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GENERAL REVIEWS AND SUMMARIES

EXPERIMENTAL PATHOLOGY OF THE HIGHER MENTAL PROCESSES

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G. G. Fernald (5) publishes the results of a general series of mental tests with an unselected group of reformatory admissions, 100 cases. Most of the paper is devoted to describing the tests and the clinical records of the subjects; the data are fully presented, but only briefly worked out. The tests are denominated: (1) weight discrimination, a series of ten similar weights ranging from 54 to 86 gm. with 4 gm. differences, to be arranged in order; (2) extent of movement, by drawing a line equal to the extent of a movement made five or six times along a given scale; (3) the Holmgren wools for color-blindness; (4) maximum number of taps in 10 seconds, registered by plate, stylus and electric counter; (5) the so-called 3-hole test, one of motor accuracy, similarly registered; (6) a new test, termed achievement capacity, measuring the time the subject will stand on his toes, when told to do so as long as possible (a special recording apparatus is used); (7) a test of speed in the cancellation of a given numeral from a standard blank; (8) a calculation test, counting backwards from 31 by 3's (cf. the familiar "100-7"); (9) the association test of Kent and Rosanoff, evaluated according to the original procedure of these authors; (10) recognition memory, the selection of 10 previously seen picture-post-cards from a group of 20; (11) ethical perception, a series of questions in moral conduct, capable of *yes* or *no* answers; (12) ethical discrimination, a new application of the order of merit method, in which a series of described offences are graded in order of their gravity.

According to the objective quality of performance in these tests, the subjects could be ordered in a range from 1 to 100, and any further subject tested could be assigned to a proper place in this range, in respect to the traits covered by the tests. The object was to effect a clearer separation between responsible and irresponsible groups. As here employed, the tests which seemed to aid in this classification were those of weight discrimination, ethical discrimination, achievement capacity, extent of movement, recognition memory, calculation and cancellation; those which failed to justify themselves were color-vision, tapping, 3-hole, ethical perception and free association. Upon the basis of the tests, three groups were made. The lowest fourth are classified as defective, all of whom could and probably should be segregated. A second quarter are characterized as subnormal, but reacting well to reformatory discipline. The remainder, nearly half, are normal and responsible intellectually. There is much more in the data than the paper brings to view.

Mikulski (7) contributes an unusually clear account of some apprehension and memory experiments. The subjects were 12 normal (educated) and 8 pathological (mostly uneducated) individuals, the latter comprising 3 epileptics, 3 psychopathic personalities, and 2 hysterics, all women. The exposure apparatus used was the pendulum described by Kramer, the exposure time being 15 σ . It was not released by the subject, but by the experimenter after a 1-second "get-ready" signal. The stimuli consisted of cards upon which 3 rows of 3 letters each were typewritten. Only 100 different cards were used, the order being varied, and the letters were arranged to form, so far as possible, nonsense syllables. As noted, two sorts of experiments were performed with this material, in the first of which the subject reported "as soon as clearly perceived" (up to 2 seconds), while in the second set a period of 40 seconds elapsed before the report. Five experiments of 50 stimuli per subject were made of each set on alternate days. The subjects gave the name and position of each letter, and divided their responses into two groups, according as they had been sure of them or not. It was not found practicable to distinguish between certainty of character and certainty of position.

In the apprehension experiments is presented the average number of responses given by each subject, which in turn averages about 3.8 for the normal and 2.7 for the pathological, out of the possible 9. Not all, of course, were correct, the mistakes averaging 15 per cent. in the normal, in the pathological 19 per cent. It is not calculated, but stated that there is no correlation between the total efficiency and

the number of errors. Of the responses in the normal, an average of 90 per cent. was given as certain, of 10 per cent. as uncertain. The pathological subjects change these averages to 94 per cent. and 6 per cent. Of the certain responses, 89 per cent. were correct in the normal subjects, whereas of all responses, only 85 per cent. were so. In the pathological cases, 84 per cent. of certain responses were correct as against 81 per cent. of all responses. The feeling of certainty is thus very slightly more reliable in the normal than in the pathological cases. Among the uncertain responses 44 per cent. were correct in the normal, 33 per cent. in the pathological cases; the former are therefore somewhat more inclined to rate as uncertain, responses that are really correct. A general practice gain in the number of responses is present in both groups of subjects, the relative gain in the pathological subjects being here somewhat greater than in the normal, represented by 34.6 per cent. as against 27.5 per cent. The per cent. of uncertain responses was nearly unchanged by practice in the normal, but decreases by about one half in the pathological group. The uncertain responses become slightly more correct in the normal, no tendency appearing in the pathological group. The later portions of each day's series show some "warming up" gain over the earlier, not so clear in the pathological as in the normal subjects. The per cent. of uncertain responses is here also unchanged in the normal, and again decreases in the pathological.

