

COMMUNITY AND ASSOCIATION OF IDEAS: A STATISTICAL STUDY.

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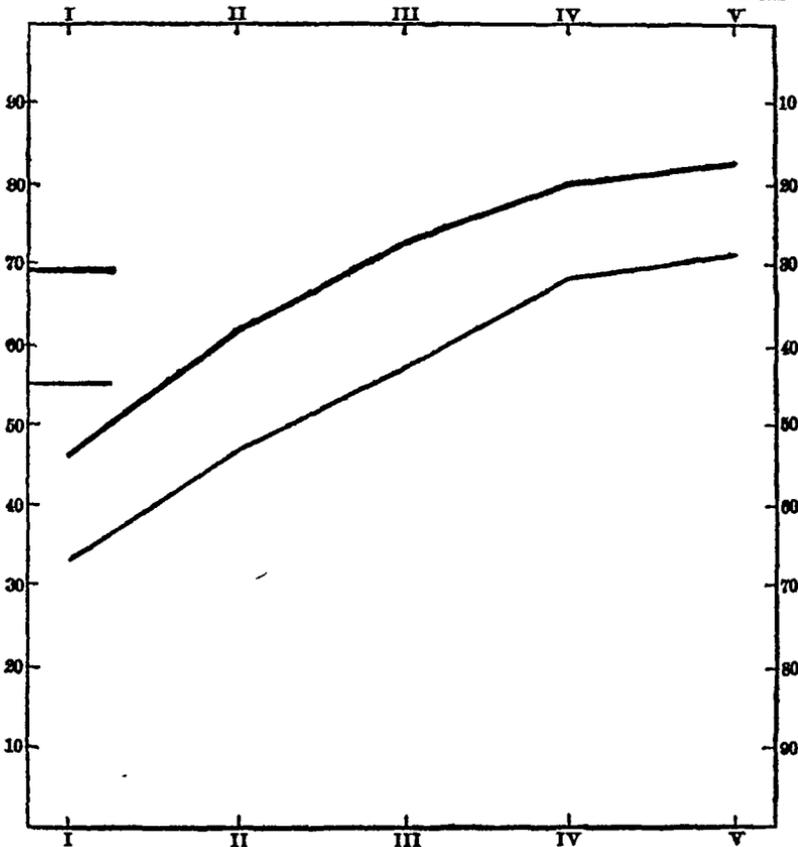
The application of statistics to the study of mental phenomena promises to supply the data for new and suggestive generalizations, as well as to corroborate, often in an unexpected manner, the laws of mind derived from off-hand observation. The census and newspaper statistics on matters large and small have familiarized us with the notion that facts which separately may have but little importance, when considered in groups give rise to significant truths. In the hope of contributing to our knowledge of the nature and regularity of such mental processes, I have upon various occasions requested a class of students to serve as the subjects of experiment.* In the test here to be described a word was written upon the blackboard and, by the withdrawal of a screen, was shown to the whole class at the same moment; each student thereupon wrote as rapidly as possible *the five words first suggested to him* by the word upon the board. In this way five associations were obtained from each student to each of the following ten words: *book, man, tree, cat, hand, hat, bread, pen, write, blue*. By counting separately for each of the five associations how often different students have written the same word we may determine the degree of similarity of their associations, and further how this community of ideas varies as the associations recede from their common starting-point. The result of this enumeration appears in the following table.

This table is based upon 69† lists of words, theoretically

* One of these tests is described in *A Study in Mental Statistics* (New Review, December 1891) and another in *A Statistical Study of Memory and Association* (Educational Review, December 1891).

† This number is too small to establish beyond the influence of chance detailed conclusions; the conclusions most firmly established and those simply suggested or made probable are indicated as they occur.

	First Word.	Second Word.	Third Word.	Fourth Word.	Fifth Word.	Total.
Number of different words ...	307	414	480	522	515	2278
Percentage of " " ...	46.2	62.1	72.7	80.1	82.8	69.8
Number of 'unique' words ...	222	313	377	447	442	1801
Percentage of " " ...	33.4	47.2	57.1	68.5	71.1	55.2
Total number of words.....	665	663	660	652	622	3262



Curves showing the relation of the community of ideas to the 'distance' in associated words from the original suggesting word. I, II, III, IV, V, represent the first, second, third, fourth, and fifth association to a given word; the vertical distances to the intersections of the heavy curve with these lines when measured from below represent the percentages of *different* words, when measured from above, the percentages of *same* words in the entire list of first, second, third, fourth, and fifth associated words respectively. The lighter curve represents the same relations for the percentages of words occurring but once in the same position on the entire lists. The short marks to the left represent the mean values of each curve.

of 50 words each, but actually containing in all 3262 words. In the first line of the table appear the number of different words written as the first, second, third, fourth, and fifth associations respectively, with their sum total; in the second line these numbers are expressed in percentages of the total number of words written, which in turn are given in the lowest line of the table. A second indication of the community of ideas may be obtained from the proportion of associations written by but one person of the entire 69; these once-occurring or 'unique' words are tabulated in precisely the same way as the number of different words and appear in the third and fourth lines of the table.

