ON THE WEIGHT OF THE BRAIN AT DIFFERENT PERIODS OF LIFE, ETC.

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IN the year 1846, I communicated to the *Edinburgh Monthly Journal of Medical Science* a series of observations of the Weight of the Brain and other organs of the body, together with various tables, compiled from the whole of the observations collected by the late Professor John Reid¹ and myself, while holding the office of Pathologist to the Royal Infirmary of Edinburgh. Since this time I have made the following observations, which, though comparatively few in number, yet being complete as to the weights of the brain and its several parts, and corresponding in every respect with the two previous series of observations collected by Professor Reid and myself, may form an useful addition to them. The present series contains also several weights of the Brain in young persons, in which the former were especially deficient. The weight employed, I need scarcely add, is avoirdupois.

TABLE I. WEIGHT OF THE BRAIN IN MALES.

The D in the column "Heart" indicates that the organ was diseased.

Weight of the											Cause of Death, etc.		
No.	Age	Whole body.	Encephalon.		Cerebrum.		Cerebellum.		P. Varol. & Med. Oblong.	Heart.			
		lbs. oz.	oz.	dr.	oz.	dr.	oz.	dr.	oz.	dr.	oz.	dr.	
1	2	24 0	43	7	38	6	4	8	0	9	2	10	Burn; death in 21 days.
2	2	..	37	0	..	..	..	..	..	..	..	..	Malformation of the heart.
3	2½	31 8	47	0	42	0	4	4	0	12	2	12	Burn; 6 hours. Liver, 19oz.; spleen, 2oz. 8dr.; kidneys, 3oz. 8dr.
4	3	25 4	38	1	33	3	4	2	0	12	..	..	Burn; 15 days.
5	4	..	50	10	45	8	4	8	0	10	4	4	Burn; 12 hours.
6	5	21 0	45	12	40	0	5	0	0	12	3	0	Cholera; 6 days. Spinal cord, 11dr. 14grs.; pons Varolii, 7dr. 15grs. Total, 19dr. 2gr.
7	10	45 0	47	12	42	0	5	0	0	12	4	4	Cholera. Spleen, 2oz. 12dr.; kidneys, 4oz. 4dr.
8	11	..	46	0	40	0	5	0	1	0	5	8	Fever. Spleen, 9oz.
9	14	..	48	12	43	0	5	0	0	12	6	2	Fever.
10	15	88 0	50	8	44	0	5	8	1	0	8	0	Instant death from injury.
11	15	..	41	10	36	0	5	0	0	10	6	0	Phthisis.
12	15	..	49	4	43	8	4	12	1	0	10	0	Malformation of the heart. Liver, 45oz.; spleen, 6½oz.; kidneys, 8oz.
13	16	..	43	8	38	0	5 8		..	..	..	..	Fever.
14	20	..	37	0	32	4	4	0	0	12	12	0	Malformation of the heart.
15	24	..	47	8	41	8	5	4	0	12	9	0	Fever.
16	25	..	48	8	42	0	5	8	1	0	..	..	Fever.
17	21	121 0	51	0	45	0	5	0	1	0	..	..	Cholera.
18	29	..	52	0	46	0	5	0	1	0	14	0D	Cholera.
19	30	..	59	8	53	0	5	8	1	0	..	..	Fever.
20	33	..	48	8	42	0	5	8	1	0	12	8	Pleurpneumonia; 3 weeks.
21	32	..	48	0	..	..	..	..	..	..	16	0	Diseased heart. Liver, 80oz.; spleen, 13oz.; kidneys, 14oz.
22	37	99 0	49	0	43	0	5	0	1	0	9	0	Fever and erysipelas.

¹ Edinburgh Monthly Journal of Medical Science. April 1843.

Weight of the										Cause of Death, etc.		
No.	Age.	Whole body.	Encephalon.		Cerebrum.		Cerebellum.		P. Varol. & Med. Oblong.		Heart.	
		lbs. oz.	oz.	dr.	oz.	dr.	oz.	dr.	oz.		dr.	
23	42	..	46	8	41	0	4	10	0	14	..	Chronic diarrhœa.
24	45	..	52	12	45	8	6	4	1	0	10 0	Phthisis.
25	51	..	45	0	30	8	4	8	1	0	13 0D	Bronchitis.
26	50	..	56	4	50	0	5	8	0	12	14 0D	Erysipelas ; 9 days.
27	60	..	51	0	45	0	5	0	1	0	..	Cholera.
28	65	..	47	6	41	4	5	6	0	12	12 8D	Intussusception.
29	72	..	42	4	37	0	4	8	0	12	14 0D	Morbus cordis et hepatis.
30	78	..	48	0	42	0	5	0	1	0	18 0D	Injury of the head.

