

The table on page 14 is the record of an examination of stools containing small curds, all but one of which came from the service of Dr. John Lovett Morse at the Infants' Hospital.

As controls, the writer has examined a number of *normal* stools from well children. Those normal stools are recorded in the table on page 15.

The small curds vary in their reaction and, as would be expected, those which reacted acid to litmus have more fatty acid than those which are alkaline. The soap decreases as the fatty acid increases. In those curds in which the reaction is alkaline or neutral, the largest part of the fat in the stool is in the form of soap. In this respect small curds contrast sharply with large curds, for in the small curds the greater part of the fat in the stool is split into fatty acid and soap, while in the large curds the greater part of the fat is unsplit and is in the form of neutral fat.¹ The sum of the fatty acid and soap in every case but one is over 80% of the total fat in the stool. It seems, therefore, to be characteristic of the small curd that a greater percentage of the fat is split than in the normal stool. Furthermore, the percentage of total fat in the dried stool is much higher than the normal, the average being 60%, as compared with 38.4% in the normal stools. The percentage of nitrogen in small curds is either normal or markedly diminished, while the percentage of nitrogen in the large curds is twice to four times as much as in the small curds. Since the majority of the fat in the stool is split into fatty acids and soap, and since the nitrogen is relatively low in amount (see Note 2), it seems probable that the protein components (the nitrogen-containing elements of the food) have been digested and absorbed and that the nitrogen in the stool represents the bodies of bacteria and intestinal secretions. The microscopic examination of small curds is additional evidence, for in no case do they show the clear white binding substance which is typical of the large curd.

CONCLUSIONS.

Small curds are composed mainly of fat, mostly in the form of fatty acid and soaps. There is no evidence that they contain casein-like material and they have, like the normal stool, a low percentage of nitrogen. They represent the fat in the food rather than protein.

NOTE 1. According to Blauberg,⁸ in infants fed on cows' milk during the first week of life, 50% of the dried stool consists of fat. This percentage decreases as the child grows older and according to Uffelman,^{9, 10, 11} the total fat in stools of babies over that age is 14% to 25.8% of the dried stool. The figures in the above table agree in general with these statements. The table also shows that the sum of the fatty acids and soaps in 75% or more of the total fat and the neutral fat is 25% or less. This agrees with Fr. Müller's³ figures obtained in adult stools, in which he gave for an average, neutral fat 24.2%, fatty acids 38.8% and soaps 37%. In other words, about 75% of the excreted in fat was split. The average percentage of nitrogen in dried stools was 3.38%, which is

somewhat lower than the figures given by Biedert,¹² who found in the stool of an infant fed on cows' milk an average of 4.23%.

NOTE 2. Like casein, the large curds are easily soluble in 5% sodium hydrate and are precipitated in a heavy flocculent precipitate by acetic acid. This precipitate was washed with hot 95% alcohol until the washings gave no precipitate with silver nitrate solution. It was then dried to constant weight and contained in one case 14.1% of nitrogen and in another 16% of nitrogen by the Kjeldahl method. The small curds, on the other hand, are only slightly soluble in 5% sodium hydrate, for on the addition of acetic acid only a slight cloudy precipitate appears and the bulk of the curd is apparently undiminished.

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- ³ Schmidt and Strassburger: Die Faeces des Menschen, 1905 ed.
- ⁴ Biedert: Jahrb. für Kinderheilkunde, xvii, 1881, p. 251.
- ⁵ Monti: *Ibid.*, i, 1868, p. 299.
- ⁶ Wiederhofer: Gerhard's Handbuch der Kinderkrankheiten, iv, 2.
- ⁷ Wegschneider: Ueber die normale Verdauung bei Säuglingen. Inaug. Dissert., Strassburg, 1875.
- ⁸ Blauberg: Experimentelle und kritische Studien über Säuglingsfaeces, etc., Berlin, 1897.
- ⁹ Uffelman: Arch. für Kinderh., ii, 1881, p. 112.
- ¹⁰ Uffelman: Deut. Arch. für klin. Med., xxviii, 1881.
- ¹¹ Uffelman: Pflügers Arch., xix, 1882, 339.
- ¹² Biedert: Kinderernährung im Säuglingsalter, etc., 1905, fifth edition, p. 61.