The significance of these numbers appears most clearly in a graphic presentation; we see at a glance how regularly *the proportion of different words, as also of unique or once-used words, increases as the associations proceed.* There is most community of ideas amongst the first associations to a given word, distinctly less community amongst the second associations, and progressively less, on to the fifth. The greatest difference is between the first and second associations, the differences decreasing with successive associations. The complete parallelism between the proportions of different and of unique words is also striking. The divergence of mental paths from a common centre, the appearance of individuality and disappearance of community of ideas, are thus clearly exhibited; and the result is important as well for its psychological bearings as for its testimony to the value of the statistical method in psychological investigations.*

It is always interesting to compare the mental processes of men and women. Former investigations have indicated that

* These results invite comparison with those of the former study; the percentage of different words for the first associated words is here 46.2; in the former study 34.4; of 'unique' words 33.4 and in the former study 20.0, the number of lists being the same in the two cases. This would indicate a greater amount of individuality in the contributors to this than in those to the former study. As above recorded, the same association occurring in two different positions is counted as two; if counted as one only, that is, irrespective of position, the percentage of different words becomes 45.7, and of 'unique' words 31.3; a comparison of these with the former averages, 69.8% and 55.2%, indicates that 24.1% of all the words recur in different positions and that 23.9% of words occur but once in one position, but again in other positions.

in unrestricted and extended series of associations such as the writing of the first one hundred words thought of, women repeat one another's ideas more frequently (in one result about 25% more frequently) than men. When the suggesting word was supplied no noteworthy difference between the sexes appeared, regarding the community of ideas amongst the first suggested words. In the present study two entirely different groups of nineteen men were selected by chance for comparison with the nineteen women who took part in the test. The result of the comparison appears in the accompanying table.

		1st Word.	2d Word.	3d Word.	4th Word.	5th Word.	Total.
Percentage of different words	Women.....	70.4	85.8	87.4	92.1	96.5	86.2
	Men: Group A	65.0	81.5	87.4	90.7	93.5	84.5
	Men: Group B	59.7	81.8	87.6	90.8	92.9	82.5
Percentage of 'unique' words	Women.....	40.3	53.0	56.3	72.5	77.8	59.6
	Men: Group A	32.8	45.7	60.1	67.0	68.0	54.5
	Men: Group B	31.2	47.6	56.4	67.0	68.5	54.1

It will be seen that in all but the third word and in both the proportion of different and of 'unique' words there is less community of associations amongst the women. This result, however, is based upon too limited data to be accepted as final, and there are indications that the associations of these nineteen women have unusually little in common.

With regard to the difference in tendency amongst the ten words to suggest the same associations, it appears, as a result of various modes of measuring them, that *blue*, *cat*, and *pen* are most apt to suggest the same words to different persons, *hand*, *book*, and *man* least apt to do so, while *tree*, *hat*, *write*, and *bread* present an average tendency in this respect.

The most frequent associations with the number of their occurrences without regard to place are: *pen—ink*, 43; *hand—finger*, 31; *blue—sky*, 30; *tree—leaf*, 29; *blue—green*, 28; *cat—dog*, 28; *pen—paper*, 27; *bread—butter*, 27; *blue—red*, 27; *man—woman*, 26; *cat—mouse*, 25; *pen—write*, 24; *write—pen*, 24.

It remains to investigate the *nature* of the associations.

For this purpose a classification followed in a former study and suggested by an analysis of the associations themselves may be adopted. (I) Whole to Part, or General to Special, such as *tree—leaf* or *tree—oak*; (II) Part to Whole, or Special to General, as *hand—arm*, *blue—color*; (III) Object to Activity, as *pen—write*; (IV) Activity to Object, as *write—pen*; (V) Object to Quality, as *tree—green*; (VI) Quality to Object, as *blue—sky*; (VII) by Natural Kind or one object suggesting another of the same class, as *cat—dog*, both being names of animals, as *bread* suggests other articles of food, *blue* other colors, and the like; (VIII) by Similarity of Sound, as *man—can*, *write—height*; (IX) Miscellaneous, including all that are ambiguous or not readily classified.

The distribution of the associations amongst the nine types appears in the table; the percentages of each kind of association both in general and for each position separately are likewise given.

