

used visual images as a means of estimating the lengths of the two distances and that his results are to be interpreted in the light of this hypothesis. The well-known observations that the threshold on the extremities is shorter in the transverse than in the longitudinal axis is corroborated only in the case of good visualizers. For poor visualizers the difference does not appear, and for the blind subject the ordinary relation was completely reversed. These observations are to be explained on the ground that the narrower, transverse axis is more easily and clearly visualized. The rapid lowering of the threshold through training, as reported by Volkmann, does not appear when the influence of vision is eliminated. The author thinks the fact that the earlier investigations were carried out with open eyes accounts for the reduction of the threshold. The judgment of direction of continuous stimuli or of the relative direction of two points from one another is dependent to a large extent on visual images as shown by the fact that this judgment is most accurate in the case of good visualizers. In making these experiments the facts were noted that, in general, two points can be distinguished before their relative direction is correctly perceived and that the direction of continuous stimuli is judged better than that of an equal extent lying between the two points of the æsthæsiometer.

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On the Development of Visual Perception and Attention. HAROLD GRIFFING, Ph. D. American Journal of Psychology, Vol. VII., 227-236. Jan., 1896.

Several series of letters were exposed through an opening in a screen before a group of persons. In the first experiment six letters arranged so as to avoid suggesting words as much as possible were exposed at a time for $\frac{1}{10}$ second and for ten successive times. The intervals between the several exposures and the warning signals were varied and the observers were without knowledge when they might expect the signal. The observers were examined in groups of ten to thirty, representing all ages from seven to twenty years. The observers fixed their attention upon the opening in the screen until the warning signal was given, and after the exposure they wrote down the letters which they thought they saw. Tables are given showing the results arranged according to age and grade in school. From these "it is evident that the extensive threshold, or ability to receive and retain a number of simultaneous retinal impressions, is a function of individual growth, reaching its maximum only when the observer is fully devel-

oped." "Practice increases the extensive threshold * * *" "The tendency to guess seems to decrease with maturity." The intellectual capacity as judged by the teachers was compared with these results. The brightest pupils showed the highest averages, with some notable exceptions. Those pupils who marked high in attention generally excelled others. The girls showed no superiority over the boys. Better results were obtained when the exposure followed the warning signal by a long interval. Children may experience abnormal fatigue "without any marked effect upon the accuracy of perception." In recalling the letters we "see the given stimuli as a unit and then analyze this unit into its components." When only one letter was exposed the older pupils again excelled the younger; the results were respectively seven errors in 230 observations and twenty-eight errors in 160 observations. When six colors were used in the place of the six letters the results were apparently the same. When the exposure was made for a full second, there was a greater percentage of correct answers, the older pupils showing the higher percentages. "The extensive threshold does not measure the number of objects that can be simultaneously grasped by consciousness;" it "may depend upon the reproductive processes, and the analysis of the memory image," and "to some extent upon the attention." The 'capacity for attention' is to be distinguished from the powers of the attention.

The paper has great significance for psychology and for the practical teacher who has to do with the marking and promotion of pupils. The results are conclusive against the absolute value of a system of examinations. It is well to bear in mind in regard to the extensive threshold increasing with age that in our schools a process of selection is going on all the time. Many of the poorer pupils drop out before they reach the higher grades and the dull pupils are frequently cases of slow development; they show their brightness at a later period. The personal element enters into a teacher's estimation of pupils and this may explain some exceptions. In the last experiment we are not told whether different series of letters were used, or whether other pupils were experimented upon. Unconscious memory in the one case and practice in the other may play some part, as I have found in some of my experiments, to which the author refers in a note.

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