A COMPARISON OF MANIC-DEPRESSIVE AND DEMENTIA PRÆCOX CASES BY THE FREE-ASSOCIATION METHOD.

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I. The present study comprises three topics: (1) a revision of the system of classification (for use in the free-association experiment) presented in "An Experimental Study of Literary vs. Scientific Types," American Journal of Psychology, vol. 28, p. 248 (April, 1917); (2) the intensive study of the free-association records of fifty pathological cases at McLean Hospital, Waverley, Mass.; (3) the testing, at the same hospital, of a new list of three hundred words, to be used as stimuli in the free-association experiment.

2. In the study of the free-association records, it became increasingly evident that the original system of classification was unwieldy, and subject at many points to very serious criticism on account of the large personal equation involved in deciding as to the nature of many of the associations. The following revision is proposed:

Group I, Class I. Contiguity. The former subdivision of the class into several varieties is unjustified. Moreover the boundaries of the class become vague as soon as we admit associations in which either the stimulus or the associate does not name an objective thing located in space contiguous with an object named by its corresponding associate or stimulus. After the fifty cases had been studied by the older method, each individual was studied again with respect to the number of associations in which both stimulus and response named (a) objective things, (b) persons, or (c) animals. A comparison of the figures thus obtained with those obtained by the older method showed no large discrepancies. Throughout this paper "contiguity" means objective spatial contiguity of the type just described, e. g., carpet-
floor, lion-forest. It is believed that the personal equation involved in classification of such associations is slight. It should be noted that a response designating a part of the object named by the stimulus, such as hand-finger, or one enlarging the objective presentation, such as window-house, is included under the definition of contiguity. The category of “temporal contiguity” (e. g., sleep-dream) is omitted, owing to the larger personal equation involved in classification.

Class 2. Similarity. The former elaborate subdivision of the class into varieties is again unjustified. Four subheads are allowed: (a) associations in which the response is a synonym of the stimulus, and belongs to the same part of speech, e. g., anger-wrath, loud-noisy, including those in which the response is more specific than the stimulus, e. g., smooth-polished, and those in which it is more general, e. g., working-doing; (b) synonyms in which response and stimulus belong to different parts of speech, e. g., anger-mad, swift-speed; (c) similarities less exact than synonyms, e. g., deep-low, comfort-ease (this category being useful only for general comparative purposes, its outlines being too vague for exact usage); (d) “co-ordinates,” or members of a class, e. g., lion-tiger, cheese-butter. Only nouns are admitted here, unless the inclusion of an occasional verb or adjective pair, such as whistle-sing, yellow-green, be justified in clear-cut cases. Such occasional cases have been included in the present study, but the writer is still uncertain whether it is better to admit them or not. Co-ordinates are believed to be sufficiently distinct from synonyms to justify their separation into another class.

Class 3. Opposites. The former subdivision into exact and approximate opposites is not justified. The term “contrasts” is therefore preferable to “opposites.” Illustrations are: soft-hard, cold-hot, sickness-well, sweet-sour. (It will be noted, in such cases as the last, that simple psychological contrasts are not necessarily always “logical opposites.”)

Class 4. Common Pairs—frequently named or associated with one another, but not contrasts—e. g., needle-thread, hammer-nails. Many of these, e. g., man-woman, hand-foot, superficially resemble contrasts, and it must be admitted that the boundaries of the contrast group are uncertain. The writer believes that on the whole the category of “common pairs,” as originally proposed, can profitably be retained. The former subdivision into two varieties is discarded.

Class 5, Subordinates (e. g., fruit-apple, city-Boston), and Class 6, supraordinates (e. g., hammer-tool, lion-animal), are retained, but nouns only are to be admitted.

Class 7, Cause-Effect (e. g., health-happiness) and Effect-Cause (e. g., afraid-dark) is omitted on account of the personal equation in classifying.

Class 8A, Person or Thing Representative of a General Idea (e. g., music-piano, religion-Bible) is retained, the stimulus being in all cases a noun. Class 8B, similarly named, in which the stimulus is an adjective, is also retained. This is the very frequent and important adjective-noun association, in which the noun-response is appropriate to the stimulus-adjective, e. g., dark-night, soft-chair, sweet-sugar, swift-river. Class 8C, in which a noun-stimulus is “used by the subject as though it were an adjective” (e. g., carpet-tack) is omitted.