The *Merkversuche* are similarly treated. The total number of responses averages higher than before, and so does the per cent. of errors, the figures being 4.3 and 17.7 per cent. for the normal, 2.9 and 20.8 per cent. for the pathological group. The per cent. of certain responses is slightly lower in both groups than for the apprehension experiments, the figures being 87.8 per cent. and 93.8 per cent.; the uncertain responses are thus more numerous than above. They are again fewer in the pathological group; *per contra*, these do not have so good a consciousness of the sources of error as the normal. The feeling of certainty loses in value through the pause, through factors that we do not perceive. Among the uncertain responses 46 per cent. were correct in the normal, 38 per cent. in the pathological; in each case correspondingly more than with the apprehension experiments. The practice effect is rather less marked here than in the apprehension experiments; the per cent. of uncertain responses, however, decreases very much with practice in the normal, less markedly in the pathological group. The "warming up" phenomena within the series are but little if at all, in evidence with either group; the ratio of uncer-

tain responses behaves in about the same way as in the apprehension experiments.

Two articles, covering much the same ground, are published by Bischoff (2, 3) regarding a special method for the clinical observation of memory. It is based upon a procedure described at the instance of Bischoff by Vieregge¹ some five years since, concerning the number of heard figures that could be correctly reproduced at once, after one minute, and after one minute with distraction. The series used (and quoted) vary in length up to twelve figures, and a standard rate for enunciating them is given. The digits are not, however, given separately, but in notational sequence, *i. e.*, not 5, 2, 6, 9, etc., but five million two hundred sixty-nine thousand, etc. This way is more difficult, but actual comparison seems to show its greater reliability. The subjects are then less likely to use different methods of grouping the stimuli. The more complex question presents itself of whether one should work down from too difficult series or up from too easy ones. The author takes two points, the largest number always repeated correctly, and the smallest number never repeated correctly, and plots the curve between them. Testing with ten normal subjects, the first of these quantities is found to range between 3 and 6, the second between 6 and 11, out of ten trials for series of lengths up to 11. Somewhere in the range between the two quantities is to be found the point to serve as the standard for memory capacity. If now the series are given beginning with the largest, the effect of practice is not so pronounced, and the tests are more reliable, with smaller variations. This procedure is therefore the one recommended. Attention is called to the desirability of making the tests as expeditiously as possible, and of giving warning signals before the beginning of each series. Visual exposure was used in testing the retention of the stimuli, the number retained at intervals of immediacy, 5 sec., 15 sec., 30 sec. and 60 sec., being 40, 49, 54, 48, 38. A convenient method for distraction during the interval was counting backwards from 200 to the beats of a metronome, but an interval of not less than a minute should be used for such experiments. If a one digit stimulus cannot be correctly reproduced at the given interval, the result is stated in terms of the longest time in which it can be. The other paper, though very brief, reproduces some interesting additional data, discusses further the detailed nature of errors, and gives perhaps the better general orientation in the problem.

Upon this procedure Peters (8) bases one of the most extensive

¹ *Allg. Zsch. f. Psychiat.*, 1908, 65, 207-239.

studies of memory in general paralysis that we have. The only important differences of experimental routine were that the subject always gave at once what was remembered, whether or not it was to be repeated after a pause; and that the counting was discarded as being not a distraction but an interference, repetition of foreign words being substituted. A somewhat exacter method of evaluation is also sought for. Of the 68 cases of general paralysis in the institution on September 30, 1911, 13 were too demented to be available, 4 failed to coöperate, and the results discussed are gathered from the remaining 51.

The experiments in immediate memory the author designates by *A*, those with the one-minute pause by *B*, those with the one-minute pause and distraction by *C*. The general average efficiency of reproduction in the *A* experiments is 3.9 figures, about half of the normal according to Vieregge. Ten patients were unable to reproduce even a single figure after the pause of the *B* experiments. For the remainder the corresponding average is a retention of 2.7 figures, for all, 2.2. In the *C* experiments 22 patients retain nothing, the comparative average of the remainder being 1.7 figures, for all, .96 figure. Between these different capacities there is not sufficient correlation to make them estimable one from another; the *B* and *C* experiments have quite poor records, with good ones in the immediate retention. It was especially the distractible and inattentive cases who contributed to this latter result. Sixty-two per cent. of the cases had been under observation for a year or more; of six groups of cases, the first in memory was the fourth in length of hospital stay. There is little relation between the quality of performance and the length of time in the hospital, manifesting the varying rates at which the disease progresses. For measuring the progress, however, the method seems to have special value, particularly the distraction feature.

