

first few times she fell on the walk or on the stairs. Now she keeps on her feet and often runs."

In answer to my question for criticism of a method, I did not get what I wished. One or two are worthy of your attention:

"I find that kindergarten games are of the greatest value, not only giving physical exercise in a free and enjoyable way, but also helping to develop the imagination, stimulating the laggard, and affording the best opportunity to study the individual child. The children unconsciously show their needs as they play. If, for example, the feet or legs tire, they show a tendency to shuffle and twist around. I change the game at once to one of skipping', marching or some motion song in which the feet play a prominent part. The same methods are applied when children tire of sitting or finger work, which they easily show, and changing the work rests and quiets them."

"In our number work, in fact, in everything in the school-room, I insist upon the children using full sentences, by which will be incidentally gained the proper construction of sentences and the habit of speaking properly. I have already accomplished much along this line with Z— P—. For instance, at first Z— would say, '*scused*,' and this one word, accompanied by much gesticulation, was to let me know that he wished to leave the room. Now he has formed the habit of saying Please may I be excused? "

"To know the fatigue point of the children, both mental and physical, you must study them in a close, near way."

"I have discovered, in dealing with two or three of my boys, that there are periods in their existence when what would be in normal children the most flagrant cases of insubordination must be excused and tolerated on the ground of their feeble-mindedness."

"I have had best results, in awakening sluggish faculties, from the games, especially the game of chasing the ball."

"The Swedish system of gymnastics seems to me to be specially adapted for the feeble-minded. The manner of giving commands excites mental effort. Such exercise should not become mechanical. When a movement becomes mechanical it no longer has any mental effect."

"Our children are deficient in their power of observation. Nothing is more important than to cultivate this. Manual work is the key to the situation. They not only learn to *do*, but they learn to *see* by doing."

I have given enough illustrations to suggest the possible value of this method of securing cooperation. To be asked for our opinions, to have our opinions received as valuable, and to see them acted upon and become a part of the regular order of the institution, is felt by all of us as complimentary. Until every employee feels a personal and vital interest, not only in the success of his own department, but in that of the institution as a whole, we shall not have the best possible administration. The plan of requiring special reports and making special requests for suggestions seems to me full of promise, and I hope to carry it out further, not only among the teachers and the heads of the more important departments, but among all the attendants and industrial employes.

A STUDY OF THE SENSES OF THE FEEBLE-MINDED.

BY A. R. T. WYLIE, PH. D., PSYCHOLOGIST AT THE MINNESOTA SCHOOL FOR THE FEEBLE-MINDED.

Man comes to the study of himself last. This is true both of the race and the individual. Anthropology has had considerable to tell us of ancient man, but it is only recently that we have been giving due attention to present man. This is due in part to the growth of criminal anthropology and to psychology. The application, in recent years, of experimental

methods to psychology has restated many of the old problems and created many new ones; hence its phenomenal growth. However, normal psychology must attain a certain growth before that most fruitful field of abnormal mind can be attacked; and it is only recently that we find serious attempts in this direction.

The chief difficulty in the way of psycho-pathology is the undeveloped condition of psychology. It cannot tell us with sufficient accuracy what the normal mind is, and until it can in individual psychology are steps in this direction, and all work on abnormal mind will prove an efficient stimulus to this end.

The importance of psychological investigations of the feeble-minded is evident from a wider outlook. This is not true so much of the lower grades, or idiotic, who are extra-social beings, as of the higher grades, who are distinctly anti-social. These latter are intimately connected with many sociological and criminological questions of the day, as vagabondage, hereditary crime, prostitution, truancy, etc., and the consequent questions of punishment and legal control. The solution of these questions depends in great part on thorough psychological investigation.

The methods to be employed can be divided into two classes—the objective and the subjective. The most exact are the objective, but they are of limited use. They consist chiefly in making use of various reflexes, chief of which are, the pulse, respiration, iris, and bladder.¹ In the subjective methods the child tells what he sees, feels or hears. The value of such evidence depends, of course, on the mental ability of the child. He may not understand; he may imagine that he feels something when he does not; he may agree to whatever you wish

1 See Tuke's Dict. of Psych. Med.

him to, or in a spirit of bravado he may resist any impression that you may wish to create. Hence, there are great variations and irregularities in the results. But these irregularities are part of the subject; they are one of the chief characteristics of the imbecile. Science cannot be frightened by the difficulties in the way, but must find out what the imbecile is and does do, not what an ideal one might do. Consequently our subjective methods are more or less objective.