Class 9, in which the associate names a “general idea” of which the stimulus is “representative” (reverse of 8A), e. g., bathcleanliness, Bible-religion, is retained.

Class 10, in which the associate names the substance of which the stimulus is composed, e. g., river-water, window-glass, is retained. Classes 9 and 10 are of interest only because an occasional subject shows a marked tendency toward one or the other (or both) of these types, most subjects giving very few associates of either type.

Classes 11 and 14, including various types of associations in which the response names a property of a stimulus-noun, are merged into one class. Here are included the common noun-adjective associations in which the adjective is appropriate to the noun, e. g., mountain-high, spider-big, city-large, street-wide. Participle-responses, such as eagle-flying, baby-loved, are admitted, provided of course that they modify their nouns, as adjectives do. No responses but such adjectives and participles can safely be included here, except abstract nouns clearly naming a property of the stimulus, e. g., fruit-lusciousness, such that turning the abstract noun into an adjective (e. g., lusciousness into luscious) would give a clear predicate, of the noun-adjective type.
Classes 12, 13, 15, 16, 18, 19, 23, 26, 28, and 29, minor classes in which the personal equation of classifying is small, can be safely retained where such associations are numerous enough to justify it, but they are too uncommon to be of much use. No purpose is served by the former subdivision of some of these classes into varieties.

Classes 17, 20, 21, 22, 24, 25, and 27 are omitted, being not only uncommon, but subject to a large personal equation in classifying.

Group II, "Pure Verbal Associations." The writer is less sure than ever that he can tell such an association (the common "speech-habit") from a meaningful association. This category is therefore omitted.

3. In summary, the revised classification comprises:
   Class 1. Contiguity (Spatial).
   Class 2. Similarity.
      a. Synonyms, stimulus and response belonging to same part of speech.
      b. Synonyms, stimulus and response belonging to different parts of speech.
      c. Less exact similarities.
   Class 3. Co-ordinates.
   Class 4. Contrasts.
   Class 5. Common pairs.
   Class 6. Subordinates.
   Class 7. Supraordinates.
   Class 8. Response naming person or thing representative of general idea in stimulus.
      a. With stimulus as noun.
      b. With stimulus as adjective.
   Class 9. Response naming general idea of which stimulus is representative.
   Class 10. Response naming substance of which stimulus is composed.

Responses not falling into any of these categories are grouped as unclassified.

4. Using this method of classification, about 35 per cent of all associations (from the Kent-Rosanoff records considered) had to be thrown into the unclassified group on account of uncertainty as to their proper classification. It will be observed, in what follows, that the classes of association which are referred to in the comparison of manic-depressive with dementia praecox cases are among those least subject to error on account of possible inaccuracy of judgment on the part of the experimenter. The three classes chiefly used—namely, contiguity, adjective-noun, and noun-adjective—are clear-cut and subject to no large error.

II.

5. The cases intensively studied comprise twenty-one of manic-depressive depression, twelve of manic-depressive excitement, and thirteen of dementia praecox. Four cases of general paresis were also studied, making a total of fifty; but these four cases are of course too few to warrant any conclusions, and are of interest only for comparative purposes. In all cases the records were taken by Dr. F. L. Wells, using the Kent-Rosanoff word-list, as a part of the regular psychological work of the hospital. The writer's obligation to the hospital is especially apparent in this part of the work, and is more than can be stated in mere formal acknowledgment; he wishes at this point to express his gratitude for assistance given by members of the staff, especially Dr. C. M. Kelley and Mr. R. W. Buck, and most of all to Dr. F. L. Wells, under whose helpful supervision the work was done.

