Motion	10.9	61	4.4

resistance, the number of refusals, and the proportion of quick responses, it appears that the women are more suggestible in *Pitch* and less clearly so in *Brightness*. *Size* shows a briefer resistance but also a larger proportion of total refusals among the men. *Motion* gives no positive difference, although the distribution shows more women yielding within five seconds and fewer resisting for two minutes. Taken as a group, the four tests show women somewhat more open to suggestions of this type than men.

The correlations indicate that the theoretical relationships between the four tests of this group are reflected in the effects upon the subjects. *Pitch* is more closely correlated with *Brightness* than with any other test; its next closest correlation is with *Size*, and it is positively correlated, for both men and women, with *Motion*. *Brightness*, however, has other correlations stronger than that with *Pitch*, while its correlation with *Motion* is not close, and with *Size* the poorest of all. *Size* is closely (as these figures go) correlated with *Motion* and *Pitch*, but not with *Brightness*. *Motion* and *Size* are closely correlated, but all the other correlations for *Motion* are very uncertain on account of the very low coefficients obtained from the women and the very much better figures obtained from the men. On the whole, the relation of the two pairs, *Pitch* with *Brightness* and *Motion* with *Size*, stands out clearly. Further, *Pitch*, *Size*, and *Motion* seem to be interrelated, but *Brightness* does not seem to be closely related to any of them except *Pitch*. While these four tests really seem to constitute a family group, it must be acknowledged that their relationships within the group are not much stronger than some of their relationships outside the group, and in the case of *Motion* not so strong.

Although these tests do not afford many high coefficients of correlation with other tests, positive figures occur more frequently than negative ones. This seems to indicate, so far as it goes, that suggestibility is a trait of such a kind that if a person proves suggestible in one of these tests he is more apt than not to prove suggestible in other tests. Since the coefficients are much higher for men than for women, the above conclusion is much more probably correct for men than for women.

IV

TWO TESTS DEPENDING UPON A SERIES OF PROGRESSIVE INCREASES

1. Progressive Weights; 2. Progressive Lines

These tests were made as nearly alike as possible in method and in scoring. The idea in the background in the directions was "least perceptible difference" or "delicacy of discrimination." The real source of the suggestion seems, however, to be the actual series of increases with which the experiment begins. The method of scoring was adapted to the purpose of obtaining exactly comparable scores from the two experiments.

1. Progressive Weights[12]

Fifteen black tin boxes of uniform appearance, but marked on the top in a conspicuous manner with numbers, in order, from one to fifteen, were placed in a row on a table. The actual weights of the first five were 20, 40, 60, 80, and 100 grams, and all the others were 100 grams. The directions which were handed to the subject were as follows:

DISCRIMINATION OF WEIGHTS

This experiment is intended to test your ability to distinguish between weights. Lift the weights, one after the other, as directed by the experi-

[12] This experiment is Binet's (*La suggestibilité*, pp. 161–208). The directions, material and method of scoring are according to Whipple, *Manual of Mental and Physical Tests*, p. 410, edition of 1910.

menter, beginning on the left. As you lift each weight say whether it is heavier, lighter, or the same as the one just before it. All that you have to say is either "lighter", "heavier", or "the same." Remember you are to compare each weight with the one lifted just before. Do not lift any weight more than once.

The experimenter indicated to the subject the manner of lifting the weight between the thumb and fingers. It is very hard to make the subjects follow the directions in this experiment, and more verbal explanations were required than is desirable; but once the subject had got fairly started there was no difficulty in making the judgment.

There were ten judgments upon weights which were really all the same. The index of suggestibility was obtained by counting the number of judgments "heavier" which occurred among the judgments on these ten weights. The table below indicates that women are more apt than men to continue saying "heavier" when there is no longer any difference between the weights. The average result is confirmed by the findings of four of the six experimenters.

Experimenter	Number women	Average number "heavier"	Number men	Average number "heavier"
A	19	4.3	10	3.6
C	9	4.8	6	4.1
G	19	4.1	6	4.1
He	10	5.2	19	4.1
I	12	4.4	8	4.9
S	11	4.9	11	3.7
All	80	4.5	60	4.05

As some objection may be raised to the method of scoring, on the ground that no account has been taken of the number of times the weights were judged equal, it may be added that the average woman calls the weights equal 3.5 times, while the average man calls them equal 3.7 times in ten trials. This indicates that the index according to positive cases, as given above, does not seriously misrepresent the actual sex difference.

The distribution of persons according to different degrees of suggestibility, shown in figure 9, reinforces the inference from

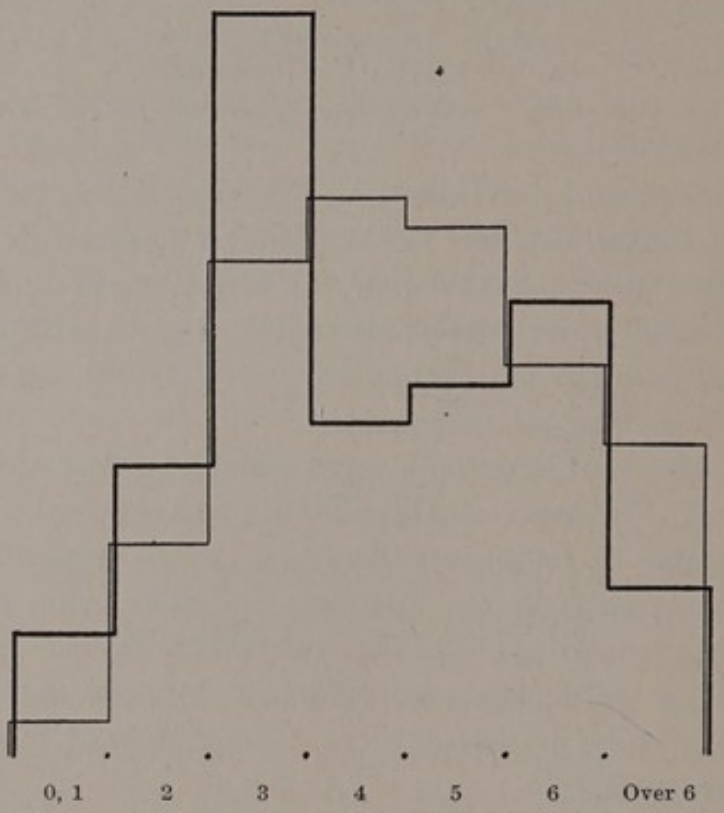

Fig. 9—Progressive Weights. Light line, women; dark line, men.

the average that women are more suggestible than men in this experiment. More men say "heavier" only three times or less (47 per cent as compared with 30 per cent). More women say "heavier" seven times or more (12.5 per cent to 6.7 per cent). The mode for the women is four judgments of "heavier", that for the men three.

Frequency of Different Degrees of Suggestibility

The figures show the percentile proportion of the subjects who reported "heavier" 0, 1, 2, 3, etc., times among the 10 trials with equal weights.

Times	Women	Men	Times	Women	Men
0	1.3	1.7	6	13.8	18.3
1	0.0	3.3	7	5.0	5.0
2	8.6	11.7	8	7.5	0.0
3	20.0	30.0	9	0.0	1.7
4	22.5	13.3	10	0.0	0.0
5	21.3	15.0			

The correlations between ranking in *Weights* and other tests is shown in the following table. In the groups of 54 women and 29 men the women give two negative correlations out of eight (*Touch, Motion*) and the men one (*Heat*). The correlation is unusually high with *Brightness, Pitch,* and *Size;* and positive, but not high, with the closely analogous test of *Progressive Lines.* Particular interest attaches to the high correlation with *Brightness* and *Pitch,* not only because these tests involve another method and were given by different experimenters at a different time but also because their suggestion is addressed to sight and hearing respectively, while the suggestion of *Weights* is addressed to a different sense. The correlation is negative for the women and not high for the men with *Touch,* which is addressed to the same, or to a closely related, sense. Perhaps it should be noted, however, that the conspicuous numbers on the tops of the weights make a strong appeal to the eye. Of twenty-one correlations for separate experimenters thirteen are positive for women and the same number for men.

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE EXPERIMENT WITH PROGRESSIVE WEIGHTS AND SUGGESTIBILITY IN EIGHT OTHER TESTS

Women

Experimenter	Number cases	Touch	Odors	Heat	Brightness	Pitch	Size	Motion	Lines
A	19	—.24	.....	.....	.....	.....	.17	.04	.44
C	9	—	.....	.....	.....	.....	—	—	.41
G	19	.05	.....	.....	.....	.....	.12	—.08	.05
He	9	.68	.....	.....	.....	.....	.21	.35	—.08
I	12	—.08	.....	.....	.....	.....	—.05	—.31	—.07
S	11	.04	.....	.....	.....	.....	.53	.06	—.05
All	54	—.13	.18	.05	.22	.07	.27	—.24	.17

Men

Experimenter	Number cases	Touch	Odors	Heat	Brightness	Pitch	Size	Motion	Lines
A	10	—.20	.....	.....	.....	.....	.29	.42	.01
C	5	—	.....	.....	.....	.....	—	—	.90
G	6	—.46	.....	.....	.....	.....	—.09	—.20	—.46
He	19	.08	.....	.....	.....	.....	—.12	.09	.05
I	7	.24	.....	.....	.....	.....	—.34	.13	—.44
S	11	.08	.....	.....	.....	.....	.09	.20	.13
All	29	.11	.16	—.16	.40	.38	.22	.18	.16

The final statement for this test may be put in the following way:

1. Women are undoubtedly more suggestible than men.

2. There is a positive correlation between this test and others, and the correlation is not lower for tests given by a different method, by different persons, at a different time, and addressed to a different sense organ.

3. The correlations are higher with groups of men than with groups of women.

2. Progressive Lines[13]

This experiment corresponds very closely to the one with *Progressive Weights,* just described. They were given by the same experimenters at the same sitting, but another test intervened between them. The directions which were handed to the subject read as follows:

ESTIMATION OF LENGTH OF LINE

It is the purpose of this experiment to test your ability to estimate the length of short lines. You will see one line at a time and you are to reproduce it right afterward from memory. Take one look at the line and then make a mark on the cross-section paper just the distance from the left-hand edge that the line is long. Then say "ready" and the next line will be shown you. Make your estimate of it just under your estimate of the last line. And so on for all of the twenty lines.

The lines were drawn very black on glazed white paper and attached to a drum which could be revolved. They were exposed, one at a time, through a horizontal slit in a screen. The estimates were made on every fifth line of a sheet of millimeter co-ordinate paper. All the preceding estimates could be seen when a new one was made. The actual lengths of the first five lines were 12, 24, 36, 48, and 60 mm., and all the rest were 60 mm.

In order to make the results comparable with those of the last experiment (*Weights*), suggestibility was measured in terms

[13] This experiment is Binet's (*La suggestibilité,* pp. 83–160). The material and directions are according to Whipple; *Manual of Mental and Physical Tests,* p. 414, edition of 1910. The method of scoring has been changed to conform with that used in the experiment with *Progressive Weights.*

of the number of estimates, among the ten following the last actual increase, which were greater than the estimate of the preceding line. Such an increase in the estimate corresponds to the judgment "heavier" in the *Progressive Weights*. It will be noticed that in this manner of scoring no account is taken of the last five estimates. They were included in the programme of the work before it was realized that they would not be wanted.

According to the table below, there is no sex difference in the average number of lines which are drawn longer than the one just before, but it may be noted that four of the six separate experimenters find the women more suggestible in this respect.

Experimenter	Number women	Average number "longer"	Number men	Average number "longer"
A	19	3.6	10	4.7
C	9	3.7	5	4.2
G	19	3.6	6	3.3
He	9	4.3	19	3.8
I	12	4.8	7	4.3
S	11	5.1	11	4.2
All	79	4.1	58	4.1

The average woman makes the lines equal more times than the average man (2.8 to 2.6), but makes them decrease less times (3.1 to 3.3). In other words, the men do not make the lines equal quite so often, but they make them shorter enough more times so that the number of *increases* is the same for men as for women.

The distribution of persons according to degree of suggestibility, shown in figure 10, does, however, indicate that women are somewhat more suggestible than men. The mode for the women

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects who drew a certain number of lines longer than the line just preceding.

Lines	Women	Men	Lines	Women	Men
0	0.0	1.7	5	34.2	24.2
1	3.8	8.6	6	8.9	8.6
2	10.1	6.9	7	1.3	1.7
3	16.5	25.9	Over 7	0.0	0.0
4	25.3	22.4			

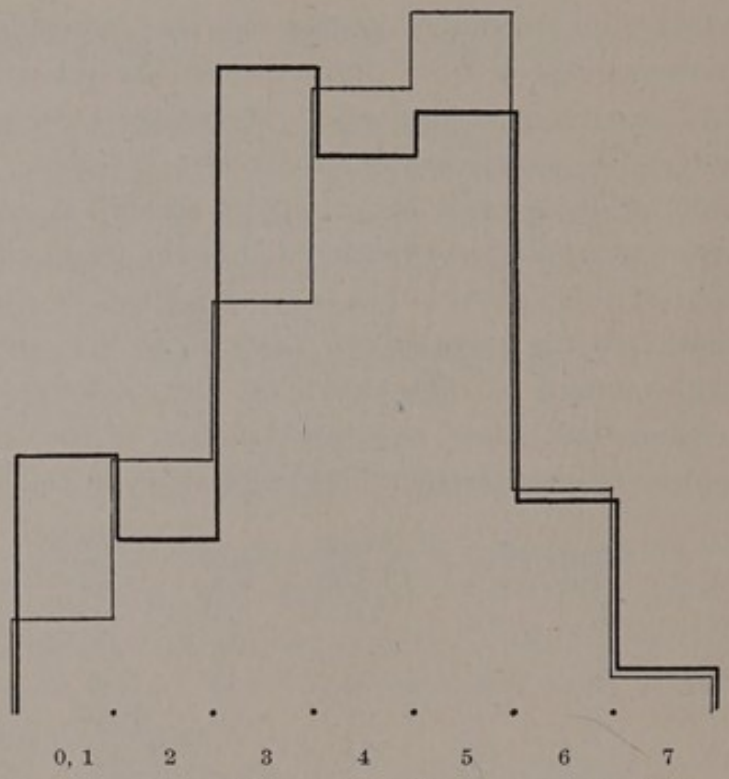

Fig. 10—Progressive Lines. Light line, women; dark line, men.

is higher than the mode for men, and there are more men who give only a very small number of increases.

Other methods of scoring may be used in this experiment. For example, the ratio may be calculated between the last of the increasing lines and the longest estimate made for one of the equal lines which follow. The figures of the following table show the results of a computation of the ratio between the average length of the fifth line (the last of the increasing lines) and the average length of the longest line given as an estimate of one of the following 15 lines (all of which were really equal to the fifth).

Experimenter	Women	Men
A	1.15	1.18
C	1.30	1.23
G	1.22	1.14
He	1.21	1.14
I	1.16	1.18
S	1.19	1.17
All	1.20	1.16

According to these figures, in which the general average is substantially supported by the findings of the separate experimenters, the women are more suggestible in the sense that they are more likely to draw some one line of the fifteen equal lines considerably longer than the standard. It is interesting to note that the average estimate of the 60 mm. standard was much too low. It was 44.3 mm. for the women and 45.4 for the men. The actual length of the sporadic longest line is, in the average, practically the same for men and women (women 53.0 mm., men 52.9). It is evident, then, that the women are not induced by the suggestion to draw a line which is absolutely longer than that of the men, but only one which is longer by comparison with the very inaccurate estimate of the fifth line.

The coefficients of correlation between the ranking in this test (on the basis of the number of estimates which show an increase) and the ranking in other tests is shown in the following table.

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE EXPERIMENT WITH PROGRESSIVE LINES AND SUGGESTIBILITY IN EIGHT OTHER TESTS

Women

Experimenter	Number cases	Touch	Odors	Heat	Pitch	Brightness	Size	Motion	Weights
A	19	—.06	.....	.....	.....	.....	.49	—.13	.44
C	9	—	.....	.....	.....	.....	—	—	.41
G	19	.44	.....	.....	.....	.....	—.21	—.29	.05
He	9	—.06	.....	.....	.....	.....	—.01	—.19	—.08
I	12	.42	.....	.....	.....	.....	.68	—.05	—.07
S	11	.47	.....	.....	.....	.....	—.40	—.60	—.05
All	54	.14	.28	.15	—.06	.05	.06	—.20	.17

Men

Experimenter	Number cases	Touch	Odors	Heat	Pitch	Brightness	Size	Motion	Weights
A	10	.06	.....	.....	.....	.....	.04	—.23	.01
C	5	—	.....	.....	.....	.....	—	—	.90
G	6	.03	.....	.....	.....	.....	—.03	—.03	—.46
He	19	.60	.....	.....	.....	.....	.47	.63	.05
I	7	.08	.....	.....	.....	.....	.84	.58	—.44
S	11	.18	.....	.....	.....	.....	.53	.53	.13
All	29	.17	.24	.04	.08	—.08	.17	.23	.16

The best correlation is with *Odors,* a wholly unrelated test. The correlation with *Weights* is fairly high, but not as high as might be anticipated in view of the close relationship in method between the two tests. This test does not give a positive correlation with *Brightness* or *Pitch* in spite of the fact that *Weights,* its theoretical relative, has a high correlation with those tests. On the whole, the supposed relationship of *Lines* and *Weights* is not well supported by the correlations.

The chief conclusions from this test are:

1. Women appear to be somewhat more suggestible than men.
2. The correlations with other tests are for the most part positive.
3. The correlations are higher for men than for women.

3. Conclusions Regarding the Two Experiments Involving a Series of Progressive Changes

These experiments are successful in so far as they afford what has the appearance of being a measure of the suggestibility of nearly every person tested. Only two individuals among 140 escaped wholly from the suggestion of *Progressive Weights,* and only one among 137 from *Progressive Lines.*

In spite of the close external resemblance of the two tests, the coefficients of correlation do not indicate that they are particularly apt to affect the same persons in a similar manner. Each of them is correlated more strongly with other tests than with its mate, and the two of them do not show high correlations with the same tests.

On the whole, the two tests show positive correlations with other tests, but this is not so true for women as for men.

Both tests make women appear more suggestible than men.

Owing to the fact that a larger number of men prove comparatively resistant to the suggestion, the groups of women, as represented in the distributions, are more compact than the groups of men. The women present a more distinct single mode.

V

FIVE EXPERIMENTS INVOLVING MEMORY, RECOGNITION, AND IMAGINATION

1. Recognition of Form (Checkerboard); 2. Recognition of Position (Letters); 3. Recognition of Size; 4. Memory for Pictures; 5. Ink-Blot Test for Imagination

These tests have little or no theoretical relationship. They are grouped here for convenience in presentation. The measurements obtained in most of them are of such a nature that it is not possible to calculate correlations between them, or with other tests.

1. Recognition of Form (Checkerboard)[14]

The directions for this experiment were as follows:

MEMORY FOR SPACE RELATIONS

It is the purpose of this experiment to test the accuracy of your memory for simple space relations.

A design will be shown you in which there are six small circles. You are to observe the absolute and relative locations of these circles so that when you take another card of the same size you can mark in the exact locations of the circles.

Try to put the circles in exactly the same positions on the second card that they had on the first card.

The first card was marked with a checkerboard of five lines 34 mm. apart and with circles 6 mm. in diameter drawn on the intersection of certain of the lines, as in figure 11. This was exposed for fifteen seconds; and after it had been withdrawn, a second card of the same size was shown. The second card was marked with a checkerboard of seven lines, as in figure 12. If the circles were marked on any of the intersections of lines in

[14] This experiment was developed on the basis of W. McDougall's "Spot pattern test." See Burt, C., *Brit. Journ. Psychol.*, vol. 3, 1909, p. 150.

this second figure, neither the absolute nor the relative positions of the circles would be the same as in the first figure. The subject is held to be suggestible in this experiment if he places the circles on the intersections of lines. He is held to be suggestible even though he may be aware that the figure when completed is not exactly the same as the standard.