THE ASSOCIATION TEST AND PSYCHO-ANALYSIS.*

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OF the various attributes of consciousness which normal psychology studies, the one of most practical interest to the medical man is that of association. Upon it depends our memory, and it is this function of association that we put in action when we say, "Let me think," which really means, Let me remember or associate.

Anatomically, association depends upon the fact that every sensory area in the cerebral cortex, the sight in the occipital lobe, hearing in the temporal, etc., is connected with every other sensory center by a large number of association neurons. You will remember that what used to be called the silent area of the brain, the frontal lobes, is now known to be composed mainly of these association neurons, a great central switch-board to which incoming sensory stimuli are referred and worked over into appropriate motor responses. You will also recall that the corpus callosum is the large association tract connecting the cerebral hemispheres, and there are many lesser groups.

So we have these fibers associating every sensory area with every other. Physiologically we are unable to apply actual experiments which will demonstrate the action of these fibers except in the simplest of cord reflexes. It remained for psychology, approaching the study of the mind from the analytic side of consciousness (introspection and laboratory experiment), to point out the function of these associations. From the psycho-physical standpoint, then, we may think of it thus: Let every sensory neuron in the brain

* Read before the Somerville Medical Society, June 4, 1908.

stand for a possible idea, which, as you are aware, is nothing but the reproduction or memory of a thing once perceived. It then takes but small knowledge of physics to see that if thoughts are to be related they must have some medium of relationship, and what more natural than to look for such through these association fibers which we can actually see present in the brain even with the unaided eye.

Now psychologists have found, and you can all verify it by a little careful introspection, that ideas or experiences are not recalled without some impression or related memory present in thought to serve as the motive for the recall, and this is called the Law of Association. If I say *a* you instinctively think *b* because you early established such a neural habit; this is called association by continuity, i. e., we recall things in the sequences in which they most frequently occur. Or we may remember things through their similarity or contrast.

As life goes on and our experiences are multiplied, the early perceptions collect about them other related perceptions and by association are built into synthesized thought systems, each in itself complete, but also capable of association with all other thought systems. It is as if consciousness were a placid lake with a large number of little whirlpools (thought systems). Each pool is in itself complete, but its water may yet form a part of any of the other pools. This is the normal state. When we come to study the disturbances of consciousness, as we do in neurasthenia and hysteria and in those types which Grasset has described as semi-insane and semi-responsible, we find this conception of the association of ideas, especially when joined to our anatomical knowledge, of inestimable value. It gives us two working methods.

1. The association test.
2. Psycho-analysis.

1. The association test originated in the psychological laboratory of the father of experimental psychology, Professor Wundt, of Leipsic. In this country Dr. Peterson, of New York, and Coriat, in Boston, have written of using it in their clinics; it is now being tried out by many. Some of you may have seen an article by Professor Münsterberg in *McClure's* last fall entitled "The Third Degree," in which he described the association test as the one by which he came to the conclusion that Harry Orchard was telling the truth in his terrible confessions. The test offers us a ready means of getting at facts which either are forgotten or which for some reason of his own the patient wants to conceal. It may also in some measure help us to dig out subconscious fears, and here may be found to assist psycho-analysis.