After becoming thoroughly acquainted with his subject, he must educate him in the tests that he wishes him to perform, and then throw out all that are not fairly representative. The average error will be higher than in normal psychology, but the nature of the material necessitates it.

The senses being the basis of all mental life, the first investigations were made concerning them.

TOUCH.

Observers are agreed that touch is imperfect or obtuse among the feeble-minded.¹ However, it is a subject very difficult to get at, especially among the lower grades, on account of their mental dullness and lack of attention. Lombroso finds a dullness of touch among the criminal and insane.² In order to investigate the sensibility of touch among the higher grades of feeble-minded children, the author made use of Scripture's touch weights, the common compass aethesimeter not being applicable. There were twenty of these weights, ranging from one to twenty milligrams. The back of the hand was the point selected for testing. The method of work was to begin with the smallest weight, and find the one whose touch was just perceptible. There were thirty-two boys and thirty-seven girls tested. The results were:

Ireland: *Mental Affections of Children*, p. 303.
Sollier: *Psych. de l'Idiot et de l'Imbecile*, p. 54.
L'Homme Criminel, Vol. 1, p 315.

	Left Hand	Mean Variation	Right Hand	Mean Variation
Boys	3.7	3.4	3.5	2.8
Girls	2.3	1.9	2.3	2.6

The normal, according to Scripture, is 2.0. This shows touch to be considerably dulled among the feeble-minded, especially among the boys. The high mean variation is very noticeable, and is characteristic of the feeble-minded. Dividing the girls and boys into three groups, according to their mental ability, as estimated by their teacher, A being the highest, we have:

	Left Hand	Mean Variation	Right Hand	Mean Variation
	3.5	3.8	4.3	3.8
	2.0	1.5	1.5	0.8
	7.3	6.6	6.8	5.9
	2.6	1.9	2.3	1.8
	1.4	0.7	1.8	1.2
	2.9	3.5	2.9	2.5

This further indicates that the fineness of touch depends on mental ability. This is more evident when we consider the fact that there were a number whose touch threshold did not lie within the range of the weights. Of these there were four boys graded C and eight girls graded, one A, one B, and six C. Three boys graded C and one graded B were unable to perform the test; also, four girls graded C and one graded B.

Among those tested were six Mongols. These all showed a remarkable dullness. Four of them did not come within the range of the weights. The other two gave readings of eighteen and twenty.

PAIN.

That a large number of the lower grades of feeble-minded children lack in some degree the sense of pain is a fact of frequent observation.¹ They beat themselves, pound their heads against the walls and floors, pick holes in themselves, bite

Ireland: Op. Cit., p. 404. Sollier, Op. Cit., p. 54.

themselves even to making great ulcers, and pull out their hair with no seeming discomfort. One girl when angry will scald herself severely. However, the total loss of pain is not thought to be so common as among the insane.²

For the purpose of investigating the pain sense of the feeble-minded, the author made use of Cattell's algometer. This consists of a spring dynamometer, by means of which a given pressure can be exerted on any surface. "Attached to the lower end of the spring is a cylindrical piece of brass. This is capped with hard rubber, which is applied to the surface to be stimulated. The cap which comes in contact with the skin is hemispherical, and about eight millimeters in diameter. The pressure is exerted by the hand of the experimenter, and the amount of pressure is indicated in kilograms." The stimulus was applied to the volar surface of each hand over the fifth metacarpal, and to the forehead about two centimeters above the nasal. The pressure was increased at rate of two kilograms per second. Each child was given five trials, seven days apart, during the summer of 1899. Taking the children's reaction time at 0.338 seconds,³ and the normal time at 0.150 seconds, the results were reduced one kilogram. The mean variation was calculated for each person, and then averaged. The results were as follows:

FEEBLE-MINDED CHILDREN.

Feeble-minded Children	Left Hand	Mean Variation	Right Hand	Mean Variation	Fore- head	Mean Variation
37 Boys	5.6	0.96	5.7	0.95	2.8	0.67
38 Girls	3.0	0.75	3.2	0.78	1.4	0.56

Ireland: Op. Cit.
'Journal of Psycho-Asthenics, March, 1900.