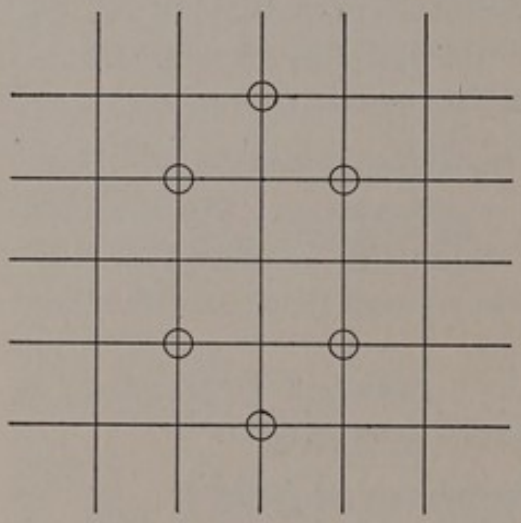

Fig. 11

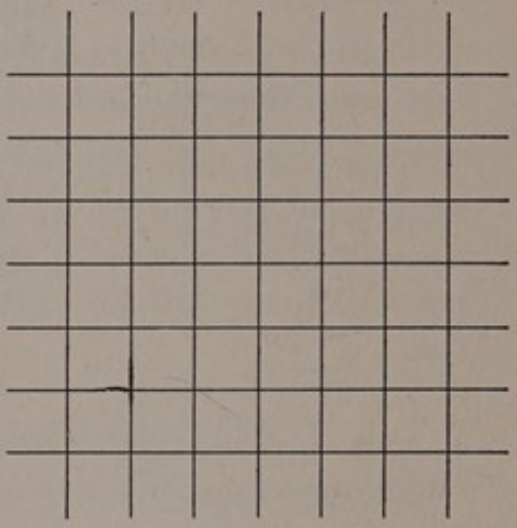

Fig. 12

The following table shows, for each experimenter, the number of persons tested and the number who succeeded in resisting the suggestion. Less than 22 per cent of the women resisted, while over 37 per cent of the men resisted. The validity of the total figures is attested by the fact that only one of the six experimenters found men more suggestible. The conclusion seems assured that women are more open to this suggestion than men.

Experimenter	Number women	Number resisting	Number men	Number resisting
A	19	4	10	1
C	8	3	5	4
G	19	3	6	3
He	9	0	19	7
I	12	4	8	2
S	11	3	11	5
All	78	17	59	22

The measurements do not permit of calculating a correlation between this test and others. The relationship of suggestibility in this to suggestibility in the next test (*Recognition of Position*) will be discussed in the next section.

2. Recognition of Position (Letters)

The title of this experiment is a misnomer, for no recognition is really involved. It is rather a case of false recognition. The actual situation may be better understood by reading the directions which were handed to the subject.

MEMORY FOR POSITION

It is the purpose of this experiment to test the accuracy of your memory for position.

A card will be shown you on which there are twelve letters. Observe it closely, noting the positions of the letters. After you have had a short look at this card another will be shown to you, and you will be asked to tell from memory which of the letters are in the same position as on the first card.

The letters were plain Roman capitals 41 mm. high, arranged in three rows of four letters each on a card 18 by 20 cm. The first card contained the letters shown in the left-hand combination below. The second card contained the letters in the right-hand combination.

C F L D	D W G Q
J X G K	P L B H
N V T R	T K M Z

The first card was exposed for fifteen seconds, and immediately replaced by the second. Although five letters appear on the second card which appeared on the first card, there is no letter which appears in the same position on both cards. Suggestibility is measured by the number of letters falsely recognized as being in the same position on the second card.

The following table gives the number of subjects tested by each experimenter and the proportion of the subjects who failed to respond to the suggestion, together with the average number of letters which the suggestible subjects thought they recognized.

Experimenter	Number women	Per cent failures	Average number letters	Number men	Per cent failures	Average number letters
A	19	15.8	3.6	10	10.0	3.0
C	9	33.3	2.0	6	50.0	2.7
G	17	35.3	1.8	5	40.0	1.7
He	10	60.0	1.8	19	36.8	1.7
I	12	58.3	1.4	8	37.5	2.6
S	11	54.6	1.8	11	72.7	1.7
All	78	39.8	2.40	59	40.7	2.23

In the average, women appear to be more suggestible than men. Fewer women are able to resist the suggestion, and those who yield to it report a larger number of letters than the men.

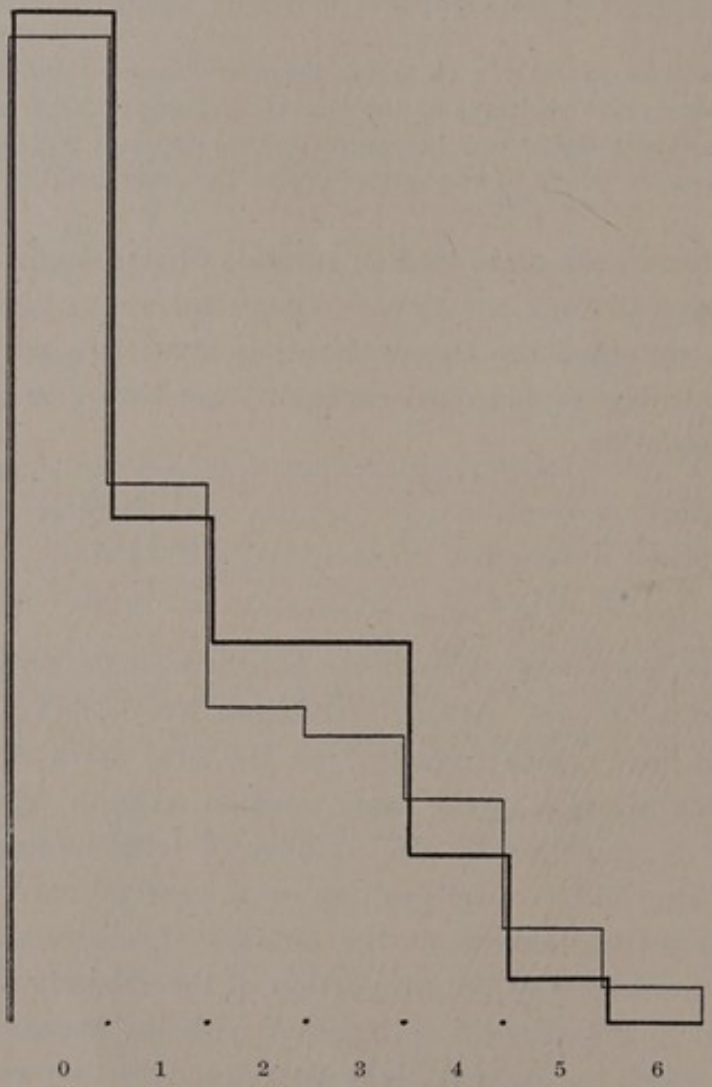

Fig. 13.—Position of Letters. Light line, women; dark line, men.

But little confidence can be placed in the average because of the great differences between the findings of different experimenters. The separate experimenters do not report a consistent sex difference in suggestibility. Yet an inspection of the distribution of the persons according to the number of letters they thought they recognized tends to increase one's confidence in the sex difference indicated by the average figures.

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects who thought they recognized 0, 1, 2, 3, etc., letters as being in the same position on the second as on the first card.

Number letters	Women	Men	Number letters	Women	Men
0	39.7	40.7	4	9.0	6.8
1	21.8	20.3	5	3.8	1.7
2	12.8	15.3	6	1.3	0.0
3	11.5	15.3	Over 6	0.0	0.0

Individuals who report a comparatively large number of letters (four or more) are more common among the women than among the men. On the whole, it seems probable that women are more suggestible than men in this test.

The measurements are not sufficiently delicate to warrant the calculation of correlations with other tests, but a direct comparison of the "failures" (i.e., cases of immunity from suggestion) in this experiment with the failures in the preceding one (*Recognition of Form*) gives the following figures:

	Women	Men
Number who failed in *Checkerboard*	17	21
Number who failed in *Letters*	30	24
Number who failed in *both* tests	5	10
Per cent of those who failed in *Checkerboard* who also failed in *Letters*	29%	48%
Per cent of all persons who failed in *Letters*	40	41
Per cent of those who failed in *Letters* who also failed in *Checkerboard*	17	42
Per cent of all persons who failed in *Checkerboard*	22	37

These figures show that a woman who failed to respond to the suggestion in one of these tests is not so apt as the average woman to fail to respond in the other test. But a man who fails in one is a little more apt than the ordinary man to fail in the other. Thus we have a phenomenon of the same order as that which makes the correlations generally higher for men than for women. For the men it may be said that those who prove suggestible in one of these tests probably will prove suggestible in the other, but the same statement can not be made for the women.

3. Recognition of Size (Squares)[15]

The directions were as follows:

MEMORY FOR SIZE

It is the purpose of this experiment to measure the accuracy of your memory for size.

The experimenter will first show you a white square on a black card. You are to observe this closely, trying to remember how large it is.

Then the experimenter will withdraw the card and will show you a board on which there are a large number of squares like the one on the card. You are to look them over and indicate the one which seems to be the same size as the one on the card.

This experiment is repeated with each of three standard squares and with each of three sets of squares on the boards.

The three standard squares were all of the same size (a 10 cm. square of white bristol mounted on a half sheet of black bristol), but the subject saw that there were three of them; and as he had no opportunity of comparing them he might infer that they were different. The squares from which the choice was to be made were mounted on three black boards 8 inches wide. The boards were exposed standing on end against the wall, the largest square at the bottom. The first board shown contained squares ranging from 6 cm. to 14 cm. by steps of a half centimeter. This will be referred to as the "medium" board. The "small" board

[15] The plan of this experiment is derived from Hollingworth's study of the "indifference point" (Hollingsworth, H. L., "The central tendency of judgment," *Journ. Philos., Psychol., etc.*, vol. 7, 1910, p. 461). The same idea is to be found in the recognition of length experiment of Binet (*La suggestibilité*, p. 62).

was shown next; it contained squares ranging from 3.5 cm. to 11.5 cm. Finally, the "large" board, containing squares ranging from 8:5 cm. to 16.5 cm., was shown. The relative sizes of the boards is shown in figure 14. The 10-cm. standard square is marked *right* in each part of the figure. The standard 10-cm. square on the card was shown for fifteen seconds each time just before exposing each of the boards.

It is not quite certain in this experiment how a person would respond if he were really "suggestible" or how he would respond if he were not "suggestible". It is open to question, indeed, whether this experiment really involves suggestion at all. It

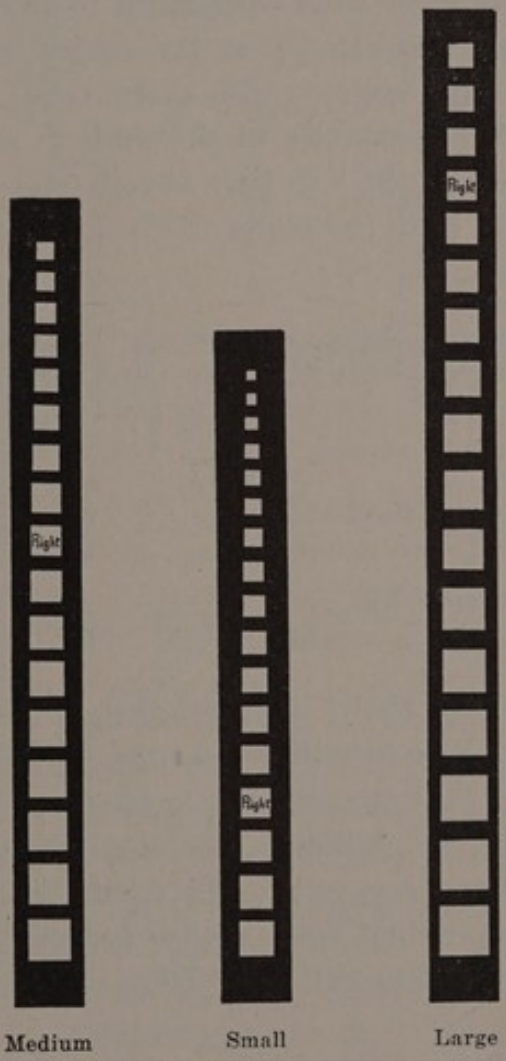

Fig. 14—The position of the 10-cm. square on each of the three boards is shown by the word *Right*.

differs from all of the others in that it rests upon an extremely theoretical assumption. The assumption which was made, whether justly or not, was that a suggestible person would tend to select a square toward the middle of the series on the board from which the selection was being made. Upon this assumption "suggestibility" was measured, in the case of the "small" and "large" boards, on the basis of the choice made on the "medium" board, with the further assumption that the "constant error" of memory would be approximately the same for the other boards as for the medium one. The square selected on the medium board is taken as the datum point for each person. With that to start from, we know what card ought to be chosen on each of the other boards (assuming that the subject ought to select a square of the same absolute size every time). The following figures show what proportion of the subjects actually chose the size which they "ought" to have chosen and what proportion chose a card nearer to the center of the set or farther from the center of the set.

Per Cent of Persons Choosing the "Right" Square, or One Too Near the Center of the Set, or One Too Far From the Center of the Set

	"Right"	Too near center	Too far from center
Women, set of small squares	31%	41%	28%
Men, set of small squares	24	40	35
Women, set of large squares	21	63	15
Men, set of large squares	21	63	16

The figures show that it is a fact that the choice is more apt to fall too near the center of the set than too far from it. The tendency toward the center of the set appears in both the "large" and the "small" sets, although this involves choosing too large a square in one case and too small a one in the other case. It is noticeable, however, that the tendency toward the center of the set is much stronger in the set of large squares than in the set of small ones.

Upon the assumption which has been made regarding the effect of the suggestion, it is not possible to make out a distinct

sex difference with regard to the number of individuals who respond to the suggestion. The proportion of individuals who choose a square too near the center of the set is almost exactly the same for men as for women.

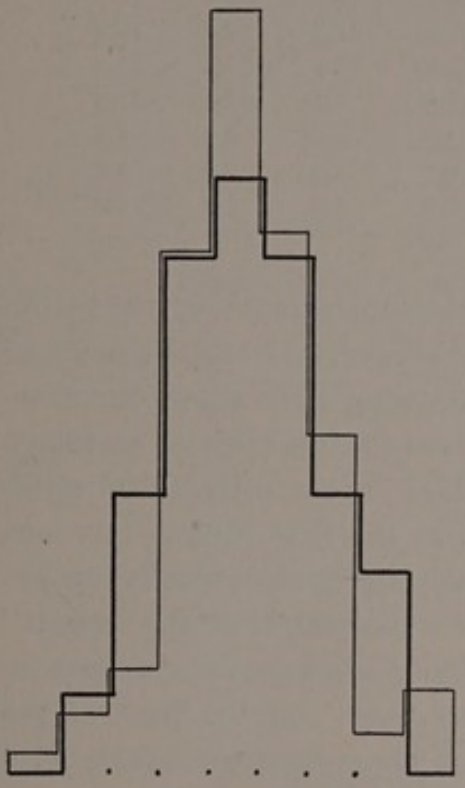

Fig. 15

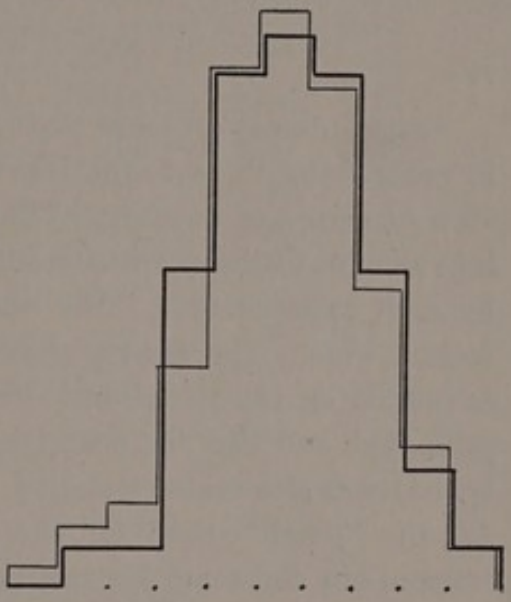

Fig. 16

Figs. 15 and 16—Size of Squares. Fig. 15, small squares; fig. 16, large squares. Light line, women; dark line, men.

The graphs for the distribution of the judgments (figs. 15 and 16) show the characteristic excess of choices too near the center, but do not indicate a sex difference of any consequence. In the following table the "right" square is the one which would have been chosen if the subject had made the same absolute error in the "small" or "large" set that he made in the "medium" set. The table then shows the number of choices, 1 step, 2 steps, 3 steps, etc., in either direction from the "right" choice. Each step is to the next card in the series, that is, 5 mm.

Steps from "right"	Small squares		Large squares	
	Women	Men	Women	Men
4 too far from center	0.8%	0.0%	0.8%	0.0%
3 too far from center	2.4	3.2	2.4	1.6
2 too far from center	4.1	11.3	3.3	1.6
1 too far from center	21.1	21.0	8.9	12.9
0 = "right"	30.9	24.2	21.1	21.0
1 too near the center	21.9	21.0	23.6	22.6
2 too near the center	13.8	11.3	20.3	21.0
3 too near the center	1.6	8.1	12.2	12.9
4 too near the center	3.3	0.0	5.7	4.8
5 too near the center	0.0	0.0	0.0	1.6
6 too near the center	0.0	0.0	1.6	0.0

Some interest attaches to the absolute amount of the errors in recognizing the squares, considered merely from the point of view of errors of memory. The following table shows the absolute amount of the error in millimeters for the subjects examined by each experimenter. The standard was a square 100 millimeters wide. The figures show that the first square (the one estimated on the "medium" board) was systematically underestimated, and that the next (the one picked out on the "small" board) was also underestimated. The underestimation is greater for the "small" than for the "medium" on the part of the women, but the same for the men. These figures conform with statements above, which were derived from a consideration of the number of persons who underestimated, in the "small" set, relative to the "medium" set. The square chosen in the "large" set indicates a considerable *overestimation,* which is comprehensible in terms of the tendency to make a selection toward the center of the set.

A slight difference between the sexes appears here in the fact that the general averages give more underestimation in the "small" set and more overestimation in the "large" set among the women than among the men. Yet it must be observed that the findings of only half the experimenters support this average.

The individual measurements are not finely enough graded to warrant the computation of correlations.

AVERAGE ERROR IN THE RECOGNITION OF A 100-MM. SQUARE

Experimenter	Number women	Medium set	Small set	Large set
A	14	— 2.14	— 4.64	2.50
C	12	2.08	— 4.17	5.00
G	16	— 0.31	— 2.81	6.87
He	11	— 5.81	— 5.47	1.82
Ho	14	— 0.71	— 1.43	2.14
I	13	— 4.23	— 5.38	2.31
J	9	—10.00	1.11	1.67
M	24	— 2.29	— 2.29	3.96
S	10	— 0.50	— 4.50	1.50
All	123	— 2.36	— 3.25	3.33

Experimenter	Number men	Medium set	Small set	Large set
A	6	— 2.50	— 2.50	— 0.83
C	7	— 4.29	— 0.71	— 0.71
G	7	0.00	0.71	9.29
He	9	— 3.33	— 3.33	2.22
Ho	1	— 5.00	—10.00	10.00
I	5	— 4.00	0.00	1.00
J	6	— 1.67	— 0.83	5.00
M	8	— 3.75	— 3.12	2.50
S	13	— 2.31	— 6.52	2.31
All	62	— 2.74	— 2.74	2.74

4. MEMORY FOR PICTURES[16]

The directions for this experiment were as follows:

It is the purpose of this experiment to test the accuracy of your memory for pictures.

Two pictures will be shown to you, one after the other, for a short time. Observe them closely. After you have looked at them questions will be given to you to answer about them.

The two pictures are the ones called "Washington and Sally" and the "Disputed Case." Each was exposed for fifteen seconds. The experiment was so planned that either picture had the first exposure as often as the other. During the first season's work (1912–13) the questions on one picture were delayed for about twenty-five minutes while other experiments were being per-

[16] The pictures used in this experiment are those referred to by Whipple, *Manual of Mental and Physical Tests*, p. 301, edition of 1910.

formed; and meanwhile the subject was given to understand that no further questions were to be asked about the pictures. Later, all the questions were asked immediately after the exposure of the second picture.