	I	II	III	IV	V	VI	VII	VIII	IX
Total.....	15.6	2.8	6.2	5.2	14.9	3.3	24.4	10.9	16.7
1st assoc....	17.1	6.0	4.8	6.0	11.3	2.5	34.3	9.5	8.5
2d assoc....	18.3	2.9	6.6	5.5	12.9	3.0	28.3	9.7	12.8
3d assoc....	14.2	2.1	6.2	6.1	16.4	3.9	22.9	10.7	17.5
4th assoc....	15.2	1.2	8.1	4.4	17.8	3.6	18.8	11.9	19.0
5th assoc....	13.2	1.8	5.3	4.2	16.4	3.2	16.7	12.9	26.3

The types of associations found to be prominent in the former study are also prominent in this; the most frequent associations are those by Natural Kind, while those from Whole to Part and from Object to Quality are also prominent. Associations in one direction may be more frequent than in the reverse direction—Whole to Part more frequent than Part to Whole, and the like.

In the change in distribution of the associations in the several positions, it is possible to distinguish certain significant

tendencies; more extended data would be necessary to establish completely the relations involved. The two most regular and prominent changes are the decrease of associations by Natural Kind, and the increase of Miscellaneous associations as the associations proceed; the one decreases by regular steps from 34.3% to 16.7%, and the other increases from 8.5% to 26.3% of all the associations. Associations by Natural Kind are simple, while those termed Miscellaneous are thus indicated as variable and unusual; it appears then that the simple associations are exhausted before the more remote ones are thought of. This conclusion reinforces from a new point of view the result formulated in the general curve; the percentage of common words decreases at the same time that the nature of association varies; *it is a variation of types of association as well as of words*. Furthermore, by calculating the proportion of different as also of 'unique' words among the associations by Natural Kind without regard to position, we find only 25.6% and 10.5%, as against 45.7% and 31.3% for all associations in general—certainly a marked contrast.

The next table furnishes the data for comparing the distribution of the various kinds of association among men and women; it is formed just as was the former table, but the smallness of the numbers emphasizes the necessity of great caution in drawing deductions. Masculine preferences appear to be for associations by Sound, from Whole to Part, from Object to Activity from Activity to Object, and also for those by Natural Kind. Feminine preferences are for associations from Part to Whole, from Object to Quality, Quality to Object, and Miscellaneous. These differences are in general in accord with those formerly established and may be brought into relation with recognized differences in the mental processes of men and women.

A word should be added regarding the method of classifying and counting these associations. Inasmuch as no restrictions were imposed upon the words to be written it was left open whether the five words should all be associated with the original word, or the second word be suggested by the first, the third by the second, and so on, with little or no thought of the original word. After due consideration the former plan

		I	II	III	IV	V	VI	VII	VIII	IX
Total	M	16.7	2.6	6.6	5.4	13.6	3.0	26.0	12.4	13.7
	F	12.7	3.5	5.2	4.8	18.2	4.0	20.2	7.0	24.4
1st assoc.	M	16.4	5.8	4.9	6.0	9.3	2.5	36.3	11.4	7.4
	F	18.8	6.5	4.3	5.9	16.2	3.2	29.0	4.8	11.3
2d assoc.	M	19.1	2.2	6.6	5.5	11.1	3.0	30.4	11.7	10.4
	F	16.2	4.9	6.4	5.4	17.7	3.2	23.1	4.9	18.2
3d assoc.	M	16.4	2.3	6.7	5.7	14.2	4.4	23.5	12.8	14.0
	F	8.7	1.6	4.9	7.1	21.8	2.7	21.2	5.4	26.6
4th assoc.	M	17.1	0.9	9.3	5.2	17.3	3.0	20.1	12.6	14.5
	F	20.1	2.2	5.1	2.2	19.1	5.1	15.2	10.1	30.9
5th assoc.	M	14.7	1.6	5.6	4.4	16.4	2.3	18.7	13.6	22.7
	F	9.3	2.3	4.0	3.5	16.3	5.8	11.7	10.5	36.0

was adopted as following more closely than the other the natural order of thought. A large majority of associations are either clearly associated with the original word, or are capable of either interpretation; the thought rarely wandering entirely or far away from the original word. It is estimated that in not more than five per cent of the words is the association clearly with the preceding and *not* with the original word. Typical instances of such associations are: *Bread, cow, milk, pitcher, crockery; Write, letter, home, brother, vacation, school; Cat, mouse, trap, cheese, poison, death.* With more than five associations to each word it would undoubtedly be necessary to recognize more completely this difference in the nature of the associations, whether serial like the links of a chain, or radiating like the spokes of a wheel.