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MENTAL SCIENCE.

The Time-Sense.

A GREAT deal of experiment and discussion has been expended upon the means by which we estimate time-intervals. Different observers have obtained quite opposite results, and the entire problem seems to become more complex as study is expended upon it. The usual form of experiment consists in reproducing various intervals, as produced by the beats of a metronome or otherwise, as accurately as possible under different conditions. The difference between the true interval and the average of the reproduced intervals is then calculated, and measures the constant error; while the average deviations of the several reproductions from their mean measures the variable error. The intervals thus tested were usually very brief ones, rarely being as long as a minute. On the other hand, we have an idea of time from the relative filling-out of the interval with mental experiences. A time during which much has happened seems long: one during which little has happened seems short. The latter may be regarded as a truly mental mode of estimating intervals; but it will be readily seen that it is only roughly approximate in character, and is not applicable to such small intervals as those usually experimented upon. What, then, is the means by which we gain our notions of the duration of these short artificial time lengths; such, for instance, as we employ in music and other rhythmical occupations? This is the problem that Dr. Münsterberg has recently studied in quite an original way.[1] His reflections upon the matter led him to the opinion that for these brief intervals we have no time-sense in the strict sense of the word, but that our estimates depend upon the feelings of tension, of arrest or delay, of ordinary physiological functions; and according as the end of the interval comes upon the rise or the fall of this tension-wave will a time-interval change its character. It is rather difficult to more accurately specify the subjective feelings which one experiences in waiting for intervals or in following them, but one factor most readily observed is the variation in breathing. We have all had some experience in the change of the breathing-rate under different emotions. Breathing, too, being one of the most constant bodily rhythms, it is not improbable that this affects our notions of time. To test this, Dr. Münsterberg arranged his apparatus in the usual way, first giving an interval varying from 6 to 60 seconds, and then having the subject mark off an interval equal to it: the average error in so doing was 10.7 per cent. He now had the experiments so arranged that the second sound, closing the original interval, came at the same respiratory phase as the first or opening sound of the interval: then the error was only 2.9 per cent. In this series the sound closing the original interval was at the same time the sound opening the reproduced interval. In a following series of experiments each interval had a separate opening and closing sound. When no attention was paid as to the concurrence in the respiratory phase of the opening and closing sounds, the error was 24.0 per cent, while when this was taken into account the error was only 5.3 per cent. In a third series the attention was purposely withdrawn from the respiratory and tension feelings, and the time judgments became utterly confused. While these experiments are too few to be taken as at all decisive, they certainly suggest a very interesting field of research, and, furthermore, open out some possibility of explaining the various results of different observers.

Visual Space Measurements.

The sense that above all others gives us our knowledge of extension in all the dimensions of space is the sense of vision; but, as we approach the problem more carefully, we see that there are several modes of perceiving sensations of length by the eyes. There is, first, the passive impression of a length upon the retina, which is analogous to the impression on the skin when an object, such as the edge of a ruler, is in contact with it. In both cases it is very essential to the notion of extension thus formed on what part of the skin or the retina the image is impressed. There are finely and coarsely sensitive portions of both skin and retina; and the general law is, that the same amount of objective stimulation will give a more extended sensory effect upon the more finely sensitive surface. The centre of the eye is by far the most sensitive portion, and hence we habitually turn the eyes so that the object to be seen falls upon it; and it is the space-sense of this portion of the eye that is usually tested. We have, again, the perception of space from the muscular effort needed to move the eyes so that the beginning and end of the length shall successively fall upon the fovea or central spot. In both these cases we must, to complete our estimate of length, take into account the distance of the object from the eyes; for size and distance are inversely dependent upon each other, and each becomes inferrible only when the other is known. Again, we have two eyes, which we ordinarily use together, but which we can use separately. The distances judged may be varied to an equal extent; they may be of any stated length within ordinary limits,—may be complete continuous lines, a series of points, or simple terminal points marking off a distance between them; they may be horizontally, vertically, or diagonally arranged; they may be symmetrically or asymmetrically situated with reference to the central axis of the eyes; and so on. It is evident, then, that we exercise our power of estimating distances by the eye in a large number of complex ways, and that to introduce system into the problem of how these estimates are made it is necessary to test the space-sense of the eye under different and definite conditions. This Dr. Münsterberg[1] has recently attempted by the following method. Two small squares of cardboard are seen on a green ground with a

[1] H. Münsterberg, Beiträge zur Experimentellen Psychologie, Heft 2.

distance varying by 10 millimetres, from 10 to 200 millimetres. and the attempt is then made to set another pair of squares at an equal distance apart under the most varying conditions, the average constant error and the average variable errors being carefully calculated in each case. Of the very many points arising from the 20,000 observations thus made, only a few can be here noticed. A striking result is, that no difference, however slight, in the method of viewing the lengths, is without its effect upon the accuracy with which a distance can be reproduced All the variations above noticed were tried, and showed a difference in the accuracy of reproduction. though of course some of the variations have much less effect than others. Quite a constant result with Dr. Münsterberg is an overestimation of distances on the left, and an underestimation of distances on the right. This he explains as due to the constant practice, in reading and writing, of moving the eyes from left to right. This results in making this movement easier, and, according to the general law, the movement made with more effort will seem the longer. If, then, the eye is forced to start at the middle of the length, and move towards each side, the space on the left will seem larger than that on the right. When the distances are reproduced by each eye separately, distances on the right are overestimated by the right eye, and on the left by the left eye. This is probably due to the greater ease of each eye to direct the gaze towards the common field of vision. If an interval elapses between the sight of the standard length and its reproduction, the accuracy is much diminished, and the lengths are generally overestimated, especially the smaller ones. If the original and the reproduced lines occupy the same positions, the error is least. Broken lines seem too long, as is the usual illusion. Vertical distances are overestimated as compared with horizontal ones; but this only when the vertical is above the horizontal, and the eye is free to move. All this refers to the constant error. Regarding the variable error, which measures the uniformity of the reproductions, it is very much larger when the eyes are fixed than when they move freely. This is due to the increased accuracy of the muscle-sense over the retinal sense of space, as well as to other causes. The law holding in many other kinds of sensations, that the error depends for its absolute size upon the length reproduced, seems to hold of space-sensations, but is probably a law of the motor adjustments rather than of the retinal sensibility. These selected points must suffice to indicate the scope of this very extended and critical research.