NORMAL PEOPLE.			Left Hand	Right Hand	Fore-head	Mean Variation
Griffing	128	students—men	5.7		3.3	0.008
Griffing	98	students—women...	3.6		13	0.008
			6.89	7.13		
			5.06	5.01		
McDonald	20	professional men.	3.26	3.72		
McDonald	27	women, non-labor	3.38	3.45		
			13.27	13.61		
McDonald	34	men, Boston, un-	9.81	9.77		
McDonald	9	women, Paris,	9.36	9.00		

Comparing our results with those of Griffing, we find that our Children are more sensitive in their hands than normal people. The forehead, probably, gives more exact results, as the structural conditions are more constant. Here the boys are much less sensitive, the girls being about normal. The results of McDonald, although obtained with the same instrument, are in some respects higher, showing, as he contends, that sensitiveness to pain depends on sociological condition. Granting this, the pain sense of these children would not be obtuse. Our results show the girls to be more sensitive than the boys, and both are more sensitive in their left hands, in these respects agreeing with normal people.³

Grouping the children into three groups according to mental ability, A being brightest, we have:

	Left Hand	Mean Variation	Right Hand	Mean Variation	Fore-head	Mean Variation
Boys—A.	4.4	1.02	4.9	1.18	1.8	0.56
B.	6.5	0.86	6.2	0.91	3.4	0.76
O.	5.4	1.08	5.5	0.92	2.8	0.66
Girls—A.	3.3	0.87	3.5	0.73	1.5	0.54
B.	2.8	0.58	3.0	0.76	1.4	0.59
C.	2.9	0.79	3.1	0.87	1.6	0.67

The brighter boys have a greater sensitiveness for pain than the duller boys. With the girls such is not the indication, except, perhaps, on the forehead. Thickness of hands lessened the sensibility for pain, thinness of hands increased it.

¹See Psych. Rev. Monographs, No. 1.

²Report Commissioner of Education, 1897-98, Vol. 1, p. 1162.

³University of Iowa Studies in Psych., Vol. 1, p. 11.

Pain on the forehead continued after the stimulus ceased with twenty-two boys in 33.5 per cent of trials, and twenty-seven girls in 37.7 per cent of trials. With the greater number of the children this occurred only one or two times.

Five boys, or 12 per cent of those examined, gave from one to five tests above the reading of the instruments (13 kilograms). With one boy this was always the case. The readings taken showed the boys less sensitive than the average. Two girls, or five per cent of those examined, gave readings above the range of the instrument.

The ages of the children varied from fourteen to twenty-five years. The sensibility to pain was not observed to depend on their age.

Griffing¹ concludes that variations in sensitiveness to pain is due to "constitutional nervous differences," and to thickness of skin, propositions to which we agree. Gilbert² finds that sensitiveness decreases with age up to nineteen years among normal children, and that their mean variation is high. Carman³ finds that dull children are less sensitive to pain than bright ones, and those dull in mathematics are more sensitive on the right side. With this last statement our results do not agree.

MUSCLE SENSE.

Among the lower grades of feeble-minded children we find those among whom the muscle sense seems to be absent; they sit or lie all day, and never move unless forced to by some outward circumstance. Among those of higher grade it is lacking, as shown by difficulty in walking and moving themselves. This deficiency can exist without marked deficiency in the other senses. Children have been known who could learn to read and write but not to dress themselves.

¹O p. Cit., p. 15.

²O p. Cit., p. 11.

Amer. Jour. Psych. April, 1899, p. 396.

With others this sense may be excessively developed, as shown by a continual movement and a desire never to be at rest. Here we meet the tics and various automatic movements of feeble-minded children.⁴ Fully fifty per cent of low grade children have some such movements.

In order to test the muscle sense of our school children, the writer made use of a series of weights, all of the same size, ranging from 100 to 130 grams, in steps of three grams. The child was required to lift each weight by thumb and forefinger, in this way comparing the one weighing one hundred grams with each of the others, and then to state which one seemed the heavier. Each test was repeated in an inverse order.

Twenty-three boys and twenty-nine girls were tested. Among the boys three were unable to make the test, and four, or twenty per cent, could detect no difference in the series. Two per cent would be a fair estimate for normal children.

The only figures we have for normal children are those given by Gilbert for Iowa school children. However, he used weights ranging from eighty-two to one hundred grams. Comparing our results with his, we find that our boys have an average of 2.7 grams higher. Grouping our boys according to mental ability, we have the following averages as the least perceptible difference in grams:

- A. 7.7 ± 2.9
- B. 9.2 ± 3.0
- C. 8.3 ± 4.5

This shows a finer perception, with least variation, on the part of the brighter boys.