6. Study of fifty pathological cases shows no great preponderance of any one type of association in any one of the four psychotic groups named. Differences in central tendencies appear, and will be noted later, but individual differences between the members of a given group are so wide as to make impossible the clear-cut differentiation of groups, on the basis of the prevalence of one type of association. For example, in the category of contiguity, the dementia praecox cases range from 3 to 24 (associations given); manic-depressive depression ranges from 0 to 13, and manic-depressive depression from 3 to 25. In the category of synonyms, the ranges are 3 to 18, 5 to 13, and 0 to 22, respectively. The contrasts range from 0 to 27, from 0 to 30, and from 0 to 29, respectively. The same wide individual variations appear all the way through the classification, and, as far as these cases warrant a conclusion, it is impossible to choose any figure representing the number of associations of a given class, and to say
ences between the dementia of word-association, as studied by the free-association method.

It will, however, appear later in this study that the differences between psychotic groups are in some cases significant enough to suggest diagnostic usefulness.

7. A cursory study of the records suggested the possibility that differences of intelligence might play a part in the appearance of such inefficient responses as the synonyms belonging to parts of speech different from those of their respective stimuli (deep-depth, swift-speed). Pearson correlations were therefore worked out between the intelligence quotient (Terman) and the prevalence of this type of synonym in each subject (i.e., as compared with the total number of synonyms for the given subject). Similar correlations were computed between intelligence quotient and various other classes of association. None of these correlations were found to be large enough to be considered of any significance, except that between intelligence quotient and contiguity. This was −.21 (approximately twice the probable error).

8. It was observed that high correlations obtained in several cases between tendencies to certain types of association and tendencies to other common forms of association. Thus the Pearson correlation between co-ordinates and contrasts is +.73 (P. E. .04). No clear-cut difference between psychoses appears in this case. By the correlation method, however, two striking differences between the dementia precox cases and the manic-depressive cases appear. The rank-difference correlation, in twenty-one manic-depressive depressions, between the number of noun-adjective associations and the number of adjective-noun (8B) associations, is +.66, and in twelve cases of manic-depressive excitement it is +.72; in thirteen cases of dementia precox it is only +.28.

The correlation between contiguity and the adjective-noun category shows a striking contrast in the reverse direction. For dementia precox it is +.68, while for manic-depressive depression it is only +.20 and for manic-depressive excitement only +.22. A significant correlation appears in one psychosis in each case, while a smaller or insignificant correlation appears in the other. This is seen more clearly if one notes, on the correlation between adjective-noun and contiguity associations, the number of cases in which a subject's rank in the two variables is over half the maximum range apart; e.g., in manic-depressive depression the maximum range apart would be 21 − 1, or 20, so that an individual standing 14th in one variable and 3d in the other would thus vary over half the maximum possible range. Now five of the cases of manic-depressive depression vary thus widely, and two cases of manic-depressive excitement do so, while not a single case of dementia precox does so. Similarly, in the correlation between noun-adjective and adjective-noun associations, two out of thirteen cases of dementia precox vary over half the range, while only one out of twenty-one depressions and one out of twelve excitations do so; thirteen cases of dementia precox furnish as many such cases as thirty-three of manic-depressive psychosis.

The net result of these two correlations would be to suggest that a very wide discrepancy between the number of contiguity and the number of adjective-noun associations is atypical of dementia precox, and that a very great difference between the number of adjective-noun associations and the number of noun-adjective associations is atypical of manic-depressive psychosis. The validity of these tentative conclusions can only be ascertained from the study of larger groups.

9. It was noted above that no type of association was found of which one can say that the appearance of more than a certain number of such associations is a sure index of the presence of one of these two psychoses, and that the appearance of less than this number is a sure index of the other. Two differences in central tendencies are, however, sufficiently clear to deserve notice here. (a) In the contiguity class, the median for dementia precox is 9; for manic-depressive psychosis, 6. (b) The number of noun-adjective associations in dementia precox is very small, the median being 3; and only one subject gives over 6, this subject giving 11. In manic-depressive psychosis the median is 6, and ten individuals give over 11. The validity of conclusions regarding noun-adjective associations is, however, called in question by the fact that only four of these thirteen dementia precox cases are women, while eighteen of the thirty-three in the manic-depressive group are women; the fact that noun-adjective associations are less
frequent in men has often been pointed out, and is in fact evident in the present records. It may be noted that these four women give, respectively, 2, 2, 6, and 6 noun-adjective associations—figures which are of course unusually low, but often enough found in normal women and in manic-depressive cases. The scarcity of noun-adjective associations in dementia praecox is therefore offered only as a particular finding which may be reversed by further study. The presence of a very large number of noun-adjective associations is, however, frequent in manic-depressive psychosis; and in differential diagnosis between the two psychoses the appearance of a very large number of noun-adjective associations appears to be a fact in favor of a diagnosis of manic-depressive psychosis.