The test requires no apparatus save an ordinary stop watch, and is performed thus: A series of 20, 50 or 100 indifferent words are read off to the subject. After each word the subject responds verbally with the first word that occurs to him and without taking time for selective thought. Now having talked with the subject, one naturally has built up some idea of the possible nature of the

trouble. So among the test words one introduces some which would naturally be associated with this line of thought; i. e., if you suspect that a patient has a husband whose actions are gnawing at her heart strings, but of whom she is too proud to speak, you may introduce simple words as alcohol, woman, etc. Now the essence of the test is built upon the fact that it takes time to think and a longer time to think twice; also that associations which create an emotion, that is, which possess much feeling tone, may be greatly prolonged. Indeed, in patients whose emotions are very intense, we may be unable to get any associations at all. People vary as to the time of indifferent associations but will usually take from one to three seconds, averaging, perhaps, one and one-half seconds to two seconds. If now the word which pops into the mind is one which the subject would prefer to conceal, he will attempt to give another word, but the substitution will take time and so his reaction will be prolonged just in proportion to the amount of emotion which the first word association caused. One may also form a fair estimate of the patient's power of immediate retention or memory by repeating the words and asking for the same replies. And we can then go further, taking up each association and asking for a detailed account of the train of thought which was suggested. It is also possible to study somewhat the power of inhibition by requesting that the first set be checked back and another set substituted. Indeed, the association test opens up many possibilities. The data so obtained will, of course, not be told to the patient unless by so doing we may expect benefit, but it may nevertheless be used in directing our treatment.

Here is a case in which this method has proved of use.

CASE I. Miss Z., age thirty-five, at time of onset of illness was acting as housekeeper for a widower. She developed a typical neurasthenia, with very sensitive spine, constant fatigue, etc. There was a history of having carried a heavy load and strained her back which was followed by metrorrhagia, but she denied pelvic trouble or discomfort. The association test, however, gave the following result.

Test word.	Association.	Time. Sec.
dog	hair	2*
bear	foot	2
woods	forest	4
rose	beautiful	2
mother	dear	5
arm	limb	8
goat	obstinate	2
home	place	3
stairway	hard work	6
flow	rapid	2
baby	delight	6
finger	ring	41
beer	German	2
country	autumn	9
soup	celery	3
secret	pain	18
wren	black	2
whale	monster	31
father	mother	3
tin	thin	3

* The fractions have been omitted.

From this we made the deduction that she had a secret (18 sec.) which was associated with pain and which was making her unhappy; also that its cause had occurred the previous autumn (9 sec.). The general emotional reactions led us to suspect a conception at that time, followed by an abortion. Local examination revealed a large sub-involuted uterus with a patulous discharging os and sensitive appendages. Needless to say, persistent local treatment played an important part in her cure, which took about three months.

So much for the association test; you see that it is practically a method of analyzing the higher, waking or superconsciousness. If now we desire to go deeper into the patient's thoughts, into his sub- or, as Prince prefers to call it, his co-consciousness, we may have recourse to another method known as psycho-analysis.

2. *Psycho-analysis*. This method was early suggested by Breuer and worked out in detail by Janet and Freud. It is based on the simple facts of association of ideas. We know now that all memory depends upon association and that this process is quite as often subconscious as conscious; that in certain pathologic states of the brain, systems of neurons which have formed a synthetized thought group may become simply irritable, anesthetic or hyperesthetic. When anesthetic, as Janet has pointed out, they form the starting point of what he has described as the somnambulisms where, in its most typical form, we get a splitting off of the synthetized neuron system resulting in amnesias and multiple personality. In its lesser forms we see the various bodily anesthetics, paralyses, etc., of hysteria.

As in organic lesions of the cord we get one side of the body anesthetic, with a sharp dividing line beyond which there is hyperesthesia, so in these anesthetic neural systems in the higher cerebral centers, or, as Morat calls them, the superior systems, we get a secondary hyperesthesia which may account for the peculiar objective states which we see in these neuroses.