Of the twenty-nine girls examined, seventeen, or 58.6 per cent, could perceive no difference within the limit of the series. The twelve remaining girls gave an average only 0.5 grams higher than Gilbert's figures for normal girls. Grouping them according to mental ability we have:

See Voisin: *L'Idiotie*, p. 138.

- A. 5.7 ± 2.2
- B. 7.1 ± 4.6
- C. 9.8 ± 3.7

This also shows a finer perception on the part of the brighter girls. Those who could see no difference within the limit of the series were thus grouped, A two, B eight, C seven.

Thus we find a dullness of the muscle sense of the feeble-minded, varying inversely as the mental ability.

HEARING.

Observers have not had much to tell us of the hearing of the feeble-minded. Deafness, however, is thought to be less prevalent than among normal children.

Our tests consisted in finding the highest and lowest perceptible tone and the least perceptible difference of tone. Sixteen boys and twenty-one girls of the larger singing class were examined. For finding the highest perceptible tone, Gallon's Whistle was used. For the boys this consisted of 53,000 vibrations, with a maximum of 104,000 and a minimum of 29,600. For the girls the average was 63,000, with a maximum of 125,500 and a minimum of 25,500. The average for normal people is usually given at 50,000. For finding the lowest tone Ap-pun's Reed was used. For the boys this was found to be 18, with a maximum of 22 and a minimum of 14; and for the girls it was 18, with a maximum of 30 and a minimum of 13. A tone of 16 vibrations is usually given as the lowest for normal ears. In order to find the least perceptible difference of tone, a tone tester was used, which consists of a reed whose length can be adjusted so as to give the various tones of an octave. The tone A, 435 vibrations, being given, we then proceeded to find what difference of tone above and below this the child could distinguish. For the boys this was 7-16 tone, with a mean variation of 2-16; and for the girls it was 9-16, with a mean variation of 2-16.

Our experiments show nothing abnormal in respect to hearing. However, they were performed on our brightest children.

VISION.

The visual apparatus of idiots is generally good.¹ However, seven or eight per cent have been found blind from their first year. Strabismus is frequently found, and nystagmus and squinting are common. Abnormalities of the iris and pigmentary retinitis are also found. Schleich finds hypermetropia very common among idiots and imbeciles.²

The common means of testing vision by means of a Snellen test chart is only of limited use among the feeble-minded, being, of course, limited to those who can read. However, twenty-five boys and nineteen girls were tested with it. Of these only three boys, or seven per cent of all, had normal vision in both eyes. Nine per cent of the children had vision of 6/8 and the remaining eighty-four per cent had vision varying from 6/12 to 3/30. Dr. West found forty-one per cent of the children in the schools of Worcester, Mass., with defective vision. Eighty-four per cent of the children were astigmatic.

This test being controlled by errors of refraction, and being of limited use, we sought another. To this end we made use of a color wheel on which was mounted a piece of red paper in the usual manner, so that any amount of white could be mixed with it. The various shades thus produced were compared with a piece of the original red paper. Beginning with no white on the wheel, white was gradually introduced until a difference was noted, then reduced until no difference was indicated. The mean of these readings was taken and the variation noted.

For thirty boys the average was thirty-two degrees, with a mean variation of nine degrees; for twenty-three girls the aver-

¹Ireland: *Op. Cit.*
²Voisin: *Op. Cit.*, p. 125.

age was twenty-three degrees, with a mean variation of seven degrees. According to the investigations made to establish the validity of Fechner's Law, the normal would be 3.6 degrees. Consequently we have a visual dullness on the part of the feeble-minded, it being six to eight times that of normal people.

Grouping the children according to mental ability we have:

	BOYS.	GIRLS.
A.	16.4±5.8	15.6±4.5
B.	29.8±11.2	14.8±5.6
C.	50.7±8.3	40.0±10.7

Eight boys and five girls, who were unable to perform the test, were graded C.

Thus we conclude that there is a dullness of the visual sense among the feeble-minded.

Voisin says that the visual field is almost always modified among the feeble-minded.¹ Born criminals have been found to have visual fields remarkably limited in extent, particularly in the upper and inner halves, and with very irregular boundary lines. Those whose visual fields are limited also show deficiencies in their other senses.²

Having mapped the visual fields of fourteen feeble-minded children, they were all found limited, most of them to a remarkable extent. One boy and one girl had central vision only. The fields were limited to the greatest extent in the upper and inner halves and to a slight extent in the outer halves. The fields were as a rule asymmetrical, one being limited more than the other. This was particularly true of the paralytics. The boundary lines were as a rule irregular. There was also a variability in extent noticed, which has also been found among the criminal class.

