

## FELS MENTAL AGE VALUES FOR GESELL SCHEDULES

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One of the tests most widely used at the infant level is the Gesell Schedules (3). Gesell presents no device for standardization of total score, much less mental age. In our work here at Fels we have found it useful in graphing progress of the individual child to use mental age where possible, and the standard score method for other variables. Since the Gesell Schedules are not standardized in terms of mental age, it was impossible to plot the child's score in these terms without developing norms of such type. The present report presents the tentative mental age norms we developed for our own use, on the supposition that such norms for the Gesell Schedules might be useful elsewhere.

Children were tested<sup>2</sup> at half-yearly intervals by means of the Gesell Schedules at 6, 12, 18, and 24 months, the Merrill-Palmer Scale at 24, 30, 36, 42, 48, and 54 months, and the Stanford-Binet at 36, 48, and 60 months. Since the Fels study is a longitudinal one, the group studied is, or will be, composed of the same children at each age level. Obviously the group becomes smaller with the increase in age, since the total group of children is spread over a period of from the fetal stage to ten years. Test results used for obtaining distributions of mental age were used only when the child was tested within a restricted period about his birthday; this period was arbitrarily set at one per cent of the total age of the child (including 280 prenatal days).

In Table 1 are presented for each age level the mean score and the standard deviation for the Merrill-Palmer and Stanford-Binet Scales, mental age values at the mean, at the mean plus one sigma and the mean minus one sigma of raw score, together with the IQ's which would result from such MA values. It is seen that the mean IQ is about 115, and there is a deviation of about 15 points in IQ to account for the sigma of mental age. If we assume that though individuals may vary longitudinally the characteristics of the group distribution as measured by the Gesell Schedules are similar to those of the distributions as measured by the M-P and S-B scales later on, that is, and that the mean variability and nature of the curve are constant, it seems legitimate to calculate mental age equivalents for the raw score Gesell values (total number of items passed) in the following way:

Let the mean Gesell score represent that mental age which provides an IQ of 115, and let the sigma in mental age for the Gesell Schedules be represented by that difference from the mean in mental age which would provide an IQ of 100 for the score at  $-1$  sigma and 130 for the score at  $+1$  sigma.

When these values were calculated for each of the Gesell Schedules at the age points at which we have used them, the following results were obtained:

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NELSON AND RICHARDS: FELS MENTAL AGE VALUES

<u>Age Levels</u>	<u>Mean MA</u>	<u>Sigma MA</u>
6 months	6.90	.9
12 months	13.80	1.8
18 months	20.70	2.7
24 months	27.60	3.6

Mental age values for the raw score of the scales at each level may now be calculated according to the following equations:

- For six months,  $3.9196 + .1078555 x$
- For twelve months,  $4.1862 + .302 x$
- For eighteen months,  $9.492 + .389 x$
- For twenty-four months,  $17.048 + .443 x$

These equations are regression equations with an assumed correlation of 1 between age levels.

TABLE 1

AGE GROUPS, MEAN AND DISTRIBUTION SIGMAS OF MENTAL TEST SCORES, WITH MENTAL AGE AND IQ EQUIVALENTS

Scale	Age in Months	Number Cases	Score		M. A. Equivalents			I. Q. Equivalents		
			Mean Score	Sigma	Mean	Mean - 1σ	Mean + 1σ	Mean	Mean - 1σ	Mean + 1σ
Gesell	6	74	27.68	8.36						
Gesell	12	77	31.90	5.96						
Gesell	18	68	28.80	6.94						
Gesell	24	67	23.81	8.12						
Merrill Palmer		71	19.39	5.07	27	25	30	112.5	104.2	125.0
"	30	64	32.62	8.34	33	30	37	110.0	100.0	123.3
"	36	62	49.55	10.32	40	36	47	111.1	100.0	129.2
Stanford Binet		66	42.36	6.08	42	36	49	116.7	100.0	135.0
Merrill Palmer	42	64	61.81	10.29	48	42	55	114.3	98.8	131.0
"	48	56	74.41	7.94	57	51	70	118.8	105.2	144.8
Stanford Binet		58	55.03	7.66	55	47	63	114.6	97.9	131.3
Merrill Palmer	54	35	80.47	7.04	65	57	76	119.4	104.6	139.8
Stanford Binet	60	56	67.61	8.33	68	59	76	112.7	98.3	126.7
Mean								114.5	101.0	131.2

NELSON AND RICHARDS: FELS MENTAL AGE VALUES

Mental age values for the Schedules at each level are presented in Table 2.