Now it has been shown by Freud and Janet, and in this country by Prince and others, that the peculiar symptoms which many neurotics manifest are due to the living over again of some unpleasant episode of earlier life. The memory of this episode having vanished from the patient's superconsciousness, he does not in the least connect the two incidents and so fears that he has some serious malady which perhaps is incurable or that will require operation. We may assume now from our knowledge of brain physiology that this is due to a hyperesthesia or at least an irritable state of some of the neural thought systems. In any case, the outward result is that the patient is incapacitated for his usual duties and lives in a state of fear, is usually sleepless and, according to the character of the dominant fears, or, as the French say, phobias, may maintain good nourishment or become pale and emaciated. Usually, however, these patients do not lose weight and herein the medical mind is struck by an inconsistency between the subjective seriousness of the malady and the lack of its objective evidences.

Freud built up his system on the basis that these fears always have their origin in some sexual experience. It seems to me, however, that the instinctive emotions love, fear and anger should be placed upon an equal etiological footing. However this may be, it is certain that the majority of the patients who one meets in daily work more frequently manifest fear than any other symptom. If then it is true that the psychic illness is merely the living over of an old and forgotten unhappiness, the acting out of a previous life drama with the prompter hidden from the upper consciousness of the actor, it is plain that if this fact can be proved to the actor's satisfaction he will see himself no longer as a leading artist, but merely as a mimic, and will forthwith retire from the stage. And this is what psycho-analysis seeks to do. By a careful and prolonged search through the life history of the patient (cathartic method) it seeks to find explanation in some early experience for the present disease manifestations and then to point out the channel by which, through association, this experience has been again called into being and has had added to it all the later similar experience, thus building it into a thought system which forms a large part of his present mental content, guiding thought and lending it emotional color. The most characteristic thing about these reproduced thought systems is the accompaniment of the original feeling, tone or emotion which went with the primary experience. In fact, it frequently happens that this is the only tangible symptom at first. The patient comes to us because of the presence subjectively of a vague and peculiar mood which is out of proportion or irrelevant to his environment and which interferes with his daily vocation. Or it may be more than a mood; it may be a fit of some kind or a stupor; in any case, the object of psycho-analysis is to dig out the experience, if any, which the patient is reproducing and then to place the patient in a passive and receptive mood and carry him back in memory to this part of his existence and give him a new set of associations of a healthy and happy nature from which to build a new thought system about his central thought. James points out in his "Psychology" that it is as important to forget as to remember and that the real foundation of a good mind rests on the judgment we use in selecting the important and forgetting the irrelevant and allowing the attention to dwell upon the former with sufficient force and frequency to fix it in memory. Unhealthy minds frequently reverse this process and accentuate the trivial or painful, dwelling upon it until all other thoughts are displaced. Let me cite some cases which will illustrate psycho-analysis.

CASE I. Miss F., age forty. Neurotic from birth, she has been a nervous invalid for ten years as the result of prolonged strain and worry incident upon some illness and death in the family. During the first of her illness she had great difficulty in swallowing, even milk choked her badly. When she came under my care she had regained a fair degree of health and could eat almost everything. Meat, however, had to be put

through a fine mincer, and she had to eat alone and would sit from one to two hours over each meal, counting the number of times she chewed each morsel. If surprised she would choke and strangle. On careful questioning she finally remembered that when five years old she had had a very severe choking fit from a fish bone. It caused much commotion at the table and left a deep impression upon her. A year later she had a similar experience with a bolus of meat. She had forgotten these experiences, but when it was pointed out to her that her fear dated back to them she decided to overcome it and has since eaten quite naturally and with others. She has never quite overcome her habit of slow eating, however.