This experiment proved unsatisfactory, largely because too much was attempted in it. Four questions were asked about each picture. Two of them were perfectly open categorical questions; the other two were misleading questions involving a false dilemma.

Questions on "Washington and Sally"

1. How many persons are dancing? Correct answer: Two.
2. Which foot has the gentleman who is dancing advanced, his right or his left foot? Correct answer: His left foot.
3. Is his waistcoat pink or purple? Correct answer: Neither; it is buff.
4. Is the sword belonging to the scabbard he wears lying on a chair or standing against the wall? Correct answer: Neither; it is in the scabbard.

Questions on "The Disputed Case"

1. Of the two persons represented in the picture, tell whether both are sitting, or is one standing? Correct answer: Both sitting.
2. What is the man looking at who faces you? Correct answer: The papers in front of him.
3. What is the other man holding in his hand, an umbrella or a pen? Correct answer: Neither; the hand is empty.
4. Are the books visible in the bookcase bound in yellow or in black? Correct answer: Neither; there are no books visible.

The detailed results do not seem to be worth reproducing. The following figures show the final results obtained by consolidating the answers to all four categorical questions together and for all four suggestive questions together, without regard to the secondary conditions under which the various answers were obtained.

Number subjects	Per cent correct answers	Per cent refusals to answer	Per cent incorrect answers	
74 women	15	46	39	With suggestion
74 women	72	6	23	Without suggestion
59 men	18	43	39	With suggestion
59 men	67	9	24	Without suggestion

From these aggregate figures it does not appear that there is any difference between the sexes in respect to the inaccuracy of the answers to the categorical questions or in respect to the inaccuracy of the answers under the false dilemma; in the one case 23 or 24 per cent are erroneous, and in the other case 39 per cent are erroneous for both sexes. The only significant sex difference which appears is in the relative number of correct answers and the relative number of cases of refusal to answer. Without suggestion the women give relatively more correct answers than the men and less frequently refuse to give any answer. Under suggestion this relation between the sexes is reversed, the women are then more apt than the men to take refuge in a refusal and less apt than they to give a true statement. So that if we are to say that women are more suggestible it is only in the matter of the relative decrease in the number of correct answers, not in the number of errors.

5. Ink-Blot Test of Imagination[17]

The blots used were from the standard set designed by Whipple. During the first season blot No. 7 was used. The following season No. 12 was substituted because no copy of No. 7 could be found in the laboratory at the time of beginning work, and because it was thought that the use of another blot might bring out some interesting information.

Since completing the suggestion experiments, it has been possible to standardize the two blots by ascertaining the number of ideas which each of them suggests. This was done by issuing copies of the blots to the members of a large college class. Half of the members of the class received one blot and half the other. They were allowed two minutes in which to look at the blot and write down all the ideas which it suggested to them. The results are shown below. The figures show the average number of ideas

[17] A brief review of ink-blot experiments, beginning with their origination by Binet and Henri, *Année Psychologique*, 2, 1895, p. 444, may be found in Whipple, *Manual of Mental and Physical Tests*, p. 430, edition of 1910.

7.

Fig. 17—Blot No. 7.

12.

Fig. 18—Blot No 12.

per person, the number of these which are the names of animals, and the percentage of "animals" among the ideas.

Subjects	Blot	Average number ideas	Average number animals	Percentage of animals
79 women	No. 7	4.94	1.73	35.1%
58 men	No. 7	4.53	1.60	35.4
83 women	No. 12	4.43	1.18	26.6
57 men	No. 12	4.49	1.09	24.2
162 women	Both	4.68	1.45	31.0
115 men	Both	4.51	1.26	27.9
137 persons	No. 7	4.77	1.68	35.2
130 persons	No. 12	4.46	1.14	25.6

From these figures it appears that blot No. 7 is more suggestive, and that it is more apt to suggest animals than No. 12. More ideas are suggested to women than to men, but not by No. 12, and a larger proportion of animals are suggested to women, but not by No. 7.

In the suggestion experiment itself it was desired to find out not only whether the blots suggested more ideas to men than to women, but also whether a covert reference in the directions to "animals" would influence the members of one sex more than the other. The directions employed for this purpose were as follows:

> Individuals differ greatly in the fertility of their imagination. It is the aim of this experiment to find out how many things will be suggested to your mind by a senseless ink-blot. This particular blot may make you think of some kind of animal, or of any number of other things. See how many things you can write down in two minutes that the blot might be a picture of.

The data are given in the following table, which is arranged to show the results obtained by the separate experimenters with the different blots.

IDEAS SUGGESTED TO WOMEN

Experimenter	Number subjects	Blot	Ideas per subject	Animals per subject	Percentage of animals
A	19	No. 12	4.1	1.1	27%
C	9	No. 12	5.9	1.0	17
G	18	No. 7	6.2	2.9	46
He	10	No. 7	5.4	2.7	50
I	12	No. 12	5.5	4.2	8
S	11	No. 12	6.7	1.9	27

IDEAS SUGGESTED TO MEN

Experimenter	Number subjects	Blot	Ideas per subject	Animals per subject	Percentage of animals
A	10	No. 12	3.3	0.8	24%
C	6	No. 12	3.5	1.0	29
G	6	No. 7	3.3	1.5	45
He	19	No. 7	5.0	1.6	33
I	6	No. 12	6.2	2.2	35
S	11	No. 12	5.0	1.4	27

The following table gives the data in such a form that they may be compared with the standard figures previously given.

Subjects	Blot	Average number ideas	Average number animals	Percentage of animals
28 women	No. 7	5.9	2.8	48%
25 men	No. 7	4.6	1.6	35
51 women	No. 12	5.3	1.1	21
33 men	No. 12	4.4	1.3	29
79 women	Both	5.53	1.71	30.9
58 men	Both	4.50	1.41	31.4
53 persons	No. 7	5.3	2.2	42
84 persons	No. 12	5.0	1.2	24

These figures agree with those obtained without suggestion in the following respects: Blot No. 7 is more suggestive than No. 12, and it is more apt to suggest animals. More ideas are suggested to women than to men, and in the present case there is no exception for No. 12, though the difference between the sexes is not so great for No. 12 as for No. 7.

With respect to the number of "animals" suggested there is no clear result which can be attributed to the reference to animals in the directions. The proportion of "animals" in blot No. 7 increases considerably for women, but not for men, under the influence of the reference to animals in the directions. Blot No. 12 shows a decrease for women and an increase for men. On the whole, there seems very little ground for believing that the reference to animals in the directions had any effect at all. When all the various figures are combined we find that 31.1 per cent of the ideas were "animals" under the suggestive directions, and that 29.8 per cent were "animals" even without the suggestion. Within these narrow limits no sex difference can be found.

But with regard to the total number of ideas suggested by the ink-blot there is a very distinct sex difference. Five of the six experimenters in the suggestion experiment found that the blot suggested more ideas to women than to men, and the average figures indicate that in two minutes a woman can think of at least one more idea which is suggested by the blot than a man

FREQUENCY OF LISTS OF DIFFERENT LENGTHS

The figures show the percentile proportion of the subjects who wrote lists containing 1, 2, 3, or any other number of ideas. There were 241 women and 173 men.

Length	Women	Men
1	4.1	6.5
2	8.6	12.4
3	18.0	15.3
4	18.4	27.0
5	19.2	12.4
6	10.2	10.6
7	9.0	5.3
8	3.3	5.9
9	3.7	1.8
10	2.0	1.8
11	0.8	0.6
12	1.6	0.0
13	0.8	0.6
18	0.4	0.0

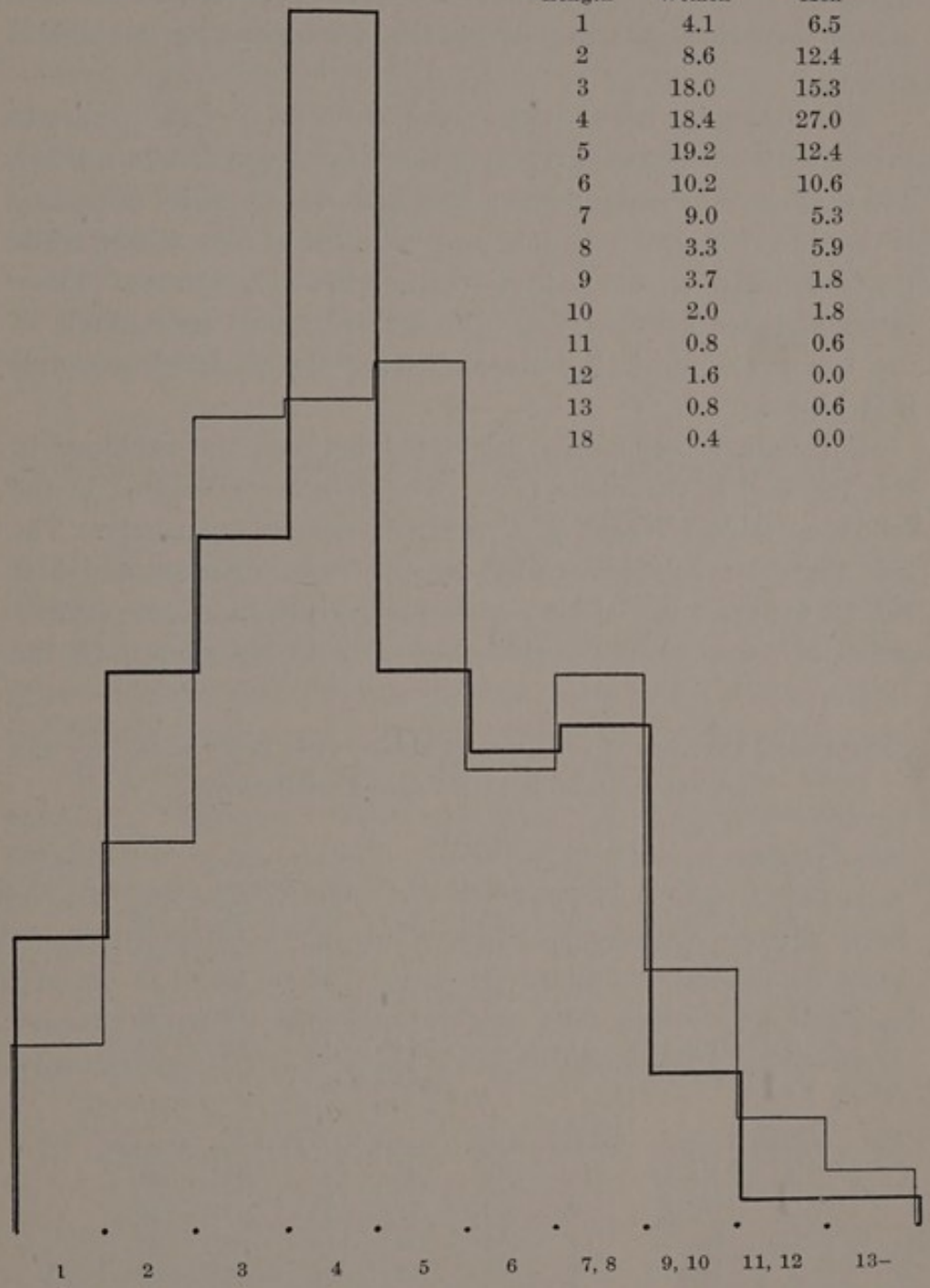

Fig. 19—Ink-blot. Light line, women; dark line, men.

can. The subsequent figures from the class experiment confirm the nature of this sex difference, but make it appear much smaller. An analysis of the data according to the number of persons who got a certain number of ideas is presented for both of the experiments together in the accompanying table and graph.

The difference between the sexes seems to be due in part to the fact that more men give very short lists (one or two words), and that more women give very long lists, but the chief difference is that the men have a distinct mode at a list of four words, while the mode for women is pushed over to a list of five words. There is a difference between the ordinary or typical individuals of the two sexes which is independent of the work of eccentric individuals.

Correlations have been calculated between the rankings in this test and in five other tests. The data are presented in the following table for each of five experimenters separately. The fact that blot No. 7 was used by two experimenters and blot No. 12 by the other three experimenters precludes the computation of correlations for the whole group of persons. Of the

Correlations Between Suggestibility in the Test With Ink-Blots and Suggestibility in Five Other Experiments

Women

Experimenter	Blot	Number subjects	Touch	Size	Motion	Lines	Weights
A	No. 12	19	.24	.00	.19	—.38	.25
G	No. 7	19	.16	.27	—.13	.20	.35
He	No. 7	10	.81	.05	.47	—.03	.10
I	No. 12	12	.22	.22	—.04	.09	.31
S	No. 12	11	.46	—.04	—.19	.52	.31

Men

Experimenter	Blot	Number subjects	Touch	Size	Motion	Lines	Weights
A	No. 12	10	.08	.53	.44	.23	.41
G	No. 7	6	.60	.71	.26	.31	—.15
He	No. 7	19	—.08	—.09	—.19	—.20	—.02
I	No. 12	7	.62	.23	—.02	—.05	—.09
S	No. 12	11	.25	—.16	.25	.30	—.11

twenty-five coefficients which have been calculated, eighteen are positive for the women and fourteen for the men. The correlation with *Touch* is the only one which is fairly consistently positive for both men and women. So far as the data go, there is evidence of a general tendency toward a positive correlation between suggestibility in this test and suggestibility in other tests.

By way of summing up it may be said that:

1. Women are more suggestible than men so far as they are tested by the total number of ideas suggested by the ink-blot.

2. There are positive correlations with other tests.

3. Contrary to the general rule, the correlations are closer for the women than for the men.

6. Summary for the Five Tests Involving Memory, Recognition, or Imagination

So far as sex differences are discernible in these tests, the indications are that women are more suggestible than men. The difference between the sexes is clear in *Recognition of Form* (checkerboard) and *Position* (letters) and in the *Ink-blot* test, less clear in *Recognition of Size,* not clear in *Memory for Pictures.*

All of the experiments of this group fall very far short of the ideal. In three of them a comparatively large proportion of the subjects remain entirely unaffected by the suggestion: *Form,* 22 to 37 per cent; *Position,* 40 per cent; *Size,* 21 to 31 per cent. No graded index of suggestibility is afforded by any of them save the *Ink-blot,* and consequently it is not possible to make accurate measurements of individual differences. This fact prevents the calculation of coefficients of correlation for these tests.

VI

GENERAL INTRODUCTION TO THE REMAINING EXPERIMENTS

All of the experiments which remain to be described follow a radically different method from that of those which have been described so far. Moreover, very few persons took part in these later experiments who had been subjects in the earlier ones. For these reasons it is not possible to make comparisons of individual records between what follows and what has gone before.

All but one of the tests now to be described were performed at a single sitting. This sitting was preceded, however, by another sitting at which records were made without any suggestions. The preliminary records obtained at the first sitting were used as standards by which to measure the effect of the suggestions which were given at the second sitting. The interval between the two sittings was usually three weeks. Proper enquiries were made to avoid the risk of including the records of any persons who might be in the possession of improper information at either test.

All of these tests involved some variation of a single suggestion which was repeated in the various tests in a form determined by the special conditions of that particular test. This suggestion had the general form of an assertion that "most persons do so and so"; for example, "most persons overestimate the weight of the jug." It so happens, of course, that such a statement is generally either true or false, and in order to compensate, as far as possible, for this difficulty, two opposite forms of the suggestion were employed in each experiment. The second form (which will be referred to as B) was the contrary of the first form (A); thus if the first said "most persons *overestimate,*" the second form said "most persons *underestimate.*" When one subject had been given the suggestion in form A, the

next subject of the same sex was given the suggestion in form B, so that in the end about half of the men and half of the women had received the suggestion in one form and the other half of each sex had received the suggestion in the other form.

The suggestions were given, as before, in a sheet of typewritten directions, but with a material difference. The subject had first been through the test without suggestion and when he came for the second sitting the suggestion was *added to* the directions which he had had when he first performed the experiment without suggestion. As an introduction to the suggestive statements there was also a preliminary statement which read as follows:

GENERAL SUPPLEMENTARY DIRECTIONS

To what extent can one's judgment be helped by knowing the results obtained by a number of other people? These experiments are exactly the same as those you took part in before, but in every case the directions give you some information about the judgments which other people have made. These statements are written in red. You are asked to pay especial attention to these statements in each case. It is the purpose of this part of the experiment to discover how much such statements will help you.

Each set of specific directions for a test was presented on a separate sheet of the little booklet of directions, and immediately after the directions which had been given at the first sitting appeared the word "Note" and the statement of the suggestion, printed in red ink. What was there printed in red will appear in italics in the following pages.

The experimenter was expected to see that the subject read the preliminary statement before he began work, and that he read each suggestive statement before he began upon the test in question. But, unfortunately, it can not be assumed that all of the subjects gave the same amount of attention to the preliminary statement, or that they gave it the same interpretation; and there is little ground for supposing that with different experimenters the suggestive notes exerted a uniform influence over different subjects. This mode of presenting the suggestion is not as satisfactory as the method adopted in the earlier experiments, in which the suggestion was inseparably incorporated in

the body of the directions and in the manipulation of the experiment itself. Yet this more open form of suggestion, as employed in the experiments which are about to be described, is not without its advantages.

We shall be particularly interested in discovering whether the individual and sex differences which have emerged rather clearly from the experiments in which the suggestion was surreptitious will still make themselves felt when the suggestion is presented as a separate statement and in such a form that the subject can not fail to be aware of it as distinct element added to an experiment which was already complete in itself.

Because of the division of the subjects for the two sets of directions there are not enough subjects in any one group who were examined by the same experimenter to warrant the presentation of data for the separate experimenters. There were twenty women and twenty-four men who received the suggestions in the "A" form and twenty-one women and nineteen men who received them in the "B" form. The subjects were about evenly distributed among five experimenters.

The correlations for suggestibility in the different tests of this division have been calculated for men and women separately and for the A and B forms of the suggestion separately, so that there are four groups for which the correlations have been calculated for each pair of tests. But in discussing the results it will frequently prove convenient to overlook the division into A and B, and in that event the expression "correlation for men" or "correlation for women" will be used to designate the average of the two coefficients, that for the A group and that for the B group.

VII

TWO EXPERIMENTS DEALING WITH THE EFFECT OF SUGGESTION UPON NORMAL ILLUSIONS

1. The Size-Weight Illusion; 2. The Müller-Lyer Illusion

These two experiments are practically identical in point of method. At the first sitting the subject was allowed to make an adjustment, to suit himself, in the light of whatever he might know about the illusions. At the second sitting he made a fresh adjustment in the face of a positive statement appended to the directions. The difference between these two adjustments is taken as the measure of suggestibility.

1. The Size-Weight Illusion

The following directions, containing no suggestion, were handed to the subjects at the first sitting:

ESTIMATION OF WEIGHTS

You will be shown a set of black weights which have been arranged in order from lightest to heaviest. Lift all of the weights to see how heavy they are, then place the large weight between the two which seem to you the nearest equal to it in actual weight, without regard to size. Do the same with the small weight.

The set of cylindrical black wooden weights, 35 mm. in diameter, and ranging from 5 gm. to 100 gm. in weight, were arranged in order in a row about 15 cm. apart on a table. The large weight (82 mm. in diameter) and the small weight (22 mm. in diameter) were placed at their respective ends of the set and the subjects did not compare them directly with each other.

The one set of suggestive statements (A) read: *Note.—Most people judge the large weight to be much lighter than it really is, but judge the small weight quite accurately.*

The other statement (B) said: *Note.—Most people judge the small weight to be much heavier than it really is, but judge the large weight quite accurately.*

The effectiveness of the suggestion is measured on the basis of the subject's performance at the first sitting, when no suggestion was given. The effect of the suggestion is regarded as positive in so far as the subject tends to correct what is represented to him as the common mistake. The amount of the influence of the suggestion has been measured by the decrease in the amount of the illusion in that part of the illusion to which the suggestive statement applies. In the A directions the suggestion applies only to the estimation of the large weight, and in the B directions only to the estimation of the small weight. In both cases, however, the positive effect of the suggestion is to reduce the amount of the illusion, and the amount of this reduction has been taken as the index of suggestibility.

