

dation, (5) indifferent with optical accommodation, (6) auditory signal stimuli, (7) optical signal stimuli.

'Earlier'	I. 100 + to 90 +	'Later'	30 — to 5 —
	II. 135 + to 125 +		100 + to 30 +
	III. 50 + to 40 +		85 — to 80 —
	IV. 105 + to 85 +		50 — to 45 —
	V. 75 +		35 — (?)
	VI. 85 + to 75 +		105 — to 5 —
	VII. 120 + to 100 +		45 — to 15 +

Finally, these results are brought into harmony with the Wundt-Külpe, and the Exner facilitation and restraint theory of attention by saying that these results show a 'natural' attention — an unconscious, individual preference for visual or auditory stimuli.

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*Zur experimentellen Kritik der Theorie der Aufmerksamkeitschwankungen.* BERTIL HAMMER. Zeitschr. f. Psychol., 1905, XXXVII, 363-376.

*Die Aufmerksamkeitsschwankungen.* C. E. SEASHORE. Ztschr. f. Psychol., 1905, XXXIX, 448-450.

Hammer holds that the so-called fluctuation of attention to visual intensity-differences is completely explained by retinal fatigue, and fixation changes which subject fresh retinal areas to stimulation. In an experiment he employed strips of gray paper laid in pairs on a gray screen, and found, in the one set of results given, that both phases of the period of fluctuation lengthened with increase in the difference between the two grays, and decreased with the continued repetition of the observation of a given difference. This result is supposed by Hammer to confirm his theory.

The theory involves the supposition that in auditory objects no fluctuations of attention occur. Hammer's second experiment showed accordingly that in the sound of a succession of strokes of an electric hammer, controlled by a metronome and supposed to strike uniformly, no fluctuation was observable. The alleged occurrence of auditory fluctuation reported by various experimenters is explained out of hand as due to faulty methods, presumably the use of unsteady sounds.

Seashore, in commenting on Hammer's article, says that the experiment on visual fluctuations brings out nothing which was not already well known. He criticises the report of the auditory experiment for omitting important information as to the rate of the metronome, the nearness of the sound to the threshold, and the duration of

the experiment. Assuming that the rate was near one per second, he would have predicted that no fluctuation would occur, since the attention wave would rise regularly to a crest with each stroke.

As an instance of faultless experimentation, in which fluctuation was clearly found, Seashore cites his own observation on fifty-five unsophisticated students, each of whom discovered the fluctuation in the sound of a chronometer beating fifth seconds, and in which results showed there was no considerable physical variation.

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### FATIGUE.

*Recherches sur la fatigue intellectuelle scolaire et la mesure qui peut en être faite au moyen de l'æsthésiomètre.* A. BINET. *Année Psychologique*, 1905, XI, 1-37.

This research concerning the effect of intellectual fatigue on sensibility was carried out by a commission appointed from the members of the 'Société libre pour l'étude de l'enfant.' The work consisted entirely of experiments on children in the primary schools of Paris.

The æsthesiometric method was used in all the experiments in which touch sensibility was tested. The back of the hand, screened from the view of the subject, was the part stimulated. In order to stimulate the skin by two points separated by a fixed distance, two needles were sunk into the edge of a card in such a way that the projecting ends of the needle could be lowered simultaneously upon the skin. There were seven such cards, the distances between the points being as follows: 0 cm., 0.5 cm., 1 cm., 1.5 cm., 2 cm., 2.5 cm., 3 cm.

The first tests were made on 45 boys and 38 girls from six to twelve years of age. The points were applied to the skin according to the method of maximum variation, that is, so that there would be the greatest possible contrast between the successive stimulations; 56 tests (*i. e.*, eight with each of the seven cards) were made before school in the morning; at the end of an hour of composition and arithmetic another similar series of tests was made.

As the average threshold for discrimination seemed to be about 1.5 cm. the conclusions concerning the effect of fatigue on touch discrimination were based on the relative number of right and wrong cases when the distances were 0.5 cm., 1.0 cm. or 1.5 cm. Out of the 840 tests on the boys recorded at these three distances there were 322 right judgments (two points). From the same number of tests