TABLE II. WEIGHT OF THE BRAIN IN FEMALES.

Weight of the												Cause of Death, etc.	
No.	Age.	Whole body.	Encephalon.		Cerebrum.		Cerebellum.		P. Varol. & Med. Oblong.		Heart.		
		lbs.	oz.	dr.	oz.	dr.	oz.	dr.	oz.	dr.	oz.		dr.
1	7 days	7	14	1	12	13	1	0½	0	3½	0	13	Liver, 6oz. 8dr.; spleen, 6dr.; kidneys, 1oz.; medulla spinalis, 2½dr.
2	1 year	15	31	8	27	0	4	0	0	8	2	0	Phthisis. Liver, 12½oz.; spleen, 1oz.; kidneys, 2½oz.
3	1½	13½	31	0	27	0	3	8	0	8	1	8	Hydrocephalus.
4	3	22	39	10	34	8	4	8	0	10	1	12	Burn; 1 day.
5	3	22	34	10	30	8	3	11	0	7	1	10	Burn; 4 hours. Liver, 16½oz.
6	5	28	41	8	36	8	4	4	0	12	2	14	Cholera; 1 day.
7	6	..	51	0	45	8	4	12	0	12	2	12	Burn; 14 hours. Spleen, 1oz. 8dr.; kidneys, 3oz. 12d.
8	11	36	44	6	38	8	5	0	0	14	3	14	Cholera. Spleen, 2oz.; kidneys, 4oz.
9	13	46½	37	8	32	8	4	4	0	12	6	2	Fever.
10	19	..	45	0	39	0	5	0	1	0	8	0	Cholera.
11	20	..	49	0	43	0	5	0	1	0	..	..	Fever.
12	19	..	46	12	41	0	5	0	0	12	7	12	Fever.
13	22	..	44	6	39	0	4	6	1	0	10	4	Fever.
14	30	..	46	0	40	0	5	0	1	0	10	0	Cholera.
15	36	104½	43	0	37	8	4	8	1	0	9	0	Delirium tremens.
16	76	..	44	6	38	6	5	0	1	0	10	12D	Strangulated hernia.

WEIGHT OF DISEASED BRAINS.

MALES.

11	38	56 4	50 0	5 4	1 0	4 0	Chorea; 6 weeks.
12	..	53 0	..	..	..	..	Convulsions.
33	..	54 0	..	..	..	11 0D	Apoplexy; 3 days.
62	..	39 12	35 0	4 4	0 8	16 0D	Soft. of brain, morbus renum

FEMALES.

24	..	42 8	37 0	5 8	..	..	Diseased brain and ear.
70	..	43 0	..	..	..	13 0D	Apoplexy.

The above observations are so few in number, that I have not thought it necessary to compile separate tables from them, more especially as it will be seen that they very closely correspond with the former much more numerous series. In the two following tables, however, I have presented the results obtained by calculating the whole of the data collected by Professor Reid, together with the present and former observations published by myself.

TABLE III. *Average Weight of the Brain at different periods of Life in Males.*

Ages.	Numbers weighed.	Average weight.	
		oz.	dr.
1 to 2 years	3	39	7
2 to 3 ..	4	44	1
3 to 5 ..	6	44	13·16
5 to 7 ..	4	45	4·25
7 to 10 ..	6	46	14·33
10 to 15 ..	13	47	15·2
15 to 20 ..	11	49	5
20 to 25 ..	21	50	13·9
25 to 50 ..	123	50	3·8
50 to 90 ..	53	48	9·4
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TABLE IV. *Average Weight of the Brain at different periods of Life in Females.*

Ages.	Numbers weighed.	Average weight.	
		oz.	dr.
1 to 2 years	3	31	1·3
2 to 3 ..	9	37	5
3 to 5 ..	4	41	0·5
5 to 7 ..	5	41	4
7 to 10 ..	2	40	6
10 to 15 ..	3	40	10·6
15 to 20 ..	18	45	4·1
20 to 25 ..	15	46	1·8
25 to 50 ..	69	45	0·6
50 to 90 ..	23	43	0·3
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The extreme range in the weight of the encephalon of the adult male is from 34 oz. to 62 oz. 12 dr., the number of brains weighed having been 197; and in the adult female the range is from 36 oz. 12 dr. to 54 oz., the number weighed having been 107.