It might reasonably be thought, however, that a second test would show a smaller error even without the suggestion. In this connection it may be observed that the suggestion does not apply directly to the estimation of the small weight in the A group nor to the estimation of the large weight in the B group. In those cases the second estimate is only slightly more accurate (less illusion) than the first estimate. But when the suggestion does apply (to the large weight for the A group and the small weight for the B group) the second estimate is much better than the first. The figures given below are the amount of the average error, that is, the average amount of the illusion, in grams, for the large weight and for the small weight, in the first test (always without suggestion), and in the second test (partly with and partly without suggestion, depending on the wording of the statement).

	A Group		B Group	
	Large weight	Small weight	Large weight	Small weight
First test, no suggestion	20.8	16.6	22.0	16.5
Second test, no suggestion	.....	15.3	20.7	.....
Second test, with suggestion	15.0	.....	.....	8.0

There can be no doubt that the suggestion operates normally to reduce very greatly the amount of the usual illusion. This

can be made clearer by considering the results without regard to whether the error occurred on the small or large weight. Then the average error of the first trial is 19 grams, the average error of the second trial *without* suggestion is 18 grams, and the average error of the second trial *with* suggestion is only 11.5 grams.

The fundamental facts regarding sex differences in this experiment are contained in the following table. The figures show the average amount of the illusion, in grams, under the various conditions mentioned.

		A Group			B Group		
Subjects	Weight	First test	Second test		First test	Second test	
20 women	Large	23.8	16.3	(with sug.)	24.9	22.7	(no sug.)
24 men	Large	18.4	14.0	(with sug.)	18.8	18.6	(no sug.)
21 women	Small	18.8	17.0	(no sug.)	17.5	11.8	(with sug.)
19 men	Small	14.8	14.0	(no sug.)	15.4	5.9	(with sug.)

A simple analysis of these figures shows that the average amount of the effect of the suggestion in reducing the size of the illusion, in grams, is as follows:

	A Group	B Group	A and B
Women	7.5	5.7	6.6
Men	4.4	9.5	6.6

From this it appears that there is no sex difference for the entire experiment, taken as a whole. The women are more suggestible in the A portion and the men more suggestible in the B portion, but when the data for both portions are combined it appears that the average influence of the suggestion is exactly the same for both sexes.

But, while the crude data for this experiment give no consistent sex difference in suggestibility, there are certain corrections which ought, probably, to be considered before arriving at a conclusion. In the first place, the women are more apt than men to reduce the amount of the illusion in the second trial in that part of the work in which the directions assert that "most per-

sons judge quite accurately.'' The extent of this tendency is revealed in the following figures. These figures show the average amount by which the illusion is reduced in the second test when the suggestion does not apply to the weight considered.

	A Group	B Group	A and B
Women	1.8	2.2	2.0
Men	0.8	0.2	0.5

It is probably just that the amount of the reduction in the illusion which has been attributed to the suggestion should be diminished by the amount of reduction which would occur in the second trial even without the suggestion. If this is done, we get the following figures to show the net effect of the suggestion in reducing the illusion.

	Large weight	Small weight	Both
Women, decrease second trial with suggestion	7.5	5.7	6.6
Women, decrease second trial without suggestion	1.8	2.2	2.0
Women, net decrease due to suggestion	*5.7*	*3.5*	*4.6*
Men, decrease second trial with suggestion	4.4	9.5	6.6
Men, decrease second trial without suggestion	0.8	0.2	0.5
Men, net decrease due to suggestion	*3.6*	*9.3*	*6.1*

This treatment of the data makes it appear that the men are more suggestible, and there is still another correction to be made which tends to strengthen this inference. Reference to the fundamental table on page 373 shows that the illusion itself, without regard to suggestion, is much stronger for the women than for the men. When the figures are combined we obtain the following averages for the first test, before any suggestion had been given, for the absolute amount of the illusion in grams:

	Large weight	Small weight	Average
Women	24.4	18.4	21.4
Men	18.6	15.1	17.0

Now if, instead of regarding the effect of the suggestion in the light of an absolute amount of weight (so many grams), we regard it as a proportion of the original amount of the illusion, we obtain the following figures. These figures show the effect

of the suggestion in reducing the amount of the illusion, expressed in per cent of the original amount of the illusion.

	A Set Large weight	B Set Small weight	Both
Women	23%	19%	22%
Men	19	62	36

Or if, instead of the net (corrected) amount of the reduction, we take the uncorrected, crude, amount of it:

	A Set Large weight	B Set Small weight	Both
Women	31%	31%	31%
Men	24	63	39

The result of these corrections makes it appear that men are more suggestible than women under the B form of the suggestion, and when the two forms are considered together, but not under the A form.

Frequency of Different Degrees of Suggestibility

The figures show the percentile proportion of the subjects who were induced by the suggestion in the second trial to reduce the amount of the illusion by the number of grams indicated. The number of grams given as the amount of the reduction of the illusion is the difference between the estimate made at the first trial, when there was no suggestion, and the estimate made at the second trial, under the influence of the suggestion. A negative figure means that the amount of the illusion was increased instead of being decreased at the second trial in spite of the admonition of the suggestive statement.

Full Table

Amount of reduction	Women	Men
—20 g. and less	4.9%	0.0%
—15 g.	0.0	2.3
—10 g.	0.0	11.6
— 5 g.	7.3	16.3
0 g.	17.1	11.6
5 g.	22.0	11.6
10 g.	26.8	11.6
15 g.	9.7	18.6
20 g.	2.4	7.0
25 g.	4.9	2.3
30 g.	2.4	2.3
35 g.	0.0	2.3
40 g.	2.4	2.3

Condensed Table

Amount of reduction	Women	Men
—5 g. and less	12%	30%
0 or negative	29	42
5 or 10 g.	49	23
15 g. or over	22	34
20 g. or over	12	16

The distribution of the degrees of suggestibility (see the graphs, fig. 20) shows that the men are more apt to prove strongly suggestible or else to react in a strongly negative manner. The women tend to group more closely about a mode in the middle on the smaller degrees of suggestibility.

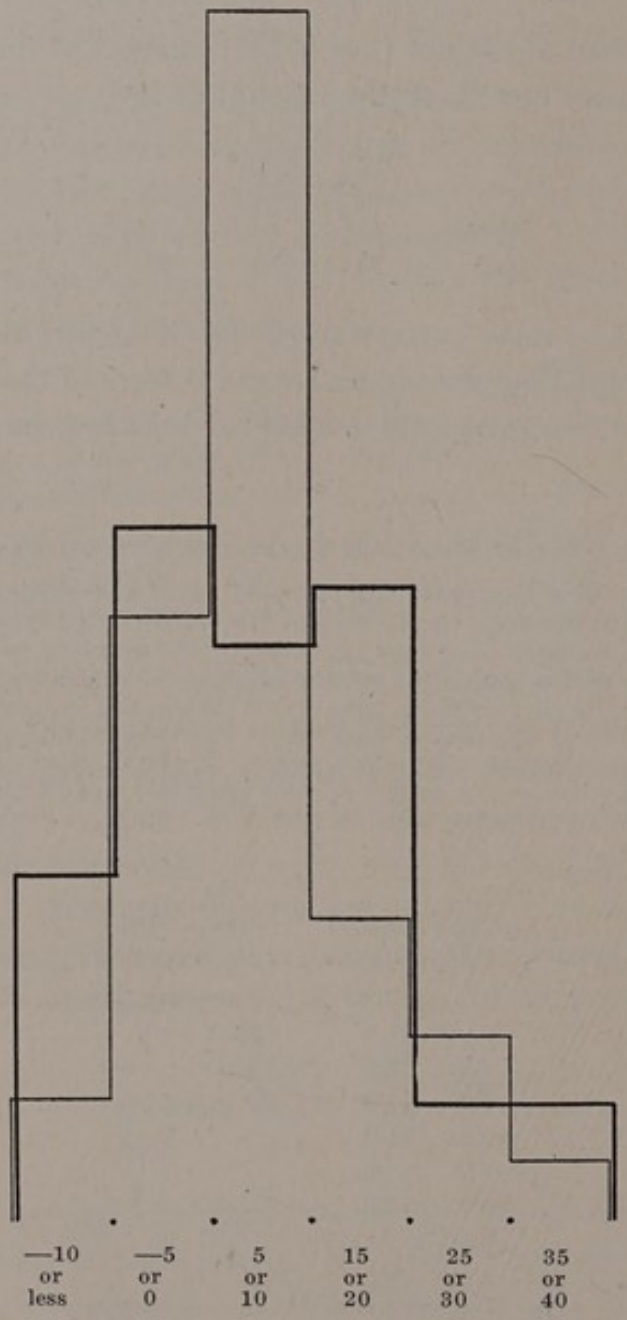

Fig. 20—Size-Weight Illusion. Light line, women; dark line, men.

The correlations between the rankings in this test and the rankings in other tests bear indications of a sex difference which has been noted frequently before, namely, that the correlations are more apt to be distinctly positive for the men than for the women. There are twelve correlations to be considered for each sex, for there are two correlations with each of the other six tests with which this one is correlated because of the division of the data on the basis of the A and B directions. Of the twelve for the women, six are negative, but nine of the twelve for men are positive.

There is no particular test with which this one is closely related if we judge by the indices of correlation. The other illusion test (the Müller-Lyer, to be described in the next section), which has many points of outward resemblance with this test, does not show a high or consistently positive correlation with it.

Correlations Between Suggestibility in the Experiment With the Size-Weight Illusion and Suggestibility in Six Other Tests

	Women A	Women B	Men A	Men B
Müller-Lyer	.05	.21	—.11	.09
Distance	—.09	—.28	.33	.29
Weight	.07	—.29	.38	—.42
Rectangle	—.14	—.26	.22	.53
Triangle	—.32	.33	.12	.38
Cross	.02	.05	.28	—.15

The results of this experiment may be summarized as follows:

1. Men are probably subject to the suggestion to a greater extent than women, although more men than women resist it.

2. There is a positive correlation between this test and a majority of the other tests for men, but not for women.

2. Müller-Lyer Illusion

The directions which were handed to the subject at the first sitting were as follows:

ESTIMATION OF LENGTH OF LINES

You will be shown an example of the visual illusion called the Müller-Lyer illusion. It is so arranged that one arrowhead is adjustable in each figure. You are asked to adjust figure A (←—→) and figure B (›—‹) so

that the line between the arrowheads appears to be equal to the standard line, M, in both cases.

The drawings were placed in a frame on a table so that the subject adjusted them while standing up. The drawings were arranged in the manner indicated in the figure below. The standard line between the two forms of the illusion was 20 cm. long. The right-hand angle of each illusion figure was drawn on a separate card which could be moved back and forth in a track by the subject until he got it to suit him. The lines themselves did not move and the ends of them did not tally with one another.

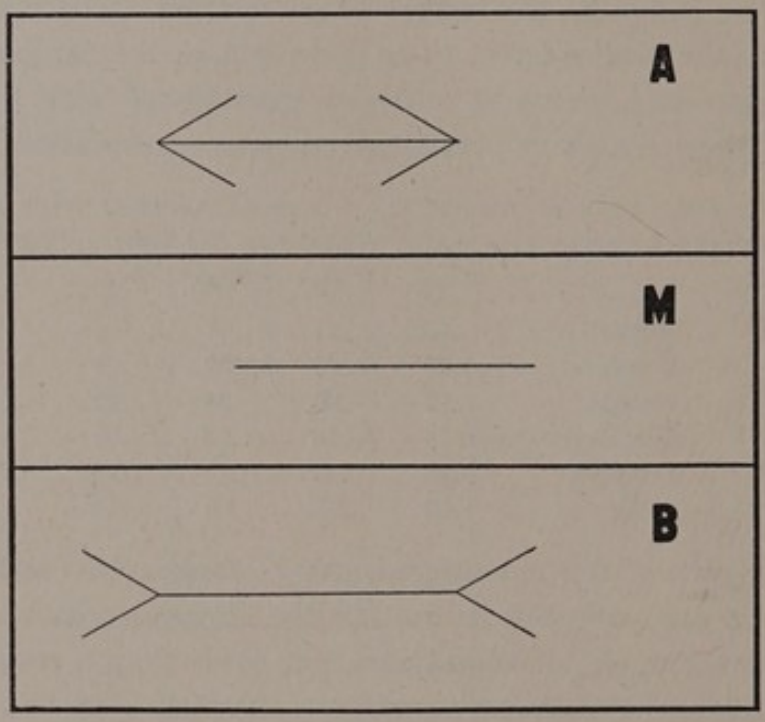

Fig. 21

The supplementary statement containing the suggestion read as follows for the A set: *Note.—Most persons make the line in figure A* (←——→) *much too long, but judge the line in figure B* (>—<) *quite accurately.*

The other set of directions (B) read: *Note.—Most persons make the line in figure B* (>—<) *much too short, but judge the line in figure A* (←——→) *quite accurately.*

The influence of the suggestion was measured, just as in the last experiment (*Size-Weight Illusion*), by taking the difference between the first adjustment, made without any suggestion, and the adjustment made at the second sitting, when there was a suggestion. It may be assumed, for the purpose of obtaining an index of suggestibility, that the second adjustment would be the same as the first, except for the effect of the suggestion which accompanies the second directions. In what sense this assumption is correct may be seen from the following figures. These figures show the actual amount of the illusion, for each of the two figures, in the first trial when there is no suggestion, and in the second trial, when there is suggestion or is none, according to the wording of the directions. The numbers indicate millimeters.

	A Group		B Group	
	Arrow-head figure	Feather-head figure	Arrow-head figure	Feather-head figure
First test, no suggestion	27	9	28	11
Second test, no suggestion	—	17	31	—
Second test, with suggestion	19	—	—	4

The effect of the suggestion is to reduce the amount of the illusion. The above figures show that the illusion is not reduced, but is considerably increased, in the second trial unless the suggestion is present. A combination of these numbers shows that the illusion amounts to 19 mm. in the first trial and to 24 mm. in the second trial when no suggestion is made; but when there is a suggestion it amounts to only 12 mm.

The essential facts regarding sex differences in this experiment are to be found in the following table. The numbers show

		A Group		B Group	
Subjects	Illusion figure	First test	Second test	First test	Second test
20 women	Arrow	36	25 (with sug.)	28	34 (no sug.)
24 men	Arrow	19	13 (with sug.)	29	28 (no sug.)
21 women	Feather	15	20 (no sug.)	12	5 (with sug.)
19 men	Feather	5	14 (no sug.)	10	4 (with sug.)

the average amount of the illusion, that is, the difference between the length of the standard line and the length of the illusion figure as adjusted by the subject. The amounts are given in millimeters.

A simple analysis of these figures shows that the average amount of the effect of the suggestion in reducing the size of the illusion is as follows, in millimeters:

	A Group	B Group	A and B
Women	11	7	9
Men	6	6	6

These figures indicate that the women are influenced by the suggestion to a greater extent than the men. But there are certain corrections which should probably be considered before a final inference is drawn. There is a difference, as has been noted, between the two trials when no suggestion is given, and it is probably legitimate to add the amount of this difference to the crude measure of the suggestion. The average amount of the increase of the illusion in the second trial in that part of the work in which the suggestive statement merely asserts that most persons "judge quite accurately" is as follows:

	A Group	B Group	A and B
Women	6	5	5.5
Men	—1	9	4

When these amounts are added to the crude measure of the influence of the suggestion the following figures result:

	Arrow	Feather	Both
Women, decrease second trial with suggestion	11	7	9
Women, increase second trial without suggestion	6	5	5.5
Women, net change due to suggestion	*17*	*12*	*15*
Men, decrease second trial with suggestion	6	6	6
Men, increase second trial without suggestion	—1	9	4
Men, net change due to suggestion	*5*	*15*	*10*

From this it appears that the women are more suggestible for the arrow figure (suggestion A), but not for the feather

figure, and that they are more suggestible if results are combined for the two figures. But we still have to consider the fact that the illusion itself, without other suggestion, is more effective with the women than with the men. This may be seen from the following figures, which show the amount of the illusion, in millimeters, for the first trial, before any suggestions had been offered.

	Arrow	Feather	Both
Women	32	14	23
Men	24	8	17

Now, if we regard the effect of the suggestion in reducing the illusion, not as an absolute number of millimeters but as a fraction of the amount of the illusion itself, we obtain the following figures. These figures show the effect of the suggestion in reducing the illusion expressed as a percent of the original amount of the illusion.

	A Group (Arrow)	B Group (Feather)	Both
Women	53%	86%	65%
Men	21	187	59

Or, if we base the percent upon the uncorrected, crude, amount of the effect of the suggestion in reducing the illusion:

	A Group (Arrow)	B Group (Feather)	Both
Women	34%	50%	39%
Men	25	75	35

From any of the points of view which have been proposed the women appear more suggestible in the case of the arrow figure, and in the average for the two figures, but not for the feather figure.

An inspection of the distribution of the different degrees of suggestibility which is shown in the graph (fig. 22) confirms the evidence from the average figures that the women are more suggestible. Some 35 per cent of the men show no effect, or a

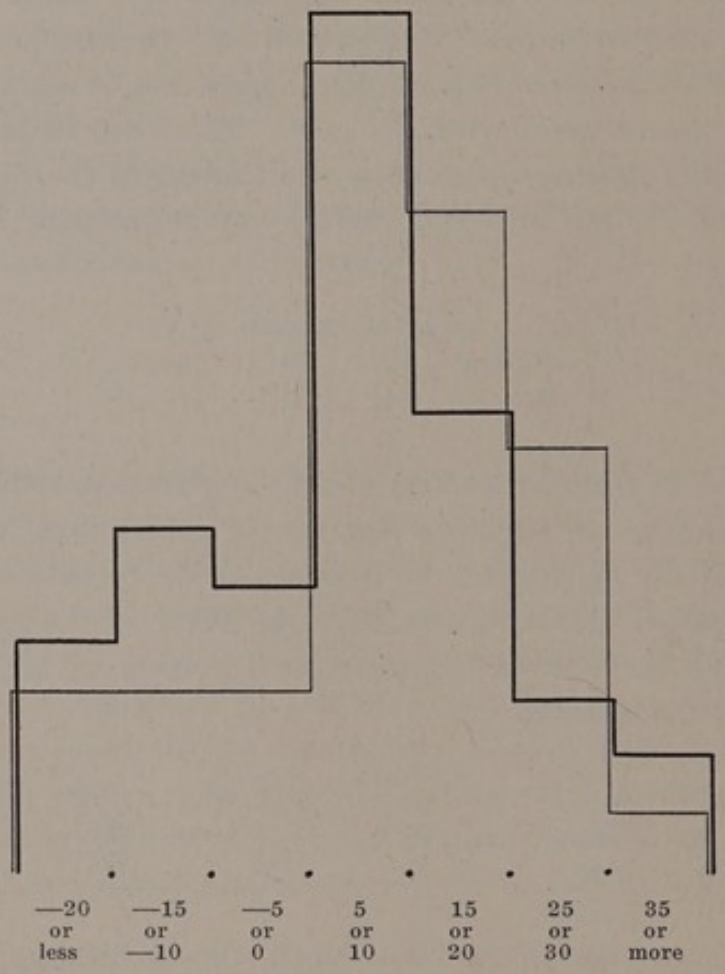

Fig. 22—Müller-Lyer Illusion. Light line, women; dark line, men.

negative effect, of the suggestion, while only 22 per cent of the women resist the suggestion in this way. About the same proportion of men as women show a small positive influence (5 or 10 mm.), but a larger proportion of the women show a large positive effect. Of the women, 20 per cent are influenced to an extent greater than 25 mm., while only 12 per cent of the men are influenced to that extent. It may be of interest to note that for these last-mentioned women, one-fifth of all the women, the influence of the suggestion (25 mm. or more) is actually greater than the average amount, for all the women, of the Müller-Lyer illusion itself.