10. The question raised by this matter of noun-adjective associations led to a study of the influence of age, sex, and intelligence, as possible factors causing differences in group-findings. Except in the case of noun-adjective associations, just referred to, no significant differences traceable to these three variables could be found. (The median intelligence quotient and the median age for the two groups show only slight differences.)

11. A comparison of the groups was made on the basis of “frequency” (relative rarity or commonplacefulness of responses given, as computed by Kent and Rosanoff for 1000 normal subjects). No significant difference was found. The dementia praecox group had a median frequency slightly higher than that of the manic-depressive group—a result not expected from previous study, and due probably to deficiency of cases. The number of “individual reactions” (those given by no subject in the normal thousand) is, however, in keeping with former results, and is of value. The median number of individual reactions for dementia praecox is 13, while for manic-depressive psychosis it is 10. The individual variations are large, seven manic-depressive cases giving a number equal to or greater than the median for dementia praecox. The presence of a very large number of individual reactions is in general in favor of dementia praecox, as has of course been noted before. But the individual reactions deserve more notice than this. The individual reactions of each subject were classified separately. The result showed that in the dementia praecox group a much larger proportion of the individual reactions are contiguities than is the case in the manic-depressive group; seven of the thirteen cases of dementia praecox give two or more individual reactions which are also contiguities, while only four of thirty-three manic-depressive cases do so. This appears to justify the conclusion that in differential diagnosis between the two psychoses a large number of “individual contiguities” would be a fact in favor of a diagnosis of dementia praecox.

12. Various methods of combining the above differences into a system of differentiation have been tried. All are more or less arbitrary, and the present one is offered simply as a suggestion. First, in view of the fact that only one dementia praecox case gives over six noun-adjective associations, it may be stated that to give eight or more noun-adjective associations seems atypical of dementia praecox, and in differential diagnosis between the two psychoses the appearance of eight or more noun-adjective associations may be regarded as a manic-depressive trait. Second, in view of the high correlation, in dementia praecox cases, between the number of contiguity and the number of adjective-noun associations, to show a difference of ten or more between the number of contiguities and the number of adjective-noun (8B) associations is atypical of dementia praecox. Third, to give 20 or more individual reactions is atypical of manic-depressive psychosis. Now applying these three criteria to our forty-six cases under discussion, the net result would be a correct diagnosis in twenty cases, an incorrect diagnosis in three cases, and no decision in the remaining twenty-three cases. But it was noted above that a large proportion of the individual reactions in the dementia praecox cases are contiguities. It is found that four members of the dementia praecox group gives four or more individual reactions which are also contiguities, while one member of the manic-depressive group does so. If the criterion “twenty or more individual reactions” be withdrawn, and the criterion “four or more individual reactions which are contiguities” be substituted, the net result of the three criteria chosen is to give nineteen correct diagnoses and one incorrect diagnosis, leaving the rest undetermined. This suggests that if larger groups would show the same tendencies, and if the methods hit upon do not owe their success to the accidental distribution of this small dementia praecox group, these criteria would be of practical service in somewhere near 40 per cent of cases of differential diagnosis between...
dementia praecox and manic-depressive psychosis. Inasmuch as the criteria were chosen for these cases, it is of course unlikely that the same methods would have equal success in others.