CASE II. Miss B., age forty-one. For five years has been worrying about her bowels, has had a vague discomfort in the right side, never very distinctly located, and profuse perspiration of abdomen from any emotion. She has had some gas and alternate diarrhea and constipation, upon which she has dwelt much and for which she has consulted many doctors and tried many forms of treatment. For a year before coming under treatment her mind was so constantly upon her bowels that finally she literally had to give up work to attend to them. She had peculiar fainting spells when everything seemed to recede and elongate. She finally discovered some mucus in her stools which seemed to justify her worst fears, and she went to bed with serious bowel trouble. She felt sure that she had appendicitis and would have to undergo an operation; indeed, she convinced her physician that this was a possibility and was sent to the hospital for observation. There her peculiar mood convinced the physicians of the psychic nature of the disease and she was sent out to my private hospital. I finally learned that she had had typhoid when twenty-one years old while living with a stepmother with whom she was constantly at war. She was delirious through the entire attack and professes to remember nothing of it except that it was all terrible. Five years ago she began to run down and have some bowel discomfort and a peculiar worrying mood. Not knowing from whence it came, and hearing much of appendicitis, she attributed her discomfort to this and gradually built it into a thought system accompanied by the emotional fear which she had previously felt for her stepmother during a similar discomfort twenty years before. This was explained to her and she made an excellent recovery after two months. I do not doubt but that this patient would have remained an invalid much longer had we not been able to give her some feasible explanation of her fears. She is highly though negatively suggestible.¹

CASE III. Miss D., age twenty-one. Came under treatment for epilepsy. After observing her closely it was found that her attacks always occurred in the front hall and usually after dinner. The attacks, too, were not typical. Physical examination showed anesthetic zones over the body. Mentally the patient was a bright college girl. In a hypnoid state she remembered that when a girl of fourteen she had been at a theater in a small city with her parents and had greatly admired the leading lady. After the show they went to the hotel and had some refreshments, and while in the dining room the theatrical company came in and sat down and she again saw her heroine. Suddenly, however, the heroine jumped up and ran into the hall, where she fell in an epileptic fit. The child ran to her and saw her carried up stairs. Here then was the experience which our patient was living over in her run-down state. She made a good recovery and has now been well for five years.

¹Though much improved this patient is still, after six months, unable to return to her occupation as bookkeeper.

Perhaps this is enough about psycho-analysis. Freud claims that it is a simple matter to make the patient recall the primary experience. He places his thumb on the nasion and pressing there commands them to remember. Some of us do not find it so easy.

Dr. J. J. Putnam has well pointed out that it may at times be harmful to require patients to recall unhappy episodes, especially if they are connected with unfortunate sexual experiences, and shows that the same end may be accomplished by getting the patient's main train of thought and then, by discussion, substituting another train of associations starting from the same point but having a happy feeling tone for its accompaniment. And after all, is not this just what we do every time we explain away an unhappy mood, — substitute another train of associations?

Medical Progress.

REPORT ON MENTAL DISEASES.

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THE SERUM REACTION OF SYPHILIS IN GENERAL PARALYSIS.

SOUTZO FILS¹ gives a résumé of articles written on Wassermann's serum reaction in syphilis. Within the last two years much work has been done on this subject, and this goes to show that in the fluids of syphilitic, tabetic and general paralytic patients there are specific antibodies. These antibodies are produced by specific antigens.

Bordet and Gengou, as well as Moreschi, Neisser and Sach, are credited with the discovery of the phenomenon known as the "fixation of the complement." This means that the antigen, meeting with the corresponding antibody, prevents hemolysis. Wassermann and Bruck have demonstrated that not only bacteria, but also diseased extracts from organs, can be used as antigens to prove the presence of antibodies. It is this discovery which has been the basis of their experiments in syphilis, tabes and general paralysis. It has been shown that the blood serum of monkeys or man, and mixed with an extract of syphilitic organs, gives rise to fixation of the complement. To obtain the reaction, Wassermann mixed an extract of an organ of a syphilitic fetus with blood serum of a syphilitic patient. This serum had been rendered inert by being heated to 56° C. A complement, e. g., the fresh serum of a guinea pig, was added and finally red corpuscles of a sheep. It was found that in every case hemolysis did not occur because fixation of the complement had taken place. This result was not obtained when the serum was mixed with an extract of normal liver or when normal serum was used with a syphilitic liver. Levaditi and Marie have found that the reaction is obtained when one makes use of a normal liver extract, and other investigators were successful with lecithin, cholesterin, vaseline, bile salts, etc. Weil and

¹ Ann. Med. Psychol., July-August, 1908.