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects who were induced by the suggestion to reduce the amount of the illusion by a stated number of millimeters. The number of millimeters given as the amount of the reduction of the illusion is the difference between the adjustment made at the first trial, when there was no suggestion, and the adjustment made at the second trial, under the influence of the suggestion. A negative figure means that the amount of the illusion was increased instead of being decreased at the second trial in spite of the admonition of the suggestive statement.

Full Table

Amount of reduction	Women	Men
—30 mm. or less	4.9%	2.3%
—25 mm.	2.4	0.0
—20 mm.	0.0	7.0
—15 mm.	4.9	4.7
—10 mm.	2.4	9.3
— 5 mm.	7.3	2.3
0 mm.	0.0	9.3
5 mm.	12.2	13.9
10 mm.	19.5	20.9
15 mm.	21.9	11.6
20 mm.	4.9	7.0
25 mm.	7.3	2.3
30 mm.	9.8	4.7
35 mm. or more	2.4	4.7

Condensed Table

Amount of reduction	Women	Men
0 or negative	22%	35%
5 or 10 mm.	32	35
15 mm. or over	46	30
20 mm. or over	24	19
25 mm. or over	20	12

The correlation of this test is not high with any of the other six, except perhaps *Triangle,* and the latter is a test which has comparatively high correlations with nearly all of the others. Negative correlations are almost as frequent as positive ones in the present case.

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE TEST WITH THE MÜLLER-LYER ILLUSION AND SUGGESTIBILITY IN SIX OTHER TESTS

	Women A	Women B	Men A	Men B
Size-Weight	.05	.21	—.11	.09
Distance	.00	.24	—.01	.12
Weight	—.30	—.31	—.14	—.07
Rectangle	—.04	.02	—.24	—.15
Triangle	.16	.39	.21	.20
Cross	—.13	.34	.06	.21

In conclusion it may be said for this experiment that:

1. Women are probably more suggestible than men.

2. Positive correlations with other tests are only slightly more frequent than negative ones.

3. Contrary to the general rule, more positive correlations appear with women than with men.

3. Conclusions Concerning the Two Experiments With Illusions

Both of these experiments are based on the assumption that most persons will take advantage of a hint which is given them concerning the nature of the mistakes made by others and, by implication, by themselves as well, and that the second estimate will show a tendency to correct what is supposed to be the common mistake. As a matter of fact, most persons do act in this way. In the *Size-Weight Illusion* there is a tendency, it is true, to reduce the illusion even for that part of the work in which the directions assert that "most persons judge quite accurately," but the tendency to reduce the illusion is much stronger when the directions suggest such a reduction; 71 per cent of the women and 58 per cent of the men respond in the way that was expected. With the *Müller-Lyer Illusion* the amount of the illusion is increased in the absence of a hint, so that the reduction of it under the influence of the suggestion is not open to any question; in that case 78 per cent of the women and 65 per cent of the men respond in the way that was expected. Both experiments may be regarded as successful in so far as they obtain a response from a large proportion of the subjects. Unfortunately they leave a good deal to be desired when it comes to the measurement of the responses which are obtained.

The sex differences which develop in these experiments are not entirely clear. In both of them a larger proportion of the women than of the men follow the direction of the hint which is given and react as it was expected that "suggestible" persons would react. But the measurement of the magnitude of the

influence of the suggestion reveals contradictions. Men are suggestible to a greater extent in the *Size-Weight Illusion* on the whole, but not in one part of it; and women are more suggestible in the *Müller-Lyer Illusion,* but not in one part of it.

In connection with the sex difference, it may be of interest to note that the extent of the illusions themselves, when no additional suggestions are made, is considerably greater among the women than among the men.

Neither of these tests correlates very well with the other tests of this division. Furthermore, they do not correlate well with each other. In spite of the close resemblance of the two in the manner of their administration and in the method of scoring the results, it appears from the correlations that a person who yields readily to one of them has nearly as good a chance as anyone else of escaping from the snares of the other.

VIII

TWO EXPERIMENTS DEALING WITH THE EFFECT OF SUGGESTION UPON THE ESTIMATION OF MAGNITUDE

1. Estimation of Distance; 2. Estimation of Weight

These two experiments are very much alike. At the first sitting the subject was asked to make an estimate of a weight, and of the length of a string, and at the second sitting he was again asked for an estimate of the same weight and distance. The difference between the two estimates is assumed to be due to the influence of the suggestion which was given with the directions for the second test. Unfortunately there was no way of obtaining a direct measure of the amount of change which would have occurred between the two estimates if there had been no suggestion, but a comparison of the results of the two

suggestions, the influence of which was in opposite directions, partly obviates this difficulty.

A special difficulty, which was encountered to some extent in all of the experiments of this entire division, but which becomes particularly obvious in these experiments, is that persons whose memory is good will recollect at the second sitting the judgments which they made at the first sitting. The fact that such people repeat at the second test the estimate made at the first sitting is not always attributable to lack of suggestibility, but may be due to greater tenacity of memory. In the estimation of distance, 18 per cent of the subjects gave exactly the same estimate in the second test that they had given in the first test. In the estimation of weight, 17 per cent gave exactly the same estimate. Only three persons among those who gave the same estimate for the weight also gave the same estimate for the distance.

1. Estimation of Distance

The original directions, containing no suggestion, were as follows:

ESTIMATION OF DISTANCE

You will be shown a white cord suspended from the skylight. You are asked to estimate the distance on this cord from the marker near the top to the marker near the bottom. Do not try to estimate by comparison with parts of the building, or anything of that kind, but only by looking directly at the cord itself. The slat nailed to the railing gives the length of one foot to aid you in making the estimate. Make the estimate as accurately as you can in feet and inches.

A white cord 2 mm. thick was hung from the skylight down into the stairwell with one marker (a spool) at a distance of about fifteen feet above the floor and in front of the subject and the other about four feet below his feet. Under the circumstances it was extremely hard to find any known distance with which to compare the length indicated on the string. The one-foot standard was nailed to the railing of the well directly in front of the subject.

The accuracy with which the distance is estimated is a matter of some interest quite apart from any effect of suggestion. The distance was overestimated by 58 per cent of the men and by 63 per cent of the women. The average overestimation among the men is 2.2 feet, and among the women 1.9 feet. The following table shows the actual number of persons of either sex whose estimate departed from the true distance of 19 feet by the number of feet stated.

Estimate	Women	Men	Actual estimate
5 feet or more too short	2	0	
4 feet too short	3	0	15 ft.
3 feet too short	3	6	
2 feet too short	3	2	
1 foot too short	3	7	
Exactly right	1	3	19
1 foot too long	8	4	20
2 feet too long	2	2	
3 feet too long	6	5	
4 feet too long	1	2	
5 feet too long	2	4	
6 feet too long	3	3	25
7 feet too long	0	1	
8 feet too long	1	0	
9 feet too long	1	0	
11 feet too long	2	3	30
13 feet too long	0	1	
	41	43	

A somewhat uneven distribution of the judgments arises from the tendency to make the estimate in a round number of feet, 20, 25, or 30 feet. The most common estimate for both men and women is not far from the true distance. The cases scatter out much more over the estimates which are too great than over those which are too small. This corresponds to a feeling which the subjects often expressed by saying "not less than 18 feet," "not less than 20 feet," etc. Apparently there is a strong tendency to fix a lower limit below which an estimate is very improbable, while the upper limit is indefinite. The feeling is that the dis-

tance is surely not less than a certain amount but may be a great deal more. This point will be reverted to in discussing the experiment upon the *Estimate of Weight,* which comes next.

It may be noted now that one of the suggestive statements (B, given below) was in accord with the general tendency to overestimate the distance, for it said that most people make the estimate too small, and that, of course, encourages the tendency to make it too large. This suggestion, which is in accord with the spontaneous tendency of the subjects, proves to be effective with more persons and to a greater extent than the other suggestion.

The suggestive note appended to one set of directions (A) for the second sitting said: *Note.—Most persons judge the distance to be longer than it really is.* The other (B) set said "shorter" instead of "longer".

The data of the following table show that the second estimate was really influenced, in the average, by the suggestive statement. The figures show the average estimate of the distance, in feet, in the first test, when there was no suggestion, and in the second test, when there was a suggestion. The mean variation of the average estimate is also shown.

	Suggestion A to make shorter		Suggestion B to make longer	
	Feet	M.V.	Feet	M.V.
Women, first test, no suggestion	21.2	3.4	20.6	3.4
Women, second test, with suggestion	20.0	3.1	23.0	3.9
Women, effect of suggestion	*1.2*	.....	*2.4*	.....
Men, first test, no suggestion	21.0	3.4	21.5	3.6
Men, second test, with suggestion	20.7	3.0	23.0	3.6
Men, effect of suggestion	*0.3*	.....	*1.5*	.....

The average of the second estimate differs from the average of the first estimate in the direction of the suggestion for both men and women and for both forms of the suggestion.

Yet, in spite of the convincing consistency of the averages, the following figures show that nearly half of the individuals

resisted the suggestion or reacted in the opposite direction. The figures are the proportion of all the subjects (in per cent) who resisted the suggestion.

	Suggestion A	Suggestion B	Both
Women	45%	33%	39%
Men	67	42	56
Both	57	38	48

The figures which have been given, together with the graph showing the distribution of degrees of suggestibility, indicate a decided difference between the sexes. The average amount of the influence of the suggestion is greater for women than for men, and a larger proportion of the women yield to the suggestion. Moreover, a greater proportion of the women prove

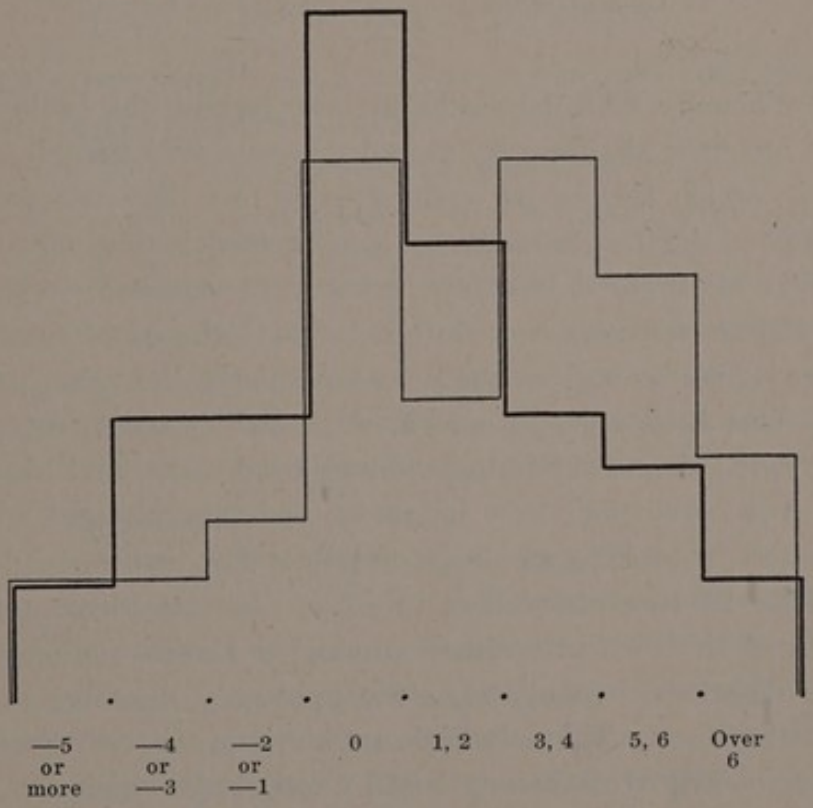

Fig. 23—Estimation of Distance. Light line, women; dark line, men.

suggestible to a comparatively large extent, as may be seen from the graph (fig. 23). Of the women, 27 per cent change their estimate in the direction of the suggestion by five feet or more, while only 14 per cent of the men are influenced to so great an extent.

Frequency of Different Degrees of Suggestibility

The figures show the percentile proportion of the subjects who changed their second estimate from their first by the number of feet indicated. A negative number of feet means a change contrary to the suggestion.

Change in feet	Women	Men
—5 or more feet	4.9	4.7
—3 or —4 feet	4.9	11.6
—1 or —2 feet	7.3	11.6
0 foot	22.0	27.9
1 or 2 feet	12.2	18.6
3 or 4 feet	22.0	11.6
5 or 6 feet	17.1	9.3
Over 6 feet	9.7	4.7

Special note must be made, in interpreting the table above, of the fact that the figures entered opposite zero include all the cases in which the second estimate was less than one foot different from the first estimate. A good many changes (6 per cent of all the cases) of only a few inches were reported, so that the figures given opposite zero do not indicate the exact number of persons whose second estimate was precisely the same as their first. The figures given probably include some persons who remembered their first judgment and stuck to it, and also some who remembered their first judgment and compromised with the suggestion by making a change of only a few inches.

Of the 24 separate coefficients of correlation, 14 are positive. The correlations with the closely analogous *Estimation of Weight* (to be described immediately) are distinctly negative in three cases out of four. The only high correlations are with *Rectangle,* and less clearly with *Triangle* and *Cross,* tests which are apt to have higher correlations on their own account.

CORRELATIONS BETWEEN SUGGESTIBILITY IN THE ESTIMATION OF A DISTANCE AND SUGGESTIBILITY IN SIX OTHER TESTS

	Women A	Women B	Men A	Men B
Size-Weight	—.09	—.28	.33	.29
Müller-Lyer	.00	.24	—.01	.12
Weight	—.35	—.16	.25	—.30
Rectangle	.47	—.03	.24	.31
Triangle	.03	.06	—.02	.64
Cross	.16	.31	.45	—.29

The conclusions from this experiment are:

1. Women are decidedly more suggestible than men.

2. There is a majority of positive correlations between this test and other tests.

3. The correlations are more distinctly positive for men than for women.

2. ESTIMATION OF WEIGHT

This experiment is very similar to the one just described. The first (non-suggestive) directions were:

ESTIMATION OF WEIGHT

You will be given a jug of water and a one-pound weight. You are asked to estimate the weight of the jug of water by lifting it. Make the estimate as accurately as you can in pounds and fractions of a pound.

Enough water had been put into a corked two-gallon demijohn to make it weigh 17 pounds. An ordinary one-pound iron disc weight, such as is used with balances, was also given to the subject. The subject could take the weight in one hand while he hefted the jug with the other.

The estimates of the weight of the jug of water were many of them very inaccurate. There was a strong tendency among both men and women to underestimate the weight; 71 per cent of the women and 72 per cent of the men underestimated the weight by a pound or more. The average underestimation among the men was 4.1 pounds and among the women 3.3 pounds. The following figures show the actual number of persons of

either sex who made an estimate departing from the actual weight of 17 pounds by the number of pounds indicated.

Estimate	Women	Men	Actual estimate
More than 12 pounds too light	1	1	
12 pounds too light	3	3	5 lbs.
11 pounds too light	2	2	
10 pounds too light	0	1	
9 pounds too light	1	2	
8 pounds too light	2	2	
7 pounds too light	6	7	10
6 pounds too light	0	1	
5 pounds too light	5	6	12
4 pounds too light	0	0	
3 pounds too light	1	2	
2 pounds too light	6	2	15
1 pound too light	2	2	
Exactly right	0	1	17
1 pound too heavy	1	2	
2 pounds too heavy	0	0	
3 pounds too heavy	9	6	20
4 pounds too heavy	0	1	
5 pounds too heavy	0	1	
6 pounds too heavy	0	0	
7 pounds too heavy	0	1	
8 pounds too heavy	2	0	25
	41	43	

There is a marked tendency to make a large proportion of the estimates in round numbers, 5, 10, 12, 15, or 20 pounds, particularly the last. This tendency is responsible for a very irregular distribution of the judgments. One effect of this is that no distinct mode can be made out. The commonest estimate is 20 pounds, but there are very few other estimates near that, and the next commonest estimate is 10 pounds. Probably the mode should be taken at 10 to 12 pounds, an underestimation of from 5 to 7 pounds. The estimations run down to absurdly small amounts; about 10 per cent of the subjects, both men and women, estimate the 17 pounds at 5 pounds or less.

In this experiment, as in the one last described (*Estimation of Distance*), the B form of the suggestion, encouraging an in-

crease of the estimate, was more effective than the other form, but in this experiment there is a natural tendency, without the suggestion, to underestimate rather than to overestimate, and this tendency is accompanied by a feeling which is the contrary of the feeling in *Distance*. In *Distance* there is a tendency to *overestimate*, accompanied by a feeling that the distance is "not less than" a certain amount, and may be more, while in *Weight* the tendency is to *underestimate* and to feel that the weight is "not more than" a certain amount, and may be less. The conclusion is forced upon us that the greater effectiveness of the B suggestion can not depend upon either the tendency to underestimate or to overestimate or upon the peculiar feelings which accompany these tendencies. It is possible that the individuals who received the B suggestion were really more suggestible individuals than those who received the A set.

The suggestive statement of the A set read: *Note.—Most persons judge the weight to be heavier than it really is.* The B set read "lighter" instead of "heavier".

The degree of suggestibility was measured by the change from the first to the second estimate. The following table proves that the average change was in the direction indicated by the suggestion. The figures show the average estimate of the weight in the first test, when there was no suggestion, and in the second test, when there was a suggestion. They give the amount in pounds. The mean variation of the average estimate is also shown.

	Suggestion A to make lighter		Suggestion B to make heavier	
	Pounds	M.V.	Pounds	M.V.
Women, first test, no suggestion	14.1	5.0	13.3	4.7
Women, second test, with suggestion	11.4	2.7	18.1	7.5
Women, effect of suggestion	*2.7*	.....	*4.8*	.....
Men, first test, no suggestion	13.0	4.5	12.8	4.5
Men, second test, with suggestion	12.5	4.4	16.2	3.8
Men, effect of suggestion	*0.5*	.....	*3.4*	.....

Both men and women reduce the second estimate when told (A) that most persons overestimate, and they increase the second estimate if they are told that most persons underestimate (B). Yet, in spite of the consistent average figures, there were a considerable number of persons who failed to respond to the suggestion or who made the second estimate in a way contrary to the intent of the suggestion. The following figures show the proportion (in per cent) of the subjects who failed to respond according to the suggestion.

	Suggestion A	Suggestion B	Both
Women	40%	29%	34%
Men	50	31	42
Both	45	30	38

While the number of persons who resist the suggestion is smaller than in the preceding test (*Distance*), it is still large.

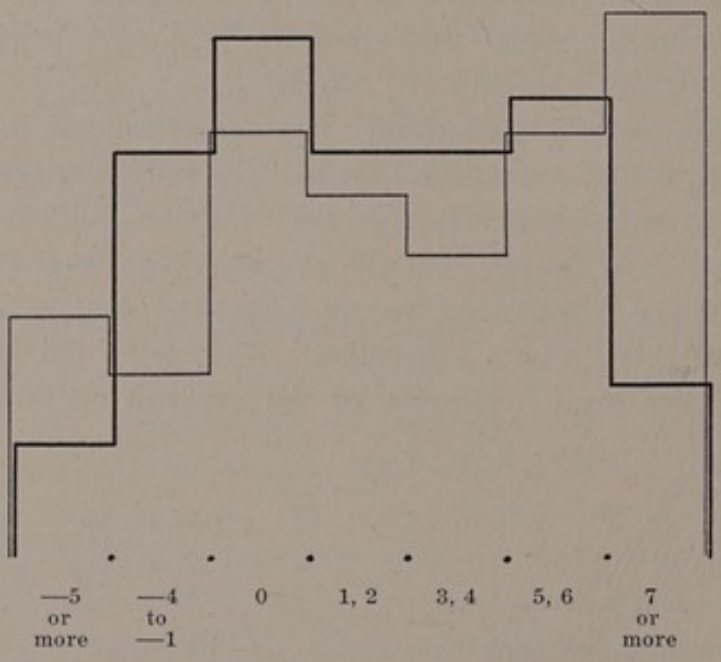

Fig. 24—Estimation of Weight. Light line, women; dark line, men.