13. Six of the respects in which differences have been found were studied in a group of twenty normal persons, ten men and ten women. The rank-difference correlation between the contiguity and adjective-noun associations was +.24, which is strikingly close to the figures found for manic-depressive psychosis (+.20 for depressions and +.22 for excitements), indicating that the high correlation in dementia praecox (+.68) is possibly significant. Similarly, the correlation, in the normal group, between noun-adjective and adjective-noun associations is +.25, which is strikingly close to the figure found for dementia praecox (+.28), indicating that the high correlation in manic-depressive psychosis (+.66 for depressions and +.72 for excitements) is possibly significant. As to the first two of the three criteria chosen for differential diagnosis between the two psychoses, five of the twenty normal persons give eight or more noun-adjective associations and three show a difference of ten or more between the number of contiguities and the number of adjective-noun associations. This indicates that the phraseology used above (paragraph 12) to the effect that such traits are atypical of dementia praecox is preferable to a statement that such traits are an index of manic-depressive psychosis. As regards individual reactions, however, no one of the twenty normal persons gives 20 or more of them, and no one gives 4 or more "individual contiguities." As far as the evidence goes, therefore, both of these two traits appear to be especially associated with dementia praecox.

14. An attempt was made to devise a new word-list which would have the advantage of including many words of emotional coloring, as well as some words of such infrequent usage as to get beneath the superficial verbal habits of the individual. Three hundred words were selected, two hundred and forty-one from the Woodworth-Wells Standard Series (Psych. Rev., Monograph Supplement, vol. 13, 1910-11), fourteen from one of the Jung lists, and forty-five selected by the writer. The great majority were rather less commonplace than the words of the Kent-Rosanoff list, but in only two cases out of three thousand associations taken was the subject unfamiliar with the stimulus-word. A few words in very common use were included simply for their emotional associations. A few pronouns, prepositions, conjunctions, and interjections were included, with the idea of breaking the "mental set," and possibly digging out something not obtainable superficially.

15. There were ten subjects—three cases of dementia praecox, three cases of manic-depressive depression, one case of general paresis, and three normal persons. In no case were more than one hundred words given to a subject on one day. Times were taken, but are not used in this study; their relationship to emotional associations was not evident superficially, and was not gone into with care.

16. The result was to obtain a very extraordinary number of synonyms. No matter what part of speech the stimulus was, the fact of its unusualness prompted the tendency to define it or to give a word of similar meaning. Of the 3000 reactions, 1254 are synonyms, while another 289 are of the "less definite similarity" type, making 1543, or over half of the total number. No significant difference between normal and pathological cases was observed. The total number of noun-adjective associations was 55, and the total number of adjective-noun associations 102, no significant differences appearing between normal and psychotic. The distribution in other classes of association is scattering and of small significance. The number of contingencies is naturally very small, on account of the nature of the stimuli.

17. The following words from the list brought sufficiently interesting responses, or showed a wide enough difference of response in different individuals, to justify, in a tentative way, their further use:

- heart
- bashful
- enjoy
- excite
- passion
- because
- above
- future
- sympathy
- indeed
- reason
- trouble
- insult (v)
- decay
- corrupt
- appear
- family
- laugh
- harsh
- body
- revenge
- agree
- advantage
- disgrace
- magic
- wonder
- disgust
- sacrifice
- expression
- death
- nuisance
- collapse
- hope
- time
- jealousy
- confidence
- attention
- care
- habit
- excuse (n)
- solemn
- treatment
- accurate
- helpless
- idiot
- time
- against
- reason
- control

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18. The results indicate, as far as they go, that unusual words do not succeed in striking deep, but merely produce synonyms. They are subject to many difficulties, chief among which for the present purpose is the difficulty of classifying with certainty the associations to which they give rise. For purposes of classification the Kent-Rosanoff list is in fact excellent, as long as one recognizes that some of the words, e.g., justice, memory, regularly give rise to associations which cannot confidently be classified, and as long as one bears in mind the necessity of throwing all such associations into the unclassified group. Whether or not the apparent differences between dementia praecox and manic-depressive psychosis noted in this paper are of genuine significance can best be determined by further study with the Kent-Rosanoff list. Other differences may be found with other lists, and the same differences might appear using other comparable stimuli; but the next step, it is believed, should be the application of these methods, with the Kent-Rosanoff list, to larger groups.