The localization of the errors is studied. In the five successive memory series given, the *A* experiments show a consistent increase in the errors from first to last, a manifestation of the well-recognized fatigability in this disorder. It is not the case with the *B* experiments, where there is an alteration of few and many errors, perhaps showing periods of recovery. The *C* experiments show an increase of errors in the later series, but by no means so marked as the *A*. The second in order of the experimental series shows some decrease in errors, which the author attributes to a more or less conscious failure to coöperate in the conditions of distraction. There is also calculated the per-

centage of errors affecting the units, tens, etc., places in the single series. The hundreds and units places suffer the most, the tens, which come at the end of the series, rather less.

Among the different types of errors, the omissions are the more frequent in the *A* experiments, least in the *C*. The "free" errors, *i. e.*, substitutions whose origin cannot be determined, are relatively more frequent in the *B* and *C* than in the *A* experiments, as we would expect. Figures added to the original series are by far the most frequent in the *B* experiments, where they seem to have been produced mainly by *Einstellung* to the longer memory series used in the preceding *A* experiments. The metatheses, partial or total, show a progressive decrease in frequency through the three types of experiment, perhaps in relation to the decreasing length of the experimental series. Among the errors of perseveration, *intra*-iteration (within the single series) and *inter*-iteration (between separate series) are distinguished. The former is more common in the *A* experiments, the latter in the other two. The special liability of these cases to errors of this sort, where pauses are involved, is brought into relation with the well-known difficulty of time orientation—accurate ordering of events—in the disease generally. Some interesting stereotypies of perseveration were noted. They are of two sorts; either made up of figures previously given, or of entirely original content (*Konfabulierend*). These latter are not very different from what is observed under similar circumstances in dementia præcox, but it seems as though such cases have more of a feeling of the nonsense character of their answers, a manifestation of their negativism. The present cases give their answers as though really thought correct. Sometimes the stereotypy affects only certain digits. In much demented cases stereotyped phrases may be mingled with the figures.

To some extent the cases could be classified according to their predilection for certain types of errors. The two principal groups are according to the dominance of errors of omission or total metathesis. The groups are the result of different attention types, fluctuating (distributive) or fixating; an analytic or synthetic memory type; or one with strong or weak tendency to perseveration. While, owing to the protean character of the mental manifestations in general paralysis many such types are exemplified, their psychopathological relations can be better studied in other psychoses, having a more unitary mental picture.

Any experimental study must command attention that follows its cases through a period of six or more years. Such is that by

Levy-Suhl (6) on the "experimental influencing of the train of thought." Starting out from the familiar tendency in various clinical groups to react to irrelevantly heard words in an abnormal, distractible, idea-of-reference manner, he formulates his experimental inquiries as: (1) How do different cases of mental disease react to definite word-stimuli, intentionally uttered to be perceived by them, and especially how do those continuously speaking of their own accord react to these brusque interruptions? (2) Are there in the reactions to such stimuli any characteristics that permit the ordering of the cases into psychological groups, and are pathognomonic for one or another mental disease?

The subjects appear to have been mainly disturbed cases, the procedure consisting of noting for a time the spontaneous utterances of the patient, and then with no preliminaries or instructions to speak one by one the given series of stimulus words; the observed reaction of the patient thereto being precisely described.

An obvious relation exists between this method and the free association test, to a destructive criticism of which a following portion of the paper is devoted. Objections are raised on account of the impossible psychological conditions it demands, its remote or even contradictory relation to the reactions of daily life. The entire fulfilment of the conditions could only discover certain formal principles and rules, but necessarily confuses that which is essential for practical and diagnostic application, and, exactly what the experiments are often for, the features individually characteristic of the personality. There is great reason to distrust the experiment in all these directions, and the conventional classification of the associations is full of uncertainties, incapable of quantitative evaluation. There follow further theoretical objections to different features in the interpretation of the association phenomena; *e. g.*, the fallacy of assuming the constant value of the same stimulus word; the variability of the preassociative starting-point, especially when the association-word itself is ambiguous and the like; some interesting experimental demonstrations of *konstellative Vorstellungserweckung* are quoted.