Sex differences appear in this test which are very similar to those in the last. The average amount of the influence of the suggestion is greater for women than for men, as was shown above, and more men resist the suggestion or react negatively,

as is also shown above. The graphs for the distribution of the degrees of suggestibility show that a larger proportion of the women are influenced to a comparatively great extent. Of the women, 39 per cent change as much as 5 pounds or more, and 17 per cent change as much as 9 pounds or more, while the corresponding figures for men are only 26 per cent and 2.3 per cent respectively. There can be no doubt that the second judgment of the women is much more gravely affected by the suggestion than that of the men.

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects who changed their second estimate from their first by the number of pounds indicated. A negative number of pounds means a change contrary to the suggestion.

Change in pounds	Women	Men
—7 or more pounds	4.9	2.3
—5 or —6 pounds	4.9	2.3
—3 or —4 pounds	2.4	7.0
—1 or —2 pounds	4.9	9.3
0 pound	17.1	20.9
1 or 2 pounds	14.6	16.3
3 or 4 pounds	12.2	16.3
5 or 6 pounds	17.1	18.6
7 or 8 pounds	4.9	4.7
9 or 10 pounds	4.9	0.0
11 or 12 pounds	0.0	2.3
Over 12 pounds	12.2	0.0

The distribution for the men is much more compact than that for the women. The women show a peculiar tendency to produce a disproportionate number of individuals who are either extremely suggestible or extremely resistant, so that their judgments fall very far away from the normal.

Only six of the twenty-four separate coefficients of correlation are positive. This is the only one of the seven experiments of this division which shows a distinct preponderance of negative correlations. The coefficients of correlation do not give indications of a close relation between this test and any of the others; the correlation with the *Cross* experiment is the only one with a positive average for the four instances, and that is consistently negative for women.

Correlations Between Suggestibility in the Estimation of Weight and Suggestibility in Six Other Tests

	Women A	Women B	Men A	Men B
Size-Weight	.07	—.29	.38	—.42
Müller-Lyer	—.30	—.31	—.14	—.07
Distance	—.35	—.16	.25	—.30
Rectangle	.00	—.20	.00	—.52
Triangle	—.21	—.45	.25	—.41
Cross	—.07	—.13	.17	.31

This experiment leads to the following conclusions:

1. Women are distinctly more influenced by the suggestion than men.

2. Suggestibility in this experiment is not positively correlated with suggestibility in other tests.

3. The tendency to negative correlation is less distinct among the men than among the women.

3. Conclusions Concerning the Two Experiments Dealing With the Estimation of Magnitudes

In both of these experiments the average judgments show that the suggestion is really effective. Yet there are a considerable number of persons who are able to resist the suggestion. The suggestion of the B type proves more effective than the other.

Women are more suggestible than men in both experiments and from every point of view.

Estimation of Distance correlates positively, *Estimation of Weight* negatively, with other tests of this division. In spite of the great amount of superficial similarity between the two tests, they do not correlate positively with each other, and, although many persons are able to resist the suggestion of one or the other of them, very few are able to resist them both.

The coefficients of correlation are higher for men than for women in both tests.

IX

FOUR EXPERIMENTS DEALING WITH THE EFFECT OF SUGGESTION UPON SIMPLE ESTHETIC PREFERENCES IN THE MATTER OF THE PROPORTIONS OF GEOMETRICAL FIGURES

1. Rectangle; 2. Triangle; 3. Cross; 4. Line

In these experiments the subject was at first permitted to arrange simple geometrical figures (a rectangle, a cross, etc.) according to his own esthetic judgment. When he came for the second sitting he was given a supplementary statement to the effect that "most persons do so and so" (make the rectangle nearly square, divide the line in the middle, etc.). The amount of the influence of the suggestion was measured by the amount by which the second estimate changed from the first in the direction indicated by the suggestive assertion.

An obvious difficulty arises from the fact that the form of the suggestion was not modified in accordance with the actual choice of the subject. Thus a statement to the effect that "most persons prefer the rectangle almost square" might be given to a person who himself really preferred it almost square or to one who really preferred a very long rectangle. The effect of the suggestion could not be expected to be the same with these different persons. The force of this objection is considerably reduced by the fact that very few people really do prefer either one of the extreme forms described in the suggestive statements; most people prefer (in fact) something between the extremes which are used for suggestion.

In these experiments more than in any of the others we may expect to find "negative" suggestibility, for when an individual reads the assertion that "most people prefer" so and so he may feel it as a challenge to his individual taste and be inclined to

do what only the select few are supposed to do. This difficulty has been avoided in the other experiments of this series by giving the impression that what "most people" do is a mistake which the individual may have committed himself and which he can now correct. In the four experiments of this sub-group the notion of a mistake does not enter. The subject is therefore in a different attitude. Instead of considering himself as one among others, all of whom are liable to make mistakes, he has here to weigh his own judgment against that of the crowd, and he may be influenced *positively,* in the direction of the popular choice, or *negatively,* in opposition to the popular choice. In the following statements the term "suggestibility" will be reserved for the positive reaction in the direction of what is supposed to be the most common, and in so far the most correct, judgment.

1. Rectangle

The first directions, which contained no suggestion, were:

RECTANGLE

You will be shown a rectangle of white cardboard the proportions of which can be adjusted to suit your taste. Let the experimenter adjust the rectangle so that it looks to you to have the most pleasing proportions which it is possible for it to have.

The rectangle had a constant height of 20 centimeters. It hung in a frame on the wall about 3 meters away from the subject. It was mounted on black bristol, and it was adjustable in length by means of a sliding black cover which was uniform with the mounting board. No choice less than the square (20 cm.) was allowed. The changes were made by first opening the rectangle out from the square to its extreme length (70 cm.), then closing it up to the square and opening it up slowly a second time with instructions to the subject to say "stop" when the best shape had been reached. Changes were permitted in case the subject was not quite satisfied with the effect after the operator had stopped.

Some interest may be taken in the actual proportions of the rectangles which were selected in the first part of the experiment

when the choice was not affected in any way by suggestion. The average of the choices of both men and women is not far from the "golden section," that is, a rectangle such that the ratio between the short and long sides of it is equal to the ratio between the long side and the sum of the two sides. The figures show the average length of the preferred rectangle and the mean variation in centimeters.

		M.V.
Average length of women's preference	31.8	3.7
Average length of men's preference	31.7	5.4
Length of "golden section" (20:L = L:L + 20)	32.36	.....

The distribution of the choices is shown in the following table. It will be remembered that no choice below 20 cm. (the square) was accepted; this accounts for the absence of scattering cases below 20. Otherwise the distribution is quite symmetrical and there is a distinct mode at the average. Evidently the "golden section" does really represent not only the average choice but the choice of the greatest number of individuals, both men and women. Individuals whose preference departs radically from the "golden section" are more apt to be found among the men than among the women. The figures of the table show the actual number of persons of either sex whose preference was for a rectangle of a length within the stated limits.

Length of Rectangle	Women	Men
20 cm. (square)	0	4
21 to 23 cm.	3	2
24 to 26 cm.	2	3
27 to 29 cm.	7	6
30 to 32 cm.	12	13
33 to 35 cm.	10	5
36 to 38 cm.	3	5
39 to 41 cm.	2	1
42 to 44 cm.	2	1
45 to 47 cm.	0	1
48 to 50 cm.	0	0
51 to 53 cm.	0	1
54 to 56 cm.	0	1
	41	43

The suggestive statement used in the A set of directions read as follows: *Note.—Most persons prefer to have one side more than twice as long as the other side.* The other set of directions (B) read: *Note.—Most persons prefer to have the figure nearly square.*

The figures of the following table give the proof that the choice made under the influence of these suggestive statements was really changed from the first choice in the direction of the suggestion. The figures show the average length of the preferred rectangle in the first test, without suggestion, and in the second test, with suggestion. The figures indicate centimeters.

In each of the four groups into which the experiment is divided the change from the first choice to the choice in the second test is in the direction indicated by the directions. A

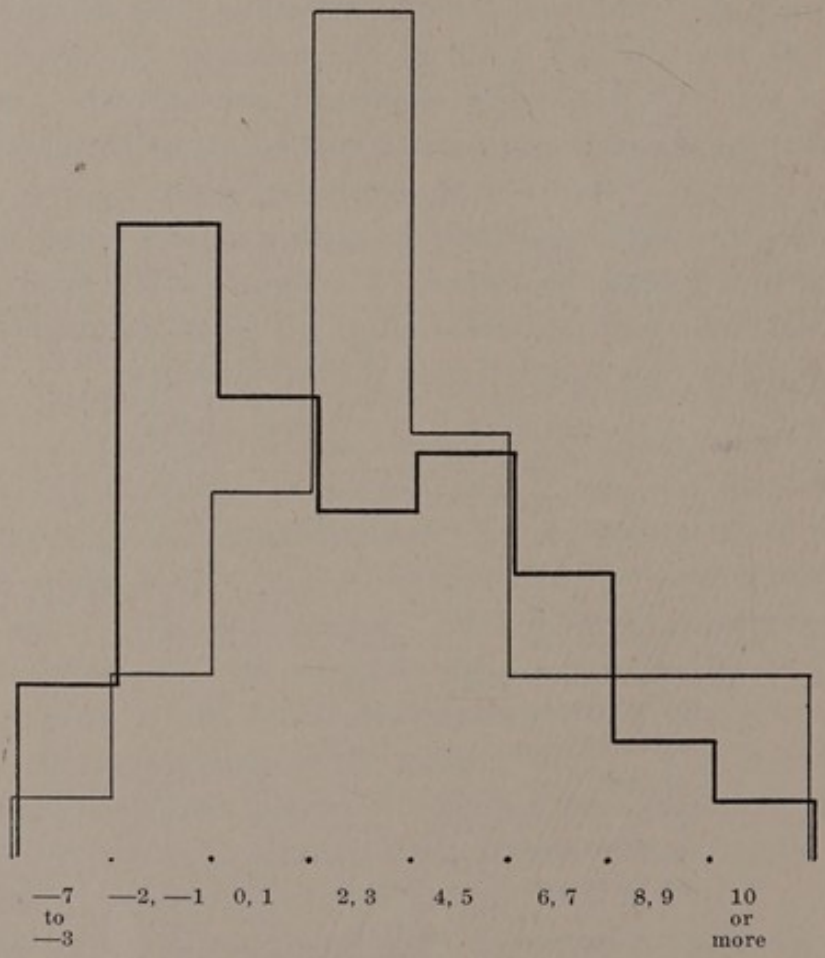

Fig. 25—Rectangle. Light line, women; dark line, men.

change of at least one centimeter in the direction of the suggestion was made by 78 per cent of the women and by 56 per cent of the men.

	Suggestion A to make longer		Suggestion B to make shorter	
	Length	M.V.	Length	M.V.
Women, first test, no suggestion	31.4	3.6	32.2	3.6
Women, second test, with suggestion	36.5	5.5	29.5	3.9
Women, effect of suggestion	*5.1*	.....	*2.7*	.....
Men, first test, no suggestion	30.0	4.7	34.0	6.2
Men, second test, with suggestion	31.6	5.9	31.3	4.8
Men, effect of suggestion	*1.6*	.....	*2.7*	.....

From the figures which have already been given it is clear that the women are considerably more subject to the influence of this suggestion than are the men. The graphs for the distribution of different degrees of suggestibility (fig. 25) also show this sex difference. The women show a distinct mode for two or three centimeters of suggestive influence, while the men show a mode at a point below zero. More women are suggestible and a larger proportion of the women are influenced to a comparatively large extent.

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects who were influenced by the suggestive statements to change their second choices from their first choices by the number of centimeters indicated. A minus figure means a change contrary to the suggestion.

Change	Women	Men
—7 cm.	0.0	2.3
—5 cm.	0.0	2.3
—3 cm.	2.4	2.3
—2 cm.	7.3	11.6
—1 cm.	0.0	13.9
0 cm.	9.8	9.3
1 cm.	4.9	9.3
2 cm.	14.6	4.7
3 cm.	19.5	9.3
4 cm.	9.8	9.3
5 cm.	7.3	7.0
6 cm.	4.9	9.3
7 cm.	2.4	2.3
8 cm.	4.9	4.7
9 cm.	2.4	0.0
10 cm. or more	7.3	2.3

There can be no doubt that women are more suggestible than men in this experiment.

The correlations between this test and the other six are nearly as often negative as positive. The correlations are chiefly positive with the other two tests of this esthetic group (*Triangle* and *Cross*) and with *Estimation of Distance*.

Correlations Between Suggestibility in the Choice of a Rectangle and Suggestibility in Six Other Tests

	Women A	Women B	Men A	Men B
Size-Weight	—.14	—.26	.22	.53
Müller-Lyer	—.04	.02	—.24	—.15
Distance	.47	—.03	.24	.31
Weight	.00	—.20	.00	—.52
Triangle	.05	—.17	.26	.62
Cross	.27	.30	.21	—.37

The most important conclusions from this experiment are:

1. Women are more suggestible than men.

2. For men there may be some correlation between suggestibility in this and in other tests, but for women there is not.

2. Triangle

The first directions (without suggestion) were as follows:

TRIANGLE

You will be shown a triangle of white cardboard. The height of this triangle can be changed to suit your taste without changing the base. Let the experimenter adjust the triangle until it seems to you to have the most pleasing proportions which it is possible for it to have.

The base of the isoceles triangle was approximately 19 cm. The sides of it were defined by two sliding wings of black bristol. By moving a rack up and down the experimenter could vary the height without changing the base appreciably. The change was made by first increasing the height from 8 to 33 cm., then returning to 8 and increasing again slowly until the subject said "stop".

The spontaneous choice of the subjects, men and women, in the first test, when there was no suggestion, is given below, to-

gether with the mean variation. The figures show the average height, in centimeters, of the triangle chosen.

	Height	M.V.
41 women	15.9 cm.	2.8
43 men	16.0	3.6

The height of an equilateral triangle of 19 cm. base would be 16.5 cm. The distribution of the choices is given in the following table. The figures show the actual number of persons who chose a triangle of the specified height.

Height	Women	Men	Height	Women	Men
9 cm.	0	1	20 cm.	0	2
10 cm.	1	0	21 cm.	0	0
11 cm.	1	3	22 cm.	0	1
12 cm.	2	5	23 cm.	1	0
13 cm.	7	7	24 cm.	0	2
14 cm.	7	5	25 cm.	1	1
15 cm.	8	7	26 cm.	1	2
16 cm.	4	1	33 cm.	1	0
17 cm.	4	1		—	—
18 cm.	1	2		41	43
19 cm.	2	3			

There is a distinct mode in this distribution for the heights of 13, 14, or 15 cm. The comparatively large number of scattering choices above 20 cm. is responsible for bringing the average up to 16 cm. The common choice of a triangle about 14 cm. high undoubtedly represents an effort to secure an equilateral triangle, for a true equilateral triangle 16.5 cm. high does not appear to be equilateral, but seems to have its sloping sides longer than its base.

No important sex differences appear in the original choices of the most pleasing triangle.

The supplementary statements intended for suggestion were similar to those used in the preceding experiment. Form A asserted that *most persons prefer a triangle in which the height is about twice as great as the base*, while form B said that *most persons prefer a triangle in which the height is only about half as great as the base*. The actual amount of difference, in centimeters, between the height in the first choice and the choice made

three weeks later under the influence of a suggestive statement has been taken as the measure of suggestibility in this experiment. The following table contains the proof that the second judgment was really affected by the suggestion. The figures show the average height of the preferred triangle, in centimeters, together with the mean variation, both in the first trial, without any suggestion, and in the second trial, when there was a suggestion.

For both men and women the second test shows a decided change in the direction indicated by the suggestion, and this is true in both divisions of the experiment. Moreover, the original data show that a change of at least one centimeter in the direction of the suggestion was made by 58 per cent of the women and 65 per cent of the men.

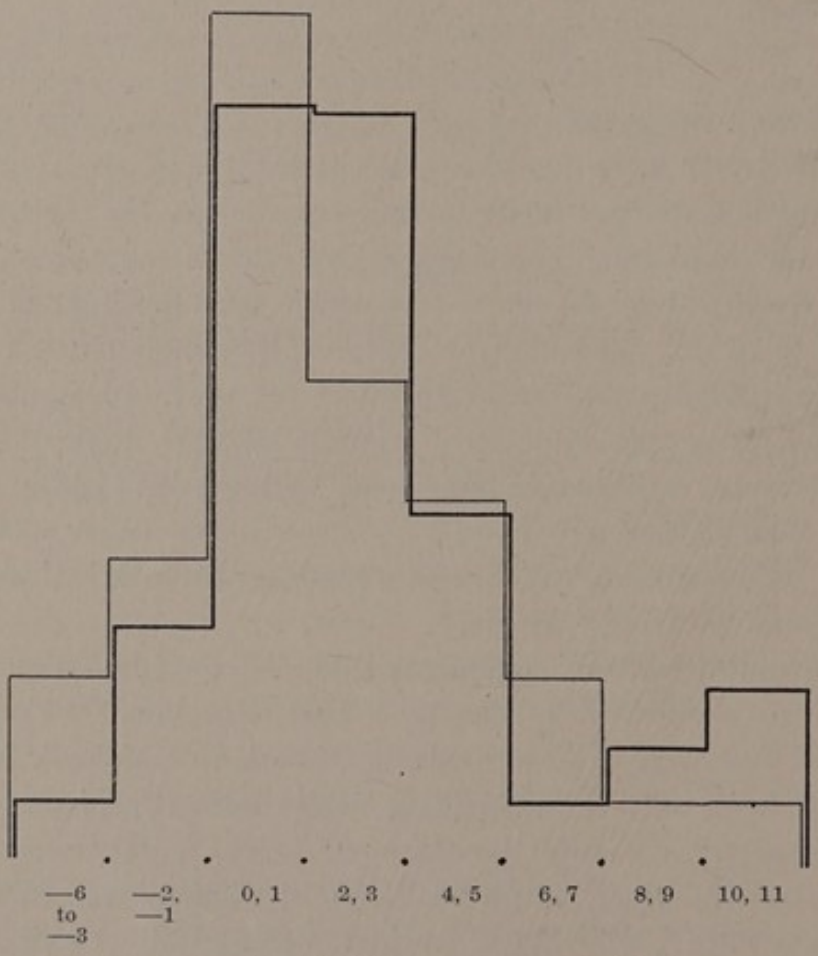

Fig. 26.—Triangle. Light line, women; dark line, men.

	Suggestion A to make higher		Suggestion B to make lower	
	Height	M.V.	Height	M.V.
Women, first test, no suggestion	15.8	3.0	16.1	2.7
Women, second test, with suggestion	17.8	3.6	14.9	2.7
Women, effect of suggestion	*2.0*	.....	*1.2*	.....
Men, first test, no suggestion	15.2	2.7	17.1	3.8
Men, second test, with suggestion	17.5	3.3	14.3	2.4
Men, effect of suggestion	*2.3*	.....	*2.8*	.....

The sex difference in this experiment is conspicuously different from that which has been found in most of the experiments. The men are more influenced by the suggestion under both the A and B forms, particularly under the latter, and more individual men than women are influenced to the extent of one centimeter or more. The distribution of the degrees of suggestibility (fig. 26) shows also that the men are more suggestible.

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects who changed their second estimate from their first by the number of centimeters specified. A negative figure means a change in the direction opposite to that indicated by the suggestion.

Change	Women	Men	Change	Women	Men
—6 cm.	4.9	0.0	4 cm.	7.3	7.0
—5 cm.	2.4	2.3	5 cm.	7.3	7.0
—2 cm.	4.9	2.3	6 cm.	4.9	2.3
—1 cm.	7.3	7.0	7 cm.	2.4	0.0
0 cm.	21.9	23.3	8 cm.	0.0	2.3
1 cm.	12.2	7.0	9 cm.	2.4	2.3
2 cm.	9.7	13.9	10 cm.	2.4	4.7
3 cm.	9.7	16.3	11 cm.	0.0	2.3

When the rankings in this test are correlated with the rankings in the other six tests it is found that 17 of the 24 coefficients are positive. The only test with which there is a negative correlation when the four coefficients are averaged is *Estimation of Weight*. The correlation is high for men with the closely related test *Rectangle,* but not so for the women. On the other hand, the test with the *Cross,* which resembles both *Triangle* and *Rectangle* in general method, shows a good correlation for women, but not for men.