HEALTH MATTERS.

Insanity in Australian Aborigines.

IN a paper read before the Intercolonial Medical Congress of Australasia, Dr. Morton Manning, the inspector-general of the insane in New South Wales, gave a most interesting account of the cases of insanity found to have occurred among the aborigines of Australia. Mental disease would appear to have been a very rare affection while they were in their primitive and uncivilized condition, and the manner in which they dealt with the few cases which did arise was of the most drastic nature. "If the lunatic was violent or aggressive, he was promptly slaughtered; if melancholy, he was allowed, if so disposed, to commit suicide; if demented and helpless, he was allowed to die; and only when quiet and peaceable, and when his erroneous ideas did not result in offensive acts, was he allowed to continue in the tribe." In the course of time, as the aborigines were brought more into contact with civilization and its attendant vices, insanity increased rapidly in proportion to the number of the population; and Dr. Manning states that since 1868, 18 aborigines had been admitted into the asylums of New South Wales, from a population which has never during that time exceeded 2,500, and is now less than half that number. In the census year 1881 the proportion of the aboriginal insane to the aboriginal population of New South Wales was 2.83 per thousand, a proportion in excess of that for the general population; and at the close of 1887 it was upwards of 5 per thousand. The causes of insanity in the 32 cases of aborigines admitted into the asylums of Queensland and New South Wales were in a considerable proportion of the cases due to drink. The prevailing type of the malady was mania, passing rapidly into dementia. All the melancholic cases originated in jail. Three were epileptics. No case of general paralysis, or any thing like it, was seen. There were 20 deaths; and in several cases the only cause which could be assigned was marasmus,—a gradual wasting without tubercular or other manifest ailment. The average duration of life was much shorter than in Europeans; the confinement, though tempered by many unaccustomed comforts, being apparently the great factor in shortening life.

Dietary for the Nervous System.

The nervous tissue requires for its constitution, says the *Dietetic Gazette* for January, the chemical constituents of the albuminoids and fats, together with phosphorus: hence the chief alimentary substance is the albuminoids (provisional formula $C_{72}H_{112}O_{22}N_{18}S$) contained in milk, eggs, cereals, the juices of vegetables, and the muscular substance of meat. Water should be freely indulged in by neurotic types of constitution almost *ad libitum*. Among the meats most suitable are, in their order, beef, mutton, lamb, and pork, and the brains of animals. Fish is not so valuable as reputed, but may be employed to vary the diet. Oysters, on the other hand, are extremely useful as nerve reconstructives. Among vegetables, wheat stands at the head of the list, containing, as it does, fatty matters and phosphoric acid. Rice, corn, oat-meal, barley, and sweet-potatoes are better than onions, carrots, beets, turnips, etc. Fruits are useful as adjuvants because of the sugars they contain.

Removal of Warts by Electrolysis.

Dr. Patrzek of Oppeln describes, according to the *Weekly Medical Review*, his method for removing warts by electricity. The wart is first thoroughly moistened with a warm solution of salt. Both needles are then thrust through it just above the surface of the skin, and the current turned on, one element after another being added until pain is felt. Five cells are sufficient. With most cases two sittings of five minutes each are sufficient to destroy the growth, which gradually dries up and falls away, leaving a surface at first slightly reddened, but which later assumes the appearance of normal skin.

The Dangers of Hypnotism.

At Nuremberg a case of some public interest was tried in the police court, says the London *Lancet*. A commercial traveller while in a restaurant told the waitress to look steadily at the white of his eye, and hypnotized her. On a second occasion he repeated the experiment; but this time the sleep was so profound that a medical man had to be called, who had the utmost difficulty in rousing the girl. The commercial traveller was accordingly summoned to appear before the magistrates, and the severe sentence of eight days' imprisonment was passed on him, which will probably be efficient in checking similar performances in that region. In France the practice of hypnotizing people for amusement seems to be very common, and unpleasant consequences are frequently reported. At a supper-party in Paris one of the company hypnotized a girl, and was unable to rouse her. She was consequently taken to the house of a medical man, and after a time she recovered consciousness. The whole party were taken into custody by the police, and were not released until next day. Even when hypnotism has been practised by competent medical men for remedial purposes, unpleasant accidents and ulterior consequences have again and again occurred; so much so, that an order has been issued by the French Government, prohibiting surgeons in the army and navy from practising it. It ought to be distinctly understood, both by the profession and the public, that hypnotism is not devoid of danger at the time, and not infrequently has permanently impaired the moral and emotional control of patients. A medical man is bound, before recommending hypnotism for a patient, to weigh the question as carefully as he would that of the advisability of administering an anæsthetic.