When we remember the origin of the eye, how it began as a bud from the anterior cerebral vesicle, and that the retina is really to be considered as a part of the brain, we see the im-

¹*Op. Cit.*, p. 126.

²Lombroso: *L'Homme Criminel and La Femme Criminelle.*

portance of these results. If the growth and development of the brain is retarded or interfered with, we would expect, then, some indication in the eye. That this is true, our result in the case of the paralytics has shown, as well as the one of a limited field on the part of the feeble-minded. The value of these facts in the diagnosis of accidental idiocy or in making a prognosis must be left to future investigation.

RESULTS.

Our results show, on the whole, a marked sense dullness on the part of the feeble-minded, with a very characteristic high mean variation. Is, then, this deficiency due to imperfections of the sense organs, or is it chiefly central? Seguin has defined idiocy as an "intelligence badly served by sense organs." With this definition no modern author agrees. Idiots are defined as beings more or less deprived of intelligence. However, such cases do infrequently occur, and have been grouped together under the name of idiots by deprivation.³ In order to produce such a condition the sense deficiency must be great, such as the loss of both sight and hearing. But such a deficiency exists among only a few feeble-minded children.

Given a sense deficiency such as is common with our children, and a normal intelligence, the child would soon, by the processes of comparison and reasoning, practically overcome such deficiency, so as to be considered a normal minded person.

In all mental processes, however simple, the mind acts as a unit, the results of such being conditioned to a greater or less extent by the so-called higher processes of the mind. After the first few times no child has a pure sensation, for the reproductive processes come into play, and we have, to a corresponding extent, perception. The mental life of some idiotic children is no doubt limited to sensations. In general terms, lack

Ireland: Op. Clt.

of appreciation is the chief mental characteristic of the feeble-minded. This is due to defect of reproduction and discrimination. Since "defective mentality always denotes defective morphology," defective reproduction would mean defective neural continuity in the brain, and defective discrimination would mean fewness of conducting paths. "Bernardini, after reading the cases of idiocy recorded in medical literature, has come to the conclusion that diminution in the number of nerve cells in idiocy, and changes in the number and form of their prolongations ought to be ranked as sufficiently proved." Thus the pathological conditions agree with what we would expect, theoretically, from considerations of their mental states. Consequently sense dullness can, in great part, be explained by lack of discrimination, which is due to cerebral conditions otherwise known to exist. However, defect of sense organ does exist, as we have seen when considering the visual fields of the feeble-minded. Consequently we are confirmed in the opinion that the chief lesion of idiocy is central, and not peripheral, as most modern authors are agreed.

Considering the point of pedagogical suggestions, we find that our work emphasizes the importance of sense training. The senses lie at the basis of all knowledge, and they must be trained to their highest efficiency in order to get the best results. The senses are not of equal value for the normal child, and they vary in value to a greater extent among the feeble-minded. Consequently each child's best sense should be cultivated, and then the others aroused and associated with it. To these ends all forms of physical and manual training are of great value.

As a consequence of this different sense capital, we deduce the result of the importance of individual teaching. However well the normal child may be able to get along with, or in spite of, the present wholesale methods, for the feeble-minded child this is an impossibility. For his education pedagogical meth-

ods must be especially adapted to his case, for it is like no other. Psychology has had much to learn from pathology, and we hazard the opinion that pedagogy has at least as much to learn.

Another consequence is the importance of the psychological examination. To apply particular methods to an individual case, the conditions must be known. These can only be brought out by such an examination. Some day this is destined to become a part of all pedagogical procedure. At present it is a rather ambitious forecast for both psychology and pedagogy.

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MINUTES OF THE ASSOCIATION.

TWENTY-FOURTH ANNUAL MEETING, MAY 29-31, 1900, POLK, PA.

FIRST SESSION.

TUESDAY AFTERNOON, MAY 29, 1900.

The Association was called to order at 4 p. m. by the President, Mr. Alexander Johnson, of Fort Wayne, Ind. The report of the Secretary was read and adopted.

On motion, Dr. Barnett of Lincoln, Ill., and Dr. Simcoe of St. Joseph, Mo., were elected members.

On motion of Dr Fernald, it was voted that the President should appoint a committee on organization. Dr. Fernald, Dr. Murdoch and Dr. Knight were appointed such a committee.