Correlations Between Suggestibility in the Choice of a Triangle and Suggestibility in Six Other Tests

	Women A	Women B	Men A	Men B
Size-Weight	—.32	.33	.12	.38
Müller-Lyer	.16	.38	.21	.20
Distance	.03	.06	—.02	.64
Weight	—.21	—.45	.25	—.41
Rectangle	.05	—.17	.26	.62
Cross	.37	.16	.18	—.11

In conclusion it may be said that:

1. Men are clearly more suggestible in this test than are women.

2. The correlations between this test and others are positive for the most part, but more clearly so for men than for women.

3. Proportions of a Cross

The first directions, involving no intentional suggestion, were as follows:

PREFERRED PROPORTIONS OF A CROSS

You will be shown a black cross which is so constructed that you can adjust the cross-piece in any position on the vertical piece according to your taste. You are asked to adjust the cross so that the cross-piece is in a position where it seems to you to produce the most pleasing effect.

The cross was made of black cardboard mounted on a sheet of white bristol. The bars were one centimeter wide. The vertical piece was 56 cm. long and the cross-piece was 36 cm. long. It was hung up with the middle of the vertical piece about at the level of the eyes. The adjustment was made by the subject himself. The subject was not permitted to place the cross-piece below the middle of the vertical piece, even if he desired to do so, which seldom happened.

The arrangement of the cross which is generally chosen is indicated by the following figures. The figures show the average length of the head-piece, that is, the average distance of the cross-piece from the top of the vertical piece.

	Length	M.V.
41 women	16.9 cm.	2.3
43 men	15.5	1.9

The "golden section" of the vertical piece considered alone would give a head-piece of 21.4 cm. The length of the head-piece would be 11.1 cm. if it stood in the golden ratio to the arm (18 cm.) of the cross.

The actual number of persons who arranged the cross with a head-piece of various lengths is shown below.

Length	Women	Men	Length	Women	Men
10 cm.	0	1	19 cm.	4	4
11 cm.	1	1	20 cm.	0	1
12 cm.	0	3	21 cm.	2	0
13 cm.	3	4	25 cm.	1	1
14 cm.	4	5	26 cm.	1	0
15 cm.	5	4	28 cm. (middle)	1	0
16 cm.	9	11		—	—
17 cm.	6	5		41	43
18 cm.	4	2			

There is a distinct mode at 16. The distribution about this mode is fairly symmetrical, except for four individuals who chose to place the cross-bar near the center of the vertical piece. The data do not show any very consistent sex differences with regard to the simple choice of proportions for the cross. Cases of an unusually high position for the cross-bar are more common among the men, and three of the four very low cases were women, with the result that the average position is nearer the top for the men than for the women. But an inspection of the complete distribution shows that the average made up in this way is not a fair index of the relation between the sexes.

The suggestive statements given to the subjects in the second test were very similar to those used in the last two experiments (*Rectangle* and *Triangle*). The A form said that *most people place the cross-piece quite near the top;* the B set said that *most people place the cross-piece almost in the middle.* The choice at the second sitting was actually affected by the form of the suggestion, as is shown below. The figures show the average distance of the cross-bar from the top of the vertical piece as adjusted at the first sitting, without suggestion, and as adjusted

at the second sitting under the influence of the suggestive statement.

	Suggestion A to make shorter		Suggestion B to make longer	
	Distance	M.V.	Distance	M.V.
Women, first test, no suggestion	17.3	3.0	16.5	2.0
Women, second test, with suggestion	14.8	3.2	17.4	2.9
Women, effect of suggestion	*2.5*	.....	*0.9*	.....
Men, first test, no suggestion	15.5	1.7	15.5	2.3
Men, second test, with suggestion	15.4	2.1	15.9	2.0
Men, effect of suggestion	*0.1*	.....	*0.4*	.....

Each of the four groups of subjects gave judgments in the second test which differed from their judgments in the first test in the direction indicated by the suggestion. Although the change is not large enough in some of the groups to have any significance in itself, it acquires significance from the agreement of the groups with one another and from the fact that a similar tendency to conform to the suggestion has been shown in the experiments with *Rectangles* and *Triangles*. It will be noted that the absolute amount of the average change of judgment is not so great in this experiment as in the other two. The change amounted to one centimeter or more with 56 per cent of the women and 44 per cent of the men.

Women are more suggestible in this test than men; a larger proportion of them yield to it, and the average amount of the influence of the suggestion is considerably greater among them. The distribution of the degrees of suggestibility, shown in the graph (fig. 27), indicates that women are much more apt to be influenced to a considerable extent by the suggestion. Only two men, or 4.7 per cent, change their judgment as much as 4 cm., while ten women, or 24.4 per cent, change 4 cm. or more in the direction of the suggestion.

This test gives relatively good correlations with all of the others. Except for *Estimation of Weight*, three of the four groups give positive correlations for each test, so that seventeen

FREQUENCY OF DIFFERENT DEGREES OF SUGGESTIBILITY

The figures show the percentile proportion of the subjects whose second arrangement of the cross differed from their first arrangement by the number of centimeters indicated. A negative figure means a change in the direction opposite to that indicated by the suggestive statement.

Change	Women	Men	Change	Women	Men
—14 cm.	2.4	0.0	2 cm.	9.8	18.6
—10 cm.	0.0	2.3	3 cm.	17.1	9.3
— 9 cm.	2.4	0.0	4 cm.	4.9	2.3
— 5 cm.	0.0	2.3	5 cm.	7.3	2.3
— 4 cm.	2.4	2.3	7 cm.	2.4	.....
— 3 cm.	2.4	0.0	8 cm.	2.4	.....
— 2 cm.	9.8	9.3	10 cm.	2.4	.....
— 1 cm.	7.3	16.3	15 cm.	2.4	.....
0 cm.	12.2	20.9	17 cm.	2.4	.....
1 cm.	9.8	14.0			

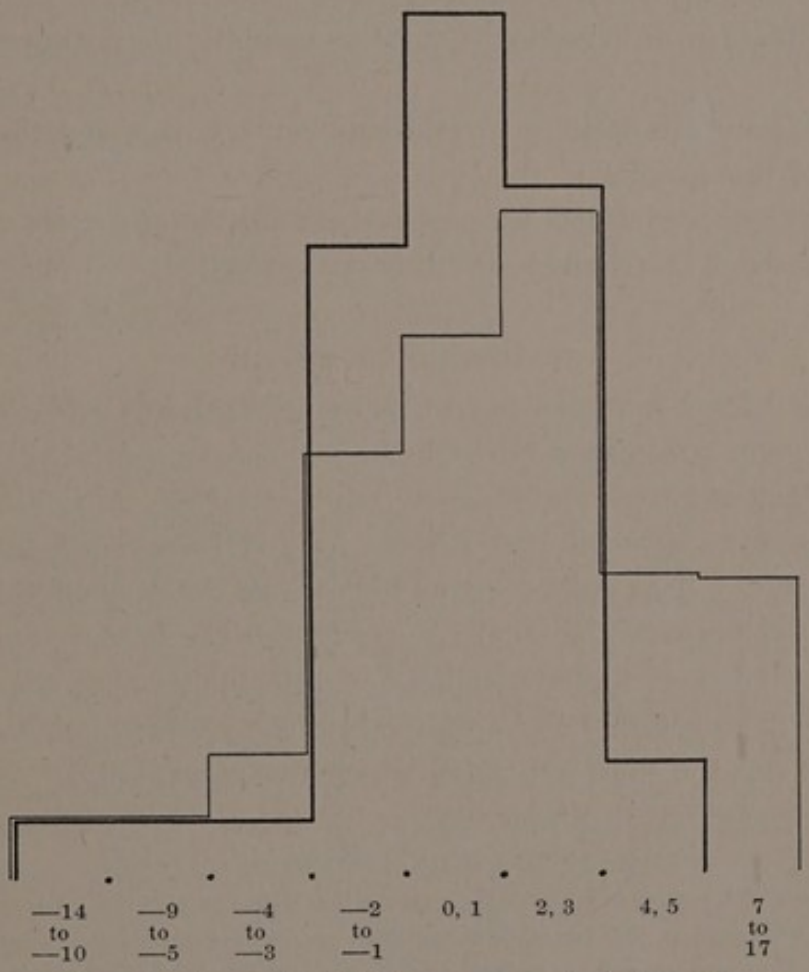

Fig. 27—Cross. Light line, women; dark line, men.

of the twenty-four coefficients are positive. The correlations with the other tests of this sub-group (*Rectangle, Triangle*) are positive, but no greater in amount than for tests which lay no claim to close relationship with this one.

Correlation Between Suggestibility in Regard to the Proportions of a Cross and Suggestibility in Six Other Tests

	Women A	Women B	Men A	Men B
Size-Weight	.02	.05	.28	—.15
Müller-Lyer	—.13	.34	.06	.21
Distance	.16	.31	.45	—.29
Weight	—.07	—.13	.17	.31
Rectangle	.27	.30	.21	—.37
Triangle	.37	.16	.18	—.11

In conclusion it may be said that:

1. Women are decidedly more suggestible than men in this test.

2. There are positive correlations between this and the other tests of this group.

3. The correlations are positive more often and more clearly for women than for men, which is exceptional.

4. Division of a Line

The "line" referred to in this experiment was a black cardboard strip one centimeter wide and 56 cm. long attached by its ends horizontally to a sheet of white bristol. A small black cross-piece 1 cm wide and 2.5 cm. long slid back and forth on this "line". The subject made his own adjustment of the position of the cross-piece on the line. Either the left or the right-hand portion of the line could be made longer than the other portion, according to the preference of the subject, but in either case it was the shorter portion which was measured.

The original directions were:

PREFERRED PROPORTIONS OF A LINE

You will be shown a black line on which there is a sliding piece which you can adjust so as to divide the line in any proportion to suit your taste. You are asked to adjust the line so that the small sliding piece divides the line in what appears to you to be the most pleasing proportion.

The suggestive statements which were given to the subjects at the second sitting were almost identical in form with those used in the experiment last described (*Cross*). The A form said that *most persons make one part very short and the other part very long.* The B form said *most persons divide the line into two equal or nearly equal parts.*

Many subjects regarded this experiment as quite foolish, asserting that the division of the line did not interest them; yet a surprising number made the adjustment of the second sitting approximately the same as that of the first sitting. In fact the number of persons who resisted the suggestion (in spite of their assertion that they did not care much where the line was divided) was so great that the data from the experiment prove to be of very little value. The following figures show how few persons were influenced to an appreciable extent by the suggestion or changed much from their first choice. The figures are the actual number of subjects.

	Women	Men
No change, or a change of 3 cm. or less	32	36
Change in the direction of the suggestion of over 3 cm.	5	6
Change opposite to the suggestion of over 3 cm.	4	1

The value of this experiment is also diminished by the fact that many persons do, as a matter of fact, prefer the line divided about in the middle, so that one form of the suggestion fails of its purpose in so far as it does not call for any change, in numerous instances, from the first choice. This difficulty has been present in the other experiments of this group, but not to the same extent. The following figures show the actual number of persons who, at the first sitting, chose to divide the line in the middle or not more than 2 cm. from the middle, and also the number of those who were affected by the suggestion to the extent of leaving the middle or of coming to the middle. In computing these figures a choice within 2 cm. of the middle of the line is counted as a preference for the middle.

Among 20 women, A, 8 first chose the middle, of whom 1 yielded to the suggestion by leaving the middle.

Among 21 women, B, 10 first chose the middle, and 2 others chose the middle under suggestion in the second test.

Among 24 men, A, 10 first chose the middle, of whom 3 yielded later to the suggestion by leaving the middle.

Among 19 men, B, 10 first chose the middle, and 3 others chose the middle under suggestion in the second test.

The following figures show the average length of the short portion of the line in the first test, without suggestion, and in the second test, under the influence of a suggestive statement.

	Suggestion A to make shorter	Suggestion B to make longer
Women, first test, no suggestion	22.4 cm.	23.4 cm.
Women, second test, with suggestion	22.5	24.3
Women, effect of suggestion	*—0.1*	*0.9*
Men, first test, no suggestion	21.5	22.7
Men, second test, with suggestion	19.9	23.6
Men, effect of suggestion	*1.6*	*0.9*

From these figures it appears that the average position of the division is affected to some degree in the direction of the suggestion in three of the four groups of subjects.

The effect of the suggestion is more pronounced among the men than among the women. Not only is the average influence more marked among the men, but the number of men who desert their first choice at the middle, or who change to the middle under the influence of the suggestion, is greater, and fewer of them make a distinct change in the direction away from that indicated by the suggestion.

On account of the unsatisfactory nature of the measurements obtained in this experiment no attempt has been made to obtain coefficients of correlation with other experiments.

The only conclusion which the data warrant is that men are more apt than women to be influenced by the suggestion employed in this test.

5. Conclusions Concerning the Four Experiments Which Involve Esthetic Judgments of Proportion

These four experiments are very closely related in respect to method and the general form of the suggestive statement. The results prove that each of the three for which coefficients of correlation have been calculated is positively correlated with the other two. Yet the correlations are not large enough, either absolutely or by comparison with the correlations found with other and less obviously related tests, to warrant the inference that the three (or four) suggestions act upon the subject in the same way. A person who is highly suggestible in one of these experiments is more apt than another to prove highly suggestible in another of these tests, but not much more apt to prove so in one of these supposedly related tests than in some other test.

With regard to sex differences, these experiments are not consistent with one another. Two of them, *Rectangle* and *Cross*, seem to indicate very clearly that women are more apt than men to respond to the suggestion by changing their preference in the direction of what they suppose "most persons" prefer. On the other hand, *Triangle*, which does not seem to differ in any essential respect from *Rectangle*, gives exactly the opposite sex difference with equal distinctness; and *Line*, although not very trustworthy on account of the fact that at least 80 per cent of the subjects proved wholly immune to the suggestion, shows that among the few persons who are at all subject to the suggestion there are more men than women.

X

THREE EXPERIMENTS DEALING WITH THE EFFECT OF SUGGESTION UPON SIMPLE ESTHETIC PREFERENCES IN THE QUALITY OF SENSATIONS

1. Preference for a Simple Color; 2. Preference for Tone; 3. Preference for a Color Combination

None of these three experiments can be regarded as a success from the quantitative point of view. The measurements which could be made were so coarse and the sources of error so manifest that no statement whatever seems warranted concerning individual differences, and what is to be said concerning sex differences must be regarded as merely approximate and of no consequence except in so far as the findings are found to agree with what has been learned from those experiments in which more exact measurements have been made.

1. Preference for a Single Color

The material for this experiment consisted of a dull black card on which were mounted eleven pieces of "Hering" colored paper 4 cm. wide and 9 cm. high. The pieces were mounted in a single horizontal row, separated from one another by a space of 2 cm. The colors were in the order of the spectrum from left to right: light red, dark red, orange, yellow, etc., to purple. The violet red was not included.

This experiment was given at the same time with the experiments of the second group of the first main division (see p. 294), but in its general method it is more closely related to the tests of the second main division, now being described. The precise

form of the suggestion is not like that used in any of the other tests. The directions were as follows:

PREFERENCE FOR COLORS

It is the object of this experiment to obtain information about the color preferences of men and women. It is generally said that *men* like reddish, ruddy, or warm colors, while *women*, as a rule, dislike them.

All that you have to do is to pick out the color that you like best in the set shown.

The directions were arranged in two sets. One set read as above, "men like . . . while women . . . dislike"; the other set read, "women like . . . while men . . . dislike." The two sets differed from each other only in interchanging the words *men* and *women*. These words are printed in italics here in order to make clear their significance; they were not italicized in the statements given to the subjects. It was intended that half of the subjects should receive one set of directions, the other half the other set. A person is counted as suggestible if he selects a color among the five beyond the middle of the set and toward the end which is indicated by the directions as being preferred by his own sex. But of course this method of measurement is highly arbitrary. The form of the suggestion itself is not free from misinterpretation, as, for example, in the case of the man who is influenced by the reflection that women have better taste than men in such matters.

Unfortunately the number of persons of either sex who received one set of directions was not exactly equal to the number who received the other set. Moreover, the preference for *blue*, among the colors used, was so strong with both men and women that the suggestion seems to have been very often ineffective when brought into conflict with it.

No clear sex differences appear. A color toward the blue end of the spectrum is preferred by 72 per cent of the women and by 73 per cent of the men, regardless of the suggestive statement. The choice was in accord with the positive suggestion in the directions for 57 per cent of the 75 women tested and for 55 per cent of the 60 men. The work of the separate experimenters is so inconsistent as to deprive these figures of real significance.

2. Preference Between Two Tones

This experiment takes us back to the group in which a norm was established by a preliminary sitting before the suggestion was given. The first directions were as follows:

PREFERENCE FOR TONES

You will hear two tones, first one produced by a metal whistle and then one produced by a wooden whistle. They are the same in pitch. Each will be sounded for ten seconds, and then each will be sounded again for five seconds. You are to say which one is the more pleasing to you.

The tones were produced by a brass Stern *tonvariator* and an Appunn wooden organ-pipe ("Ut 4"). The instruments were attuned at 495 vs, according to the tonvariator, and were blown from the same air tank. They were of about the same loudness. The wood had more noticeable overtones. It was found that 76 per cent of the women and 74 per cent of the men actually prefer the metal.

When the subject returned for the second sitting three weeks after the first test he received one or the other of the following suggestive statements appended to the foregoing directions. Form A said: *Note.—Most persons prefer the metal whistle.* Form B said *wooden.* The experiment might have proved more satisfactory if the suggestive statement had been altered to fit the first choice of each subject, so that in each case the subject would have been confronted with a suggestion to *change* from his former judgment. As the suggestions were actually given in a chance order the data are considerably more complicated.

Of the 41 women, 13 change their minds between the first and second sittings, and 8 of the 13 change in the direction of the suggestion. Of the 43 men, 11 change their minds, and 6 of the 11 change in the direction of the suggestion. The following figures show that most of the changes occurred under the direction of suggestion "B" (to prefer wood).

The unexplained but obvious tendency to change from metal to wood is strong enough in the A group, where it involves a negative response to the suggestion, to prevent many changes.

But in the B group the spontaneous tendency to change toward wood reinforces the suggestion, with the result that more changes occur.

	Positive change	Negative change
20 women, A	1	2
24 men, A	2	3
21 women, B	7	3
19 men, B	4	2

The amount by which women appear to be more suggestible than men is entirely negligible, except perhaps that the apparent difference between the sexes happens to be in the same direction as the difference which has been found more clearly in many of the other experiments.

3. Preference for a Combination of Two Colors

The original directions, which were not supposed to be suggestive, were:

PREFERRED COMBINATION OF COLORS

You will be given a card with a piece of colored paper mounted on it, and you will be shown a large card on which a great variety of colors are mounted. You are asked to pick out the color which you think would make the most pleasing combination with the one that is given you.

All of the 90 colors from a Milton Bradley sample book (size 3.7 by 7 cm.) were mounted vertically in columns of five on a large black card with space between them equal to half the width of the colored strip. The five tints and shades of each color appeared in a single vertical column. The columns were designated by letter (violet red was A and red violet was R), and the rows were designated by number, row 3 being the best saturated color. The one color used as the basis of the combinations was the Milton Bradley "green". The green strip was of the same size as the other strips and was mounted on a small black card. The subject held this card in his hand and placed it alongside of the colors in the set whenever he liked.

One set of suggestive directions read: *Note.—Most persons select a color from one of the columns marked by the letters B, C, or D* (these colors were red, orange-red, and red-orange). The "B" set read: *Note.—Most persons select a color from one of the columns marked by the letters H, I, or J* (these colors were yellow, green-yellow, and yellow-green).

In the preliminary test the two groups of colors mentioned in the suggestive statements actually contained about an equal number of choices, and between them they embraced nearly three-fourths of all the choices.