The subsequent treatment of the matter is sounder than the indications of the above paragraph. The stimulus words used were mostly nouns, especially those likely to have strong emotional associations or to arouse vivid imagery; or more indifferent words, and nonsense neologisms. Sometimes special words were used for special cases. Three types of reaction, *resp.* behavior, in the experimental situation are distinguished and described in detail. The

pathological reactions consist essentially in ignoring the unusual character of the interruption, by either questioning its meaning in some more or less natural way, or by bringing it directly into the flighty talk. The more remote the associative processes, the more certainly pathological. The principle of classifying the responses themselves is very properly according to their degree of personal reference, three distinct groups being made, the last including also "dissociative" (scattered) responses. According to these categories the cases studied divide into four types: (1) normal, as above; (2) showing indifference to the interruption, indifference to the content of the stimulus, whether emotional or nonsense, for the most part neutral, superficial associations, of the manic-flighty type; (3) a "selective hyperprosexia" affected differently by different kinds of stimulus words, and showing a much more personal responsiveness; (4) characterized by tendency to incorporate the stimulus word into the stream of thought, but not logically, and in a more or less scattered way, with occasional neologisms.

The cases, of which there are forty-four, are excellently presented, in order according to their assignment to the four groups. It is impossible to summarize the notes, but they repay study very well indeed. In conclusion, the types are reviewed according to the diagnostic entities into which they fall. If one goes over the case histories, and recasts the table on p. 141 more strictly according to Kraepelinian conceptions (the author follows Ziehen) the paranoid conditions characteristic of group 3 divide about equally between manic-depressive and dementia præcox states. Those of group 4 go to dementia præcox, giving a table as follows:

Group	Manic- Depressive	Dementia Præcox	General Paralysis	Hysteria, Secondary Delirium	Total
I					
II	10	1	3	1	4
IIa		1			11
				4	5
III	9	7			16
IV		7	1		8

The experiment is, then, one of very distinct clinical significance.

A comparative study of affective factors in the association experiment is reported by Birnbaum (1). The method involved the use of a series of association words consisting of twenty generally indifferent words (*hand, house, hat*), forty words of general emotional import, both pleasant and unpleasant (*death, health, riches*), and a few others whose emotional import was confined to the special case.

The words were not given in random order, but with the indicated groups kept separate. Times were measured by a stop-watch, those over 30 seconds were counted as failures, and in any case where it appeared called for the subject was asked if anything special had been thought of. The number of subjects in each group was small, but, besides normal individuals, included hysterics, delusional or paranoic states, with manic-depressive and "psychogenic" depressions, these groups being selected because of the particular affective anomalies they show. The method was to compare the reactions to the *a priori* indifferent stimulus words with the emotional ones, and this also in varying mental situations, as after a discussion of symptoms, or the occurrence of some event of special significance to the subject. These refinements of procedure were carried out only with the abnormal cases. The sources of error in the method are discussed, though they scarcely seem rated at their proper value. With the normal subjects the essential result was that the (*a priori*) emotional stimulus words did not have longer reaction times (by the median) than the indifferent ones. Nor is there any essential difference in the reactions to the pleasant and unpleasant stimulus words. In fact there seemed to be no type difference of any sort between the associations of the different groups; normally, therefore, the affective character of the stimulus word does not regularly insure a special affective value in the reaction.

It was then attempted to see if this phenomenon persisted in hysterical individuals, with their more labile and sensitive emotional processes. Here the median is for the emotional stimulus words slightly longer than for the indifferent ones, but the author is disinclined to explain this difference on affective grounds. Not even the peculiar change in the type of reaction, *i. e.*, to sentences and quotations, is interpreted in this way. Specially emotional reactions do seem to occur more frequently to stimulus words selected with regard to the individual case; but it is expressly noted that the subjects might be obviously much under the domination of particular complexes, to which they reacted with great emotivity, without their having any marked influence upon the character of the associations. The experiments under special conditions (*unter dem Einfluss gefühlbetonter Vorreize*) were only somewhat more characterized by the bringing out of increased emotional reactions. The difference is, however, again very dependent on the words selected for the individual case. Mention is made of the effect on the associations of special incidents, as unsuccessful attempts to escape, or to obtain release by legal process; also the influence of delusional ideas.

The paranoic conditions were confined to cases without dementia; and as before, the results were not uniform. Occasionally the reactions would be made especially matter-of-fact, as it were for dissimulation. The affective influence of the delusional ideas upon the reactions is again essentially confined to the stimulus words of already given emotional import.

