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Vibratory Sensibility: Influence of Height and Surface Area.*

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An apparatus for the quantitative determination of vibratory sensibility has been described by Newman and Corbin,[1] who determined vibratory acuity of normal individuals and found a progressive increase in threshold with age. An apparent tendency for tall individuals to exhibit higher thresholds was noticed during the course of that investigation. To determine this point, the vibratory thresholds of 139 males in the third decade of life were obtained as previously described.[1] The data so obtained were subjected to statistical analysis, in order to determine whether any relation might exist between vibratory sensibility and weight, height, or surface area. Surface area was computed by means of a DuBois surface chart as prepared by Boothby and Sandiford.

The frequencies for the thresholds of vibratory sensibility over the cranial margin of the patellae and the frequencies for different heights have been distributed in Contingency Table I, and those for the thresholds over the malleoli and for height, in Contingency Table II. Three numbers are shown in each cell in the tables. The first number represents the observed frequency, the second the theoretical frequency, and the third the chi square for that cell. Tables III and IV similarly represent the relation between vibratory sensibility threshold frequencies and surface area frequencies. The data have been analyzed by the chi square distribution method as used by Fisher.[2] The total chi square for each table, when referred to a Table of Goodness of Fit as given by Fisher, indicated that the probability that the discrepancy between the observed and the theoretical figures was due to chance was less than one in one hundred. Examination of Tables I to IV further reveals that the greatest discrepancies occur in those cells containing the extremes of the variables studied, and indicates a positive correlation between stature

* This study was supported in part by the Rockefeller Foundation Grant for Fluid Research in the Medical Sciences at Stanford University.

1 Newman, H. W., and Corbin, K. B., PROC. SOC. EXP. BIOL. AND MED. In publication.

2 Fisher, R. A., Chap. IV, *Statistical Methods for Research Workers*, Oliver and Boyd, Edinburgh, 1932.

and threshold of vibratory acuity. The chi square test showed a less significant relationship between vibratory acuity and weight.

TABLE I.
Distribution of 139 Males, 20-29 Years of Age.

Height, inches		Vibratory Threshold over Patellae					
		0.0-2.0	2.1-2.3	2.4-2.6	2.7-3.0	3.1 plus	Totals f_o
0.0-69.9	f_o	15	13	7	2	3	40
	f	12.66	7.19	6.91	4.89	8.35	
	x_2	0.43	4.69	0.00	1.71	3.43	
70.0-71.9	f_o	18	7	10	7	8	50
	f	15.83	8.99	8.63	6.17	10.43	
	x_2	0.30	0.44	0.22	0.11	0.57	
72.0 plus	f_o	11	5	7	8	18	49
	f	15.51	8.81	8.46	5.99	10.22	
	x_2	1.31	1.65	0.25	0.67	5.92	
Totals f_o		44	25	24	17	29	139

f_o = observed frequency, f = theoretical frequency, n = no. of degrees of freedom = 8, total x_2 = 21.70.

TABLE II.
Distribution of 139 Males, 20-29 Years of Age.

Height, inches		Vibratory Threshold over Malleoli				
		0.0-0.3	0.4-0.6	0.7-1.0	1.1 plus	Totals f_o
0.0-69.9	f_o	16	9	10	6	41
	f	8.26	10.03	10.32	12.39	
	x_2	7.25	0.11	0.01	3.30	
70.0-71.9	f_o	8	13	14	14	49
	f	9.87	11.99	12.34	14.805	
	x_2	0.35	0.09	0.22	0.04	
72.0 plus	f_o	4	12	11	22	49
	f	9.87	11.99	12.34	14.81	
	x_2	3.49	0.00	0.15	3.49	
Totals f_o		28	34	35	42	139

f_o = observed frequency, f = theoretical frequency, n = no. of degrees of freedom = 6, total x_2 = 18.50.

The evidence presented shows that individuals of greater height and surface area tend to have a higher vibratory threshold. That this increase in threshold could be due to other factors seems un-

TABLE III.
Distribution of 139 Males, 20-29 Years of Age.