**ADDENDUM.**

**DETAILS OF PROCEDURE IN APPLYING THE CRITERION.**

In differential diagnosis of cases by the methods noted in Part II, above, the following standardization of procedure is offered. Three classes of association are utilized: contiguity, adjective-noun, and noun-adjective. (a) Under contiguity are included associations in which both stimulus and response name objective things, persons, or animals. All stimuli not of this character can be thrown out first, leaving the following 53 words from the Kent-Rosanoff list for use in the study of contiguity:

- table, window, stomach, head, tobacco
- man, citizen, stem, store, baby
- mountain, foot, lamp, whiskey, moon
- house, spider, bread, child, scissors
- mutton, needle, boy, hammer, salt
- hand, carpet, Bible, city, street
- fruit, girl, sheep, butter, king
- butterfly, earth, bath, doctor, cheese
- chair, soldier, cottage, thief, blossom
- woman, cabbage, priest, lion, bed

Associations with these stimuli are retained if they name objective things, persons, or animals, contiguous in space with those named by their respective stimuli, e.g., table-tablecloth, head-hair, store-poker. In some cases there is no intrinsic evidence of necessary spatial contiguity, e.g., table-book, table-linen; these are included if it is evident that it is juxtaposition rather than similarity that determines the association. If similarity may plausibly be the determining quality, as in table-chair (two kinds of furniture) or moon-stars (two kinds of heavenly body), the association cannot of course be regarded as a case of contiguity. Associations selecting a part of the object named by the stimulus, such as table-leg, city-inhabitants, or enlarging the object, such as hand-body, stem-plant, are included. The various features of bathing, such as water and sponge, as responses to bath, are considered such selections of parts of a situation. Such associations as bath-tub, and table-cloth, must, however, be excluded because they complete compound words, and therefore may plausibly be mere speech-habits. Speech-habits are only considered when they thus throw doubt on associations otherwise classifiable; but their probable presence, as in bread-butter, necessitates exclusion of the association. Bath-bath-tub, and table-tublicloth, it will be noted, are not subject to this objection, inasmuch as the response begins by repeating the stimulus-word, instead of merely completing a phrase. It is occasionally necessary, unfortunately, to leave purely verbal considerations aside (which are of course the easiest to handle objectively), and face the meaning of the association entirely on its own merits; e.g., the association moon-lovers undoubtedly has its roots in contiguity, and should be so recognized, though the moon and the lovers are scarcely contiguous in space. Such cases are not common. (b) Adjective-noun associations include only those in which the stimulus-adjective may appropriately be applied to the noun-response, e.g., dark-night, soft-chair, bitter-aloes. Participles are considered adjectives, if they modify noun-responses. Occasionally a pronoun plays the part usually played by a noun, e.g., thirsty-self. When the noun merely repeats the meaning of the adjective, e.g., deep-depth, swift-speed, the association is not included here. Very occasionally there is possible doubt whether a response is a mere synonym or a noun modified by the stimulus, e.g., loud-noise. The illustration just given is considered an adjective-noun association. The vast majority of adjective-noun associations are perfectly clear. (c) Adjective-responses modifying stimulus-nouns (noun-adjective associations) are such as foot-small, spider-detetable, butter-yellow, and associations in which the adjective is replaced by its corresponding abstract noun, e.g., man-intelligence, fruit-lusciousness. No noun is included unless it is in this way obviously related to an appropriate adjective.

When the Kent-Rosanoff association list has been given to a subject, the number of associations of each of the above three classes is recorded. The "individual reactions" are noted by means of the frequency tables of Kent and Rosanoff. The number of individual reactions which are contiguities is noted. Now for each subject the three criteria...

finally selected (in paragraph 12, above) for the differential diagnosis of manic-depressive psychosis and dementia praecox are applied.

The method may be resolved to this: (a) the presence of eight or more noun-adjective associations is against dementia praecox; (b) a difference of 10 or more between the number of contiguities and the number of adjective-noun associations is against dementia praecox; (c) the presence of four or more individual reactions which are also contiguities is in favor of dementia praecox. If the question is simply one of deciding between the two psychoses considered here, (a) and (b) are of course in favor of manic-depressive psychosis. If the subject shows none of the three traits just named, or if he shows one in favor of each of the two psychoses, the method leaves him “undetermined.” Otherwise, the method will make a decision in his case. How much weight should be given to its decision can only be determined by the accumulation of more data.³

³Data accumulated since the completion of this paper tend on the whole to support the validity of criteria (a) and (b), but to cast very serious doubt on criterion (c). The work continues.