1. The average weight of the encephalon of the adult, as calculated from the observations contained in Tables I and II, is, in males, 50oz.6dr.; and in females 44oz. 7½dr. The previous observations¹ gave an average of 50 oz. 3 dr. for the weight of the encephalon of the adult male, and of 44 oz. 14 dr. for that of the female. A similarly close correspondence will be observed on comparing the respective average weights of the several portions of the brain, as deduced from the two series of observations.

2. The observations now published show, with little exception, an increase of Weight in the Brain up to the period of adult age, but they are too few to satisfactorily illustrate this point. The tables compiled by Professor Reid,² that drawn up by Dr. Boyd³ from a very extended series of observations conducted at the St. Marylebone Infirmary, and the tables in my former communication, founded upon the united ob-

¹ Edinburgh Monthly Journal of Medical Science, vol. vii, pp. 101, 166. 1846.

² Edinburgh Monthly Journal, vol. iv. 1843.

³ Wagner's Physiology, translated by Willis. 1844. Appendix, p. 700.

servations of Dr. Reid and myself, have so conclusively established the fact that the Brain does not attain its full development till from twenty to twenty-five years of age, that I should not have thought it necessary to insist upon it, had not Sir W. Hamilton¹ recently repeated, as fully established, the opinion which he formerly expressed,² that the Wenzels³ were correct in stating that the brain attained maturity at or before the age of seven. To illustrate, therefore, the law of development of the brain, I have calculated the whole of the observations of Professor Reid and myself, and the results obtained are given in Tables III and IV.

From these tables it will be seen that the average Weight of the brain increases up to from twenty to twenty-five years age.⁴ During middle life, or from twenty-five to fifty years of age, it retains about the same weight, and in after-life it declines considerably. It is true that some exceptions will be found to this rule among the separate observations, but though it occasionally happens that the brain of a young person may be found to equal or exceed in weight the average of adults of the same sex, such exceptions do not frequently occur, and can then only be ascribed to the organ having attained premature maturity, or, most generally, to the mode in which death has occurred. In cases where there is much obstruction to the circulation through the lungs during the last periods of life, the brain is found very much engorged, and though great care be taken to deprive it of the blood, it will still weigh heavier than if death had taken place under different circumstances. Thus it is that the brains of persons who have died shortly after the receipt of extensive burns, or in the collapsed stage of cholera, are found to be unusually heavy. Generally also persons who have died of acute diseases, have heavier brains than those who have long suffered from exhausting causes. To obtain, therefore, unexceptionable results, it would be necessary to calculate the average Weight of the Brain in persons who have died under precisely similar circumstances, and in observations so framed I am satisfied that the exceptions to the general rule would be very rare.

Sir W. Hamilton⁵ states that he has "established, apart from the proof by averages, that the human encephalos does not increase after the age of seven at the highest. This has been done by measuring the head of the same young person from infancy to adolescence and maturity: for the slight increase in the size of the head after seven (or six) is exhausted by the development to be allowed to the bones, muscles, integuments and hair." It is, however, evident that this method of investigation can show only the period at which the brain attains its greatest bulk, and not that at which its development is completed; for every practical anatomist is familiar with the fact, that the density of the brain varies greatly at different periods of life. Calculations of the average Weight of the Brain afford the only means by which we can ascertain the period at which its full development is attained, and the changes which it undergoes during the progress of life.

¹ Edinburgh New Philosophical Journal, Jan. to April 1850, p. 330.

² Monro's Anatomy of the Brain. 1831.

³ De penitiori structura cerebri Hominis et Brutorum, p. 267, fol. Tubing. 1812.

⁴ It is probable, indeed, that there may be a slight increase beyond this period. In Dr. Boyd's table the weight, both in males and females, is greater at from 30 to 40 years, than at any other period of life.

⁵ Edinburgh New Phil. Journ. January to April 1850.