Surface Area Square Meters		Vibratory Threshold over Patellae				
		0.0-2.0	2.1-2.3	2.4-2.6	2.7 plus	Totals f_o
0.0-1.85	f_o	22	14	9	9	54
	f	17.48	9.32	9.71	17.48	
	x_2	1.17	2.35	.05	4.11	
1.86-1.95	f_o	13	6	10	10	39
	f	12.63	6.73	7.01	12.63	
	x_2	0.01	0.08	1.28	.55	
1.96 plus	f_o	10	4	6	26	46
	f	14.89	7.94	8.27	14.89	
	x_2	1.61	1.96	0.62	8.29	
Totals f_o		45	24	25	45	139

f_o = observed frequency, f = theoretical frequency, n = no. of degrees of freedom = 6, total x_2 = 22.08.

TABLE IV.
Distribution of 139 Males, 20-29 Years of Age.

Surface Area Square Meters		Vibratory Threshold over Malleoli				
		0.0-0.3	0.4-0.6	0.7-1.0	1.1 plus	Totals f_o
0.0-1.85	f_o	20	12	11	10	53
	f	11.06	12.58	12.96	16.40	
	x_2	7.23	0.03	.29	2.50	
1.86-1.95	f_o	5	10	11	13	39
	f	8.14	9.26	9.54	12.06	
	x_2	1.21	0.06	0.22	0.07	
1.96 plus	f_o	4	11	12	20	47
	f	9.81	11.16	11.50	14.54	
	x_2	3.44	0.00	0.02	2.05	
Totals f_o		29	33	34	43	139

f_o = observed frequency, f = theoretical frequency, n = no. of degrees of freedom = 6, total x_2 = 17.12.

likely. Since the subjects were within the third decade of life, a decrease in vibratory acuity because of age would not be expected.[1, 3] Moreover, since this group consisted of medical students, it was unusually homogeneous and therefore reacted in a consistent manner to the examination.

[3] Pearson, G. H. J., *Arch. Neurol. and Psychiat.*, 1928, **20**, 482.

The reduced acuity in individuals of greater body surface may be due to their possession of fewer sensory receptors per unit area. Further investigation is needed to establish this point.

Individuals of greater height and greater surface area appear to have a higher threshold of vibratory sensibility.

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Propagation of Variola Virus in the Developing Egg.

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Since the early reports of Goodpasture and his coworkers[1, 2, 3] the chorio-allantoic membrane of the developing chick has been used for the propagation of a number of filterable viruses. This paper reports the propagation of the virus of variola major isolated directly from the pustular content of an active case. It is now in the forty-fifth consecutive passage on the chorio-allantoic membrane of the developing egg. The propagation of alastrim[4] has been attempted only after 2 passages through Macacus rhesus monkeys.

The patient, an unvaccinated white woman aged 32, developed a typical case of confluent smallpox shortly after a visit to Mexico City. The material for propagation was removed from lesions on the lower leg and soles of the feet on the seventeenth day after the onset of the disease. The abdominal and back lesions were starting to peel at this time. The material was obtained from 4 or 5 vesicles by means of a 1 cc. tuberculin syringe and consisted of 0.3 cc. of slightly turbid fluid and some swabs moistened with vesicle fluid. Growth was first obtained in one egg inoculated with 0.1 cc. of the vesicle fluid. Four days after inoculation, about 20 discrete yellowish white lesions were observed on the membrane. Impression smears showed typical Paschen bodies with Morosow's stain.[5]

* Edith Claypole Memorial Research Fellow in Pathology, 1936-37.

1 Woodruff, A. M., and Goodpasture, E. W., *Am. J. Path.*, 1931, **7**, 209.

2 Goodpasture, E. W., Woodruff, A. M., and Buddingh, G. J., *Science*, 1931, **74**, 371.

3 Goodpasture, E. W., Woodruff, A. M., and Buddingh, G. J., *Am. J. Path.*, 1932, **8**, 271.

4 Torres, C. M., and Teixeira, J. deC., *Compt. rend. Soc. de biol.*, 1935, **118**, 1023.

5 Morosow, M. A., *Zentralbl. f. Bakt. Abt.* 1, 1926, **100**, 385.