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ATTENTION—EXPERIMENTAL

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But three experimental articles upon attention for the year 1912 have been found by the reviewer. In the main, old questions are reopened and sometimes attacked in a new way.

Chronologically, the first article is one by Lorenz (2). His apparatus, an exaggerated tachistoscope, showed lines of variable length for an average time of 135 sigma. Sometimes one pair of lines was shown, again, two, three, or four pairs were exposed. The subject was asked to judge in each case which line of each pair was the longer. Later in the experiment more complicated figures were used.

He found that the accuracy of the judgment was dependent upon the number of pairs of lines simultaneously shown (decreasing with the number), upon the degree of similarity existing between the different objects in the visual field and upon the distribution of the attention. He finds that the decrease takes place in practically a

geometrical ratio, and in general the threshold is less when similar objects are used than with dissimilar ones.

The second paper, which deals with our old friend, the relation between attention and breathing, is by Suter (3). Two Lehmann pneumographs with Marey tambours gave records from the abdomen and thorax. Reading words, adding, memory tests and visual and auditory stimuli were the materials offered to attention. Six subjects were used, from each of whom care was taken to obtain normal curves.

As a result of the introspections, he concludes that there is a difference between concentration of attention and the strain of attention. With concentration, there may be no strain sensations. The subjects further differed as to just what ought to be called the strain of attention. Some meant by it attention accompanied by strain sensations, others a condition of strain of such a sort that it becomes observed by attention. He found that these strains produced a special influence on the curve of breathing.

The effects of attention upon the breathing curve may be summarized as follows: (1) The quotient inspiration/expiration is decreased. (2) In form, the inspiration and expiration curves become straightened. (3) The transitions from one to the other become more pointed. (4) The length of the breathing curve becomes shorter with a low degree of attention. (5) There appears also to be a decrease in the height of the respiration curve. (6) In extreme cases of inhibition of breathing, the height is reduced to nothing. The length reached a maximum, the duration of which corresponded with the experience, the quotient showed a minimum of zero and the form corresponded closely to a straight line. This represented the complete checking of the breathing and was possibly the sign of the best attention.

Feilgenhauer's paper (1) is on the rate of change of attention. In these experiments, the subject was in one room and the operator and noisy apparatus were in another. By this method, the investigator endeavored to get rid of the distractions which would otherwise be present. The auditory stimuli were produced by an electric spark in a light-tight box; the visual, by an electric spark in a sound-proof box which had a glass side; and the cutaneous by an especially arranged induction coil. The apparatus was so designed that the stimuli, *e. g.*, two visual stimuli, could be given at any rate of succession, or so that disparate stimuli, such as visual and auditory, could be given with any time interval between them. A mass of over 15,000 results yielded the following conclusions: (1) The smallest

active step of attention is 300 sigma. (2) The limits of the observable changes of attention lie between 262 and 394 sigma. (3) With the different kinds of stimulation there is no great change in these values, Only with a preceding optical stimulus there occurs an increase of 35 sigma due to the noticeable after effect of that kind of stimulation. (4) The shifting of attention from one stimulus to another is a smooth, gliding one if the stimuli belong to the same sense realm. With disparate stimuli it is more irregular and sudden. The smoothness is lacking. (5) The speed of the change of attention cannot be voluntarily accelerated beyond the degree mentioned above, but it can be voluntarily slowed. Nor is it possible to let attention wander with the greatest possible speed. (6) The speed of the change depends upon the personality of the observer. (7) The position of the optical stimulation, whether it was approximately at the primary position, or 35 degrees removed therefrom, had no influence upon the speed of the change of attention. It is independent of the visual angle by which the eye perceives the stimulus. Nor does the direction of the movement have any influence in the case of optical stimuli. (8) Increase in stimulation yields neither a quicker nor a slower rate of change. It remains constant with auditory and tactual stimuli. But a retardation occurs with visual stimuli. (9) Sickness and fatigue cause the rate of change to be slowed down somewhat. (10) Neither the best attitude nor the sharpest focusing of the most expert subject can make the change more rapid than normal for that person. (11) The accuracy of the judgment of the change of attention increases with an increase of the stimulus. (12) The accuracy of judgment is greatest with well defined tactual stimuli, least with optical, while the auditory stand in between. With stimuli in the same sense realm it is greater than with disparate stimuli. (13) The change of the attention given to disparate stimuli ordinarily follows at the same speed as it does with stimuli of the same sense realm. Since with optical stimuli there is a slowing up of about 35 sigma, therefore this same slowing up is also shown with disparate stimuli when the optical stimulus comes first. (14) The individual differences are more evident with disparate stimuli, and the accuracy of judgment shows greater variation.

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