The melancholic depressions are naturally characterized by greatly increased reaction times. The indifferent and emotional stimuli are equally affected; the tendency to longer times in the latter is not marked. Possibly the reactions to pleasant stimulus words are less *gehemmt* than to unpleasant ones, but even this would have no clear psychological meaning. The increased reaction time is not therefore directly dependent on the emotional character of the reactions. Inadequacy, monotony, and inferior lability mark the content of the responses. Specially noteworthy is it that the content of the reactions need not be depressive, even in most deep melancholias; the emotional state does not necessarily betray itself therein. When the tendency to depressive responses is present, it affects the emotional stimulus words more than the indifferent, and the unpleasant ones more than the pleasant. Individually selected stimuli are of relatively little additional affective value. This is seen again in the experiments under special circumstances, where there were no particular alterations, either in respect to reaction time, or content of the response. The whole group of phenomena in these depressions seems to be conditioned by thinking disorder rather than emotionally.

The other depressions considered (compulsive and hysterical) are distinguished from the above by a greater egocentricity of the reaction type, though this might be brought out only in experiments under special circumstance. There is greater lability, and not the same narrowing of the field of thought. There is also more tendency to reactions of a pleasant character, indicating the greater superficiality of the depression. These data may have a certain diagnostic value.

Eastman and Rosanoff (4) contribute the results of association experiments with 253 mainly delinquent, also feeble-minded, children, boys greatly preponderating. The ages ranged almost entirely from 11 to 17 years. The test material was the regular Kent-Rosanoff word-list, and the results are treated in the manner described in the second part of Kent and Rosanoff's original paper. In certain ways the present group is found to differ from the 1,000 normal subjects, as well as from the 247 insane cases of the previous study (though to

these comparisons there enter factors of age irrelevant to the abnormal mental conditions). Thus failures of reaction are here especially frequent, and occur mainly to words representing abstract, complex or uncommon concepts; indicating a characteristic arrest of development as distinct from normal mentality, or acquired mental disorder. "Non-specific" reactions are a little more common in the present than the previous groups, averaging 8.4 per cent. per subject, as against slightly over 6 per cent. The tendency towards "common" reactions, markedly weakened in mental disease, is less markedly weakened here, the average per cent. of individual reactions being about double the normal instead of four times the normal as in the insane. Certain sorts of individual reactions are especially prominent. A number of actual test-records are given, which are always instructive; and finally a statement of results with 15 normal children under eight who furnish records resembling the older feeble-minded, and a similar group over ten, who more resemble normal adults. Attention is thus called to the necessity of studying association types developmentally.

Of entirely coördinate importance with these studies of the association experiments is that of Pfenninger (9) but as the reviewer has already noticed it in these columns,¹ it need be mentioned only that it investigates the effects of repeating the same series of stimulus words with small groups of normal and dementia præcox subjects, for a period of eight days. The results contain a number of very interesting features.

Pfersdorff (10) contributes a study, extremely formal in character, of the types of association to be observed in the speech of the mentally diseased. The material consists of thirteen cases, which are very fully presented, but whose clinical pictures are not brought into any intimate relation with the special problem. They seem to have belonged almost entirely to the manic-depressive and dementia præcox groups. Attention is directed to the general motor aspects of speech, and its relation to other features of motility in the cases; the question of accent is specially discussed. The groupings are made according to these criteria; three are distinguished, the disorders of the first being the result of a primary *Rededrang*, of the second dependent rather upon affective disturbances, while in the third they are less of a motor character and more dependent upon the content of speech. The whole treatment bespeaks a grammatical rather than a psychological viewpoint.

¹ PSYCHOLOGICAL BULLETIN, 1912, 9, 435-438.

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MENTAL HEREDITY AND EUGENICS

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The work of the last few years has brought the physician and the psychologist more closely together than ever before. The questions of mental defect and mental disease have needed study from both standpoints, and the aid mutually rendered has been invaluable. But now another feature of the problem has drawn the two sciences still more closely together. Both physician and psychologist recognize that, in view of the new light that recent study, observations and investigations have thrown upon abnormal mental conditions, both must stand together so as to be better able to spread this information and educate the people up to the reforms necessary.

Eugenics—preventive medicine—having as its aim the saving of the race rather than the individual has come to the fore and there seems to be none of its various fields of activity but has interested some one as its advocate. Solomon (27) has stated in a concise masterly form the chief aims of the eugenics movement of today