In the original choices, without suggestion, no difference of a systematic sort could be discovered between the preferences of men and women. About 35 per cent of the members of each sex prefer with green a color which contains a large admixture of red (red-violet, violet-red, red, orange-red, or red-orange). The first choice is yellow, which is preferred by 14 per cent of the subjects. For the second place, red is tied with yellow-green (11 per cent for each of these colors).

Men show a stronger preference than women for well saturated colors in combination with the saturated green. Women show a much stronger preference for tints. The following figures show the proportion of the subjects who chose, as making the best combination with the saturated green, another saturated color, a tint, or a shade darker than the saturated color.

Choice	Women	Men
Tints	41%	9%
Saturated colors	27	60
Darker shades	32	30

The following figures show the actual number of persons, both men and women, who preferred one of the designated colors either in the first test, when there was no suggestion, or in the second test. In the second test the change in the number of persons who chose one of the designated colors may, or may not, be ascribed to the influence of the suggestive statements.

	Chose red, orange-red, red-orange	Chose yellow, green-yellow, yellow-green
20 women, A group, first test, no suggestion	6	7
20 women, A group, second test, with suggestion	12	3
Increase, ascribed to the suggestion	*6*	.....
21 women, B group, first test, no suggestion	2	6
21 women, B group, second test, with suggestion	3	9
Increase, ascribed to the suggestion	.....	*3*
24 men, A group, first test, no suggestion	7	8
24 men, A group, second test, with suggestion	9	4
Increase, ascribed to the suggestion	*2*	.....
19 men, B group, first test, no suggestion	5	4
19 men, B group, second test, with suggestion	4	6
Increase, ascribed to the suggestion	.....	*2*

In each of the four groups the suggestion is effective, for the specified colors are chosen more often in the second test if the statement recommends such a choice, and not otherwise. If the results are combined in order to make the sex differences clear we obtain the following figures, showing the per cent of persons who chose the specified colors.

	Women	Men
Without suggestion	29%	26%
Under suggestion	51	35
Increase due to suggestion	*22*	*9*

On the other hand, the per cent of persons who chose one of the three colors which were *not* specified in their own directions, but were specified, without their knowledge, in the directions of their co-subjects was as follows:

	Women	Men
First test, no suggestion	22%	30%
Second test, no suggestion	15	19
Withdrawals, instead of increase	*7*	*11*

These figures are introduced only for the purpose of showing that the increase in the number of preferences for the specified colors did not arise from a general tendency to change over to the six colors used for the suggestions. The changes which were made were not toward all of the six, but toward only the three mentioned and away from the three not at that time mentioned.

The figures above show that the number of women who can be induced to change from an expression of preference for one combination of colors to another by the statement that "most persons prefer" the second combination is considerably greater than the number of men who can be induced to change in this way.

It will have been observed that these figures take into consideration only the final results of all the changes, including the cases of those who at first preferred one of the designated colors and then changed away from it in spite of the suggestion. The following figures show the number of persons (in per cent) who adopted the designated colors, having first preferred some other, no account being made of those who originally preferred these colors and for whom the suggestion only served as a confirmation of their natural preference. The figures are the per cent of the subjects who change from some other color in the manner indicated.

	Women	Men
Change to one of the 3 suggested colors	24%	16%
Change to one of these 3 when not suggested	7	5

These figures further confirm the conclusion that women are more open than men to this suggestion.

4. Conclusions From the Three Experiments Depending Upon a Simple Esthetic Preference

The test for *Color Preference,* in which the suggestion is hidden under the assertion that *men* or that *women* prefer certain classes of colors, gives no results worth considering; the actual preferences are too strong for the suggestion.

The preference between two *Tones* is too strong also for the suggestion to affect it much. But in this case there are a very few instances in which women appear more suggestible than men.

The preference for *Color Combinations* is susceptible of change through suggestion, and in this case women are considerably more apt to respond to the suggestion than men.

XI

FINAL CONCLUSIONS CONCERNING SEX DIFFERENCES IN SUGGESTIBILITY

A general review of the entire series of twenty-six experiments reveals a very distinct difference between the sexes. In thirteen of the experiments there is a clear difference between the sexes, and in only one of these experiments are the men more suggestible. There is a slight, but still fairly reliable, difference in four other tests, and in only one of these are the men more suggestible. There are five tests in which the difference between the sexes is rather doubtful, and in only one of these does it appear probable that the men are more suggestible. There are only four experiments in which no sex difference can be made out. The following table shows the experiments arranged in the order in which they have been presented in this report. An entry under the caption *Women* means that women proved clearly or somewhat more suggestible than men, or that there is a distinct probability that they are more suggestible. An entry under *Men* is to be interpreted in the same terms. No entry, under either heading, means that the data are inadequate or self-contradictory. The page reference is to the page on which the discussion of the sex difference in that experiment is begun.

The difference between the sexes is more distinct in some of the groups of experiments than in other groups. There can be little doubt that women are more suggestible in tests which involve an imagined sensation, a series of progressive changes, distortion of memory, and estimation of magnitudes. The tests with illusions do not give clear differences between the sexes, and the tests with esthetic judgments give contradictory or indecisive results. Where degree of suggestibility is measured by the promptness of the response to the suggestion women are not conspicuously more suggestible than men. Two of the tests of this kind (*Change of Size* and *Heat*) give no sex difference; two

Least perceptible (imagined) Sensations:

Page		Women	Men
299	Odors	Clearly	
304	Touch	Clearly	
310	Heat	———	———
316	Electric Shock	Clearly	

Least perceptible (imagined) Change:

324	Change of Brightness	Somewhat	
327	Change of Pitch	Clearly	
330	Change of Size	———	———
334	Motion	Somewhat	

Series of progressive Changes:

341	Progressive Weights	Clearly	
345	Progressive Lines	Probably	

Memory, Recognition, Imagination:

350	Recognition of Form (Checkerboard)	Clearly	
352	Recognition of Position (Letters)	Somewhat	
356	Memory for Size (Squares)	Probably	
361	Memory for Pictures	Probably	
364	Ink-blot Test of Imagination	Clearly	

Illusions:

373	Size-Weight	———	Probably
379	Müller-Lyer	Somewhat	

Estimation of Magnitude:

389	Estimation of Distance	Clearly	
394	Estimation of Weight	Clearly	

Esthetic Preference, Proportions:

401	Rectangle	Clearly	
405	Triangle	———	Clearly
408	Cross	Clearly	
412	Division of a Line	———	Somewhat

Esthetic Preference, Qualities:

415	Preference for a single Color	———	———
416	Choice between two Tones	———	———
419	Color-combination	Clearly	

(*Brightness* and *Motion*) give a slight difference, and only *Change of Pitch* gives a clear difference.

The fact that women are more suggestible than men in the greater part of these tests can not be construed immediately as proof that women as a class are more "suggestible" than men. Tests of a different character, involving verbal suggestions or suggestions of a different kind, might not yield the same results. Yet it should be noted that two quite different types of suggestion were actually employed in these experiments, one in which a false or misleading statement was concealed in the directions, and, in some cases, supported by a false or misleading "demonstration", and the other in which the suggestion was presented in a comparatively open manner under the guise of a statement of information concerning what "most people" do under the circumstances. In both of these forms of suggestion, and in distinctly different variations of both forms, the greater suggestibility of women is apparent. This circumstance makes it seem highly improbable that the apparent difference between the sexes is wholly dependent upon the peculiar manner of presenting the suggestion.

A sweeping conclusion concerning the difference between the sexes should not be made without considering the question whether the men and women who acted as subjects in these experiments were typical representatives of their respective sexes. These young men and women come from the same communities and home conditions. It is difficult to see how any difference of an environmental or hereditary sort can exist between the representatives of the two sexes. Nor is it apparent that there has been any selection from the members of either sex. The men are not drawn to any appreciable extent from engineering or technical departments of the University, but are the men who elect to take general "cultural" courses which are pursued by most women in the University. From earliest childhood these boys and girls have been subjected to precisely the same conditions so far as education is concerned. Most of them have always attended coeducational schools. There is no apparent reason

why these young men and women should not be regarded as typical representatives of the younger men and women from the more prosperous families of this community.

Abstaining, however, from any generalizations outside of the actual scope of the investigation, we may fairly conclude that wherever written directions are used which give rise to false anticipations, or which contain statements concerning the usual course of most persons, these directions will prove more misleading to women students than to men.

XII

FINAL CONCLUSIONS CONCERNING INDIVIDUAL DIFFERENCES IN SUGGESTIBILITY

The question whether particular individuals possess a characteristic trait which may be called "suggestibility" and which will distinguish them from other individuals in a number of different situations has already been answered in part affirmatively with the assertion that women are, as a rule, more suggestible than men. The assertion of a sex difference is the assertion that some individuals (one sex) possess a characteristic in which they differ from other individuals (the other sex). In the present case the obviousness of the difference between the sexes in the great majority of the experiments compels the conclusion that there is a common trait "suggestibility" which appears in a variety of circumstances and which is more conspicuous in women than in men. The further question remains whether there are consistent differences in suggestibility between different individuals of the same sex.

It must be said at once that there are no individual differences which are sufficiently conspicuous to justify the experimenter in calling one person "very suggestible" and another "not suggestible." There are no individuals who have consistently high or consistently low indices of suggestibility through a series of tests.

On the contrary, the experimenter is struck by the fact that the most skeptical individual will yield at times with surprising readiness to the suggestion, while a person who has yielded to some tests with very little apparent resistance will unexpectedly become very recalcitrant. But it must be remembered that the absence of conspicuous cases of high suggestibility or of low suggestibility consistently maintained throughout a number of tests can not be taken as proof of the absence of a *tendency* in certain individuals to be suggestible or to resist suggestion.

The coefficients of correlation do afford an indication of the presence or absence of a tendency to respond to the suggestion in one test in the same general way as in other tests. A high coefficient of correlation indicates that the individuals who are suggestible in one test are suggestible in the other, and if there is a positive coefficient, even though it is a low one, it affords reason for believing that suggestibility is a trait which reappears in an individual from time to time under a variety of conditions. The following table presents certain data which may be considered in this connection. The figures are obtained by adding together the coefficients of correlation for each of the tests with each of the others in that division of the experiment and taking the average of these different coefficients. In the case of the first division there are nine tests, so that the average is based on eight figures, each of which is obtained from an array of 54 women and 29 men. In the case of the second division there are seven tests for which correlations have been calculated, so that the average rests on six correlations for the A group and six for the B group, or twelve in all. There were about 20 persons of each sex in each of these groups. The absence in the table of any figure for the correlation means that correlations were not calculated for that experiment. In two cases (*Electric Shock* and *Ink Blot*) there were no correlations calculated for the large groups of subjects, but correlations calculated for the subjects of separate experimenters were generally positive. The page reference at the left refers to the page on which the discussion of correlations is taken up in the case of each experiment.

Page		Correlations Men	Women
	Least perceptible (imagined) Sensations:		
301	Odors	.039	.147
307	Touch	.110	.220
312	Heat	.030	.098
318	Electric Shock	.....	.....
	Least perceptible (imagined) Change:		
324	Change of Brightness	.050	.275
328	Change of Pitch	.048	.200
332	Change of Size	.061	.281
336	Motion	—.084	.209
	Series of progressive Changes:		
343	Progressive Weights	.074	.181
347	Progressive Lines	.074	.126
	Memory, Recognition, Imagination:		
351	Recognition of Form (Checkerboard)	.....	.....
353	Recognition of Position (Letters)	.....	. . .
359	Memory for Size (Squares)	.....	.....
360	Memory for Pictures	.....	.....
366	Ink-blot Test of Imagination	.....	.....
	Illusions:		
377	Size-Weight	—.054	.162
383	Müller-Lyer	.052	.014
	Estimation of Magnitude:		
390	Estimation of Distance	.030	.167
395	Estimation of Weight	—.200	—.042
	Esthetic Preference, Proportions:		
402	Rectangle	.022	.092
405	Triangle	.032	.193
408	Cross	.137	.079
412	Division of a Line	.....	.....
	Esthetic Preference, Qualities:		
415	Preference for a single Color	.....	.....
416	Choice between two Tones	.....	.....
417	Color-combination	.....	.....

The figures obtained by averaging the correlations are none of them high, but among the thirty-two there are only four which are negative. The combined average for men in the 9 experiments of the first division is .204 and for the women it is .054. In the 7 experiments of the second division it is .095 for men and practically zero (.003) for women. The separate figures from which these averages have been obtained are given on pages 427 and 428. The upper right-hand and lower left-hand portions of these pages are duplicated in order to show the full column of correlations for each one of the tests. It is understood that these correlations involve a possible error, in that the work was done by different experimenters, so that the ranking of the individual subject's record may be influenced by the amount of the personal influence of the experimenter. This source of error was eliminated in the experiments of the first division by computing separate coefficients of correlation for each experimenter.

CORRELATIONS BETWEEN TESTS OF THE FIRST DIVISION

Women (54 cases) in the upper line and men (29 cases) in the lower line.

	Odors	Touch	Heat	Brightness	Pitch	Size	Motion	Weights	Lines
Odors	.....	—.01	.11	.05	—.10	.08	—.28	.18	.28
	.....	.23	.26	.40	.16	.39	.14	.16	.24
Touch	—.01	.....	.35	.15	.27	.04	.07	—.13	.14
	.23	.....	.19	.42	.15	.30	.19	.11	.17
Heat	.11	.35	.....	.07	—.29	.04	—.24	.05	.15
	.26	.19	.....	.04	.06	.26	.09	—.16	.04
Brightness	.05	.15	.07	.....	.18	—.16	—.05	.22	—.06
	.40	.42	.04	.....	.38	.09	.39	.40	.08
Pitch	—.10	.27	—.29	.18	.....	.04	.16	.07	.05
	.16	.15	.06	.38	.....	.46	.09	.38	—.08
Size	.08	.04	.04	—.16	.04	.....	.12	.27	.06
	.39	.30	.26	.09	.46	.....	.36	.22	.17
Motion	—.28	.07	—.24	—.05	.16	.12	.....	—.24	—.20
	.14	.19	.09	.39	.09	.36	.....	.18	.23
Weights	.18	—.13	.05	.22	.07	.27	—.24	.....	.17
	.16	.11	—.16	.40	.38	.22	.18	.....	.16
Lines	.28	.14	.15	—.06	.05	.06	—.20	.17	.....
	.24	.17	.04	.08	—.08	.17	.23	.16	.....

Correlations Between Tests in the Second Division

First line, 20 women under suggestion A; second line, 21 women under suggestion B; third line, 24 men under suggestion A; fourth line, 19 men under suggestion B.

	Size-Weight	Müller-Lyer	Distance	Weight	Rect-angle	Tri-angle	Cross
Size-Weight	.....	.05	—.09	.07	—.14	—.32	.02
	.....	.21	—.28	—.29	—.26	.33	.05
	.....	—.11	.33	.38	.22	.12	.28
	.....	.09	.29	—.42	.53	.38	—.15
Müller-Lyer	.05	.....	.00	—.30	—.04	.16	—.13
	.21	.....	.24	—.31	.02	.38	.34
	—.11	.....	—.01	—.14	—.24	.21	.06
	.09	.....	.12	—.07	—.15	.20	.21
Distance	—.09	.00	.....	—.35	.47	.03	.16
	—.28	.24	.....	—.16	—.03	.06	.31
	.33	—.01	.....	.25	.24	—.02	.45
	.29	.12	.....	—.30	.31	.64	—.29
Weight	.07	—.30	—.35	.....	.00	—.21	—.07
	—.29	—.31	—.16	.....	—.20	—.45	—.13
	.38	—.14	.25	.....	.00	.25	.17
	—.42	—.07	—.30	.....	—.52	—.41	.31
Rectangle	—.14	—.04	.47	.00	.....	.05	.27
	—.26	.02	—.03	—.20	.....	—.17	.30
	.22	—.24	.24	.00	.....	.26	.21
	.53	—.15	.31	—.52	.....	.62	—.37
Triangle	—.32	.16	.03	—.21	.05	.....	.37
	.33	.38	.06	—.45	—.17	.....	.16
	.12	.21	—.02	.25	.26	.....	.18
	.38	.20	.64	—.41	.62	.....	—.11
Cross	.02	—.13	.16	—.07	.27	.37	.....
	.05	.34	.31	—.13	.30	.16	.....
	.28	.06	.45	.17	.21	.18	.....
	—.15	.21	—.29	.31	—.37	—.11	.....

The following table shows all of the coefficients of correlation which have been calculated, arranged according to magnitude so as to show, roughly, the frequency of coefficients of various magnitudes. In the first division of the work (nine tests) there are 36 correlations for a group of 54 women and the same number

for a group of 29 men. There are also for this same division of the work (eleven tests) 163 correlations for women and 153 for men obtained from the groups tested by individual experimenters. These groups range in size from 5 to 24 and contain the same persons as the groups of 54 and 29, but in different combinations and together with many others. Finally, there are two groups of about 20 women and two groups of about 20 men in the seven tests of the second division of the work, making 42 more correlations for each sex. In the last column of this table the whole 472 correlations are shown.

Positive correlations predominate among the men; only 4 of the 36 figures for the group of 29 are less than .05; two-thirds of those in the second division, and of those for individual experimenter's groups in the first division, exceed that figure. For the women positive and negative coefficients are about evenly distributed with a few more positive instances in the first division.

FREQUENCY OF CORRELATIONS OF VARIOUS MAGNITUDES

Amount of correlation	First Division		First Division Groups by individual experimenters		Second Division		All correlations
	Groups of 54 women	Groups of 29 men	Men	Women	Groups of 20 women A, and 21 women, B	Groups of 24 men A, and 19 men, B	
—1.00 to —.75	.....	.....	1	.....	.....	.....	1
—.74 to —.65	.....	.....	0	3	.....	.....	3
—.64 to —.55	.....	.....	2	0	.....	.....	2
—.54 to —.45	.....	.....	1	3	1	1	6
—.44 to —.35	.....	.....	9	5	1	3	18
—.34 to —.25	2	.....	12	6	6	2	28
—.24 to —.15	4	1	10	8	4	3	30
—.14 to —.05	4	1	26	12	5	4	52
—.04 to +.05	*7*	*2*	*17*	*13*	*10*	*3*	*52*
.06 to .15	10	8	16	19	2	4	59
.16 to .25	5	12	24	18	5	10	74
.26 to .35	4	3	14	14	5	6	46
.36 to .45	.....	8	14	12	2	3	39
.46 to .55	.....	1	8	11	1	1	22
.56 to .65	.....	.....	3	10	.....	2	15
.66 to .75	.....	.....	5	8	.....	.....	13
.76 to 1.00	.....	.....	1	11	.....	.....	12
Total,	36	36	163	153	42	42	472

When the distribution of the entire 472 correlations is considered it is evident that more cases occur above zero than below and that relatively high positive correlations are much more frequent than correspondingly high negative ones.

On the whole, considering the very large number of correlations in question, the value of their averages and the way in which they are distributed, it is probable that an individual who is more suggestible than another in one of these tests will prove more suggestible in another. Yet the actual amount of the correlation is generally so small and the number of negative instances so great that the "probability" in the above statement can only be very slight. While it seems to be true that suggestibility is a trait more conspicuously developed in some individuals than in others, yet the individual differences are small and seem to be subject to reversal under the influence of conditions which are not within the control of the experimenter. Apparently the suggestions of the type used in the first division of the experiments are more apt to obtain consistent reactions from the same individual in different tests (as indicated by the correlations) than suggestions which depend upon the statement "most persons do so and so."

It has been observed that the correlations are more frequently positive and are generally higher for men than for women; in fact the figures for women are so low that without the support of the more definite data from the men they would be inconclusive. The present data do not afford any explanation of this difference between the sexes. Apparently there are men who present consistently distinct individual traits or idiosyncrasies when tested for suggestibility, while women are less consistent from test to test and do not show such marked individuality as the men.

Transmitted August 30, 1915.

11. A Theory of the Syllogism, by Knight Dunlap. Pp. 227-235 ..... .10
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