so much attention are due to a prolongation of the excited state in the same region.

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Reaction Time and Chronological Age.

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Although the literature dealing with reaction time is enormous, no studies seem to have appeared of the relationship between reaction time and chronological age in a large group of individuals having a wide span of age limits. It seemed desirable that this relationship be studied.

We employed 150 individuals, sampled at random and ranging from the ages of 4 years to 60 years, grouped, for convenience, as shown in Table I.

TABLE I.

Group	Age Limits	Av. Age of Males	Av. Age of Females
	yr.	yr.	yr.
A	4-10	7.3	5.4
B	11-20	18.0	16.3
C	21-30	24.5	23.5
D	31-40	36.1	35.8
E	41-50	44.8	45.5
F	51-60	55.1	58.4

Each group contained 20 individuals, except Group F which had 10. Half the subjects in each group were females.

Our purpose being to determine the reaction times to light and sound, 2 simple arrangements were constructed. For light, an ordinary 50 watt electric light was placed in series with one of the poles of a double throw switch, the other pole being in series with a signal magnet, recording on a moving drum, the operator's key, and the subject's tap key, the response recorded by tapping the key and breaking the circuit. The apparatus for sound consisted of a signal magnet in series with the operator's and subject's tap key placed in the primary circuit of an induction coil, with a set of head telephones in the secondary circuit.

The subjects were always seated with arm and body in the same position and given the simple instructions necessary. The experimenter's operations and recording devices were not visible to the

subjects who were told that they would have a number of practice trials before the actual recording was begun. The number of practice attempts was arbitrarily determined by the operator from the nature of the responses; if it seemed advisable to allow more attempts to make the necessary neuromuscular adjustments, it was done. Final calculations were made from the subject's 5 best responses.

Averaging the times for males and females separately in each group (Table II), we find that males always respond more quickly than females, especially in childhood and late maturity, the figures closely approximating each other in the third decade. The reaction time to sound is always less than to light.

TABLE II.

	Male Averages				Female Averages			
Group	Light	S.D.	Sound	S.D.	Light	S.D.	Sound	S.D.
A	.34	.1070	.34	.0928	.62	.1644	.59	.1890
B	.24	.0400	.23	.0409	.32	.0340	.31	.0407
C	.22	.0331	.19	.0338	.26	.0192	.20	.0736
D	.26	.0465	.24	.0141	.34	.0378	.30	.1139
E	.27	.0266	.25	.0467	.36	.0342	.30	.0372
F	.38	.0574	.37	.0806	.44	.0721	.42	.0842

S.D. = standard deviation.

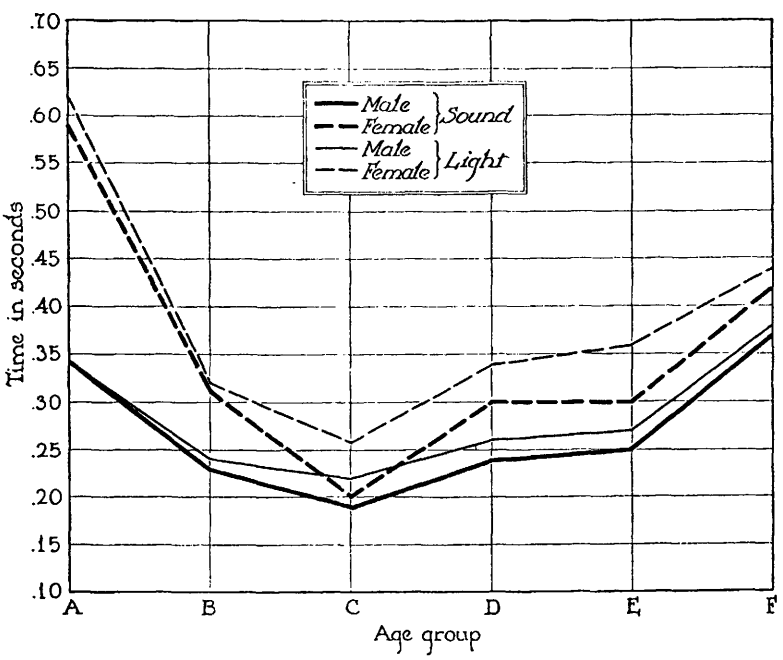

FIG. 1.

It should be recalled from Table I that although each group represents a 10-year span, the average reaction times are those corresponding to the average age of the individuals in a particular decade.

When the results are plotted in the form of a curve (Fig. 1), the striking fact becomes apparent that the shortest times are elicited between the ages of 21 and 30 years (Group C), with decrements approaching from earlier and later age groups. Thus, Rutherford's figures[1] for reaction time to sound as .15-.16 seconds, and to light as .20-.22 seconds would only hold for Group C. Our shortest figures for males show an average time of .22 seconds in response to light, and .19 seconds in response to sound. For females, the shortest average time to light is .26 seconds, and .20 seconds in response to sound.

There is a 73% increase in reaction time to light and a 95% increase in reaction time to sound of the males in Group F over those in Group C. Similarly, there is a 70% increase to light and a 110% increase to sound of the reaction time of females in Group F over those in Group C.

In the determination of reaction time, there are 2 requisites (Johnson,[2]) (a) the adequacy of the stimulus, and (b) the neuromuscular set. To meet requirement (a) for light, a 50 watt lamp was used at a distance of 3 feet from the subject with the current turned on until the response was made, while for sound, the intensity was adjusted for each subject until it was clearly audible, being kept on until the response was made. The neuromuscular set was established by the practice trials preceding the actual recording.

There may be some relation between the curve obtained in Fig. 1 and the parallel curve for mental growth, the latter increasing rapidly until late adolescence, showing a plateau from the late 'teens through the twenties, with the peak at 18 years, and then slowly falling off with approaching senility (Moss,[3] Pintner,[4] Sorenson,[5] Miles and Miles[6]).

It is probable that the great number of accidents among very old and very young persons is related to their longer reaction times.

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[1] Rutherford, *Proc. Roy. Soc. Edin.*, 1893, **20**, 328.

[2] Johnson, H. M., *Psych. Bull.*, 1923, **20**, 562.

[3] Moss, F. A., "Applications of Psychology," Houghton, Mifflin Co., Boston and New York, 1929, 158.

[4] Pintner, R., "Intelligence Testing," H. Holt and Co., New York, 1931, 86.

[5] Sorenson, H., *J. Educ. Psych.*, 1930, **21**, 451.

[6] Miles, C. C., and Miles, W. R., *Am. J. Psych.*, 1932, **44**, 44.