TABLE 2

MENTAL AGE VALUES FOR NUMBER OF GESELL ITEMS PASSED AT FOUR AGE LEVELS

No. Items Passed	Months				No. Items Passed	Months			
	6	12	18	24		6	12	18	24
1	3.8	4.5	9.9	17.5	26	6.5	12.0	19.6	28.6
2	3.9	4.8	10.3	17.9	27	6.5	12.3	20.0	29.0
3	4.0	5.1	10.7	18.4	28	6.7	12.6	20.4	29.5
4	4.1	5.4	11.1	18.8	29	6.8	12.9	20.8	29.9
5	4.2	5.7	11.4	19.3	30	6.9	13.2	21.2	30.3
6	4.4	6.0	11.8	19.7	31	7.0	13.5	21.6	30.8
7	4.5	6.3	12.2	20.1	32	7.1	13.8	21.9	31.2
8	4.6	6.6	12.6	20.6	33	7.3	14.1	22.3	31.7
9	4.7	6.9	13.0	21.0	34	7.4	14.4	22.7	32.1
10	4.8	7.2	13.4	21.5	35	7.5	14.7	23.1	32.6
11	4.9	7.5	13.8	21.9	36	7.6	15.0	23.5	33.0
12	5.0	7.8	14.2	22.4	37	7.7	15.3	23.9	33.4
13	5.1	8.1	14.6	22.8	38	7.8	15.6	24.3	33.9
14	5.2	8.4	14.9	23.3	39	7.9	15.9	24.7	34.3
15	5.3	8.7	15.3	23.7	40	8.0	16.2	25.1	34.8
16	5.4	9.0	15.7	24.1	41	8.1	16.5	25.4	35.2
17	5.5	9.3	16.1	24.6	42	8.2	16.9	25.8	35.7
18	5.6	9.6	16.5	25.0	43	8.3	17.2	26.2	36.1
19	5.7	9.9	16.9	25.5	44	8.4	17.5	26.6	36.5
20	5.9	10.2	17.3	25.9	45	8.5	17.8	27.0	
21	6.0	10.5	17.7	26.4	46	8.7	18.1	27.4	
22	6.1	10.8	18.1	26.8	47	8.8	18.4	27.8	
23	6.2	11.1	18.4	27.2	48	8.9	18.7	28.2	
24	6.3	11.4	18.8	27.7	49		19.0	28.6	
25	6.4	11.7	19.2	28.1	50			28.9	

DISCUSSION

The foregoing method of calculating mental age values makes certain assumptions which may be controversial. It assumes 1) that the function "mental ability" is similar at various points during the first five years and 2) that variability in this function is constant over this period.

Oposing the validity of the first assumption is a considerable body of evidence to show that mental tests at various ages during infancy are not highly correlated, and that they predict poorly for later mental status. This evidence merits consideration, for the lack of correlation might suggest lack of "identical elements" between tests at two age levels. From the longitudinal viewpoint, however, it is possible that correlation between two age levels, involving varied environmental forces, may be an expression not so much of "identical elements" as identical imperviousness of the elements forming the test ability to influences in the environment. Length of the body at one point is logically similar to length at a later point, as heart rate may be similar to later heart rate. But a probable higher longitudinal intercorrelation for height than for heart rate would be an expression of the fact that height is less affected by the environment than is heart rate; the degree of

NELSON AND RICHARDS: FELS MENTAL AGE VALUES

identity of the phenomena is beyond question. Low intercorrelations between mental tests at early age levels may be due in part to the fact that dissimilar functions are measured; it is more likely, however, that the functions measured are similar but that children are more susceptible to deviation in these functions than they are later in life, when such intercorrelations between mental ability at various age levels are higher.

Regarding the second point in question - that is, the assumption of constant group variation in mental ability, contrary evidence of Thurstone (4) is pertinent. Thurstone is convinced that "absolute variability" in mental ability increases with age. It is not clear that this increase in "absolute variability" is an increase over and above what we would expect with a constant coefficient of variability for an increasing chronological age. Since Thurstone's method of calculating absolute variability is considerably unlike the method of calculating variability for the distributions used here, it is difficult to apply his rationale to our own situation. We have been able to check our assumption of constant variability by scoring the Gesell performances at six and at twelve months by means of the age values Bayley (1,2) obtained for certain of the items used by us. Bayley's age placement values for 24 items yielded at six months an age score which for 52 cases, correlated .893 with our raw score, and for 63 cases at twelve months (on twenty items), .735. A comparison of the mean and standard deviations of these age values with these measures for the age values obtained by our inference method follows

		6 mos	12 mos.
Mean	Bayley	7.04	14.06
	Fels	6.90	13.80
S. D.	Bayley	0.96	1.49
	Fels	0.90	1.80

This evidence would indicate that the values obtained on the basis of what Bayley found were actual age values were not significantly less variable at six months than those obtained when it was assumed that variability was constant over this early period. The difference between the standard deviations divided by the sigma difference was .5 At twelve months the variability obtained by using Bayley's values was less (the difference divided by the sigma of the difference being 1.3).

SUMMARY

The construction of these tables of mental age values for the Gesell Schedules assumes similarity of function measured by the schedules and by repeated Merrill-Palmer and Stanford-Binet tests later than two years. It also assumes that the coefficient of variability is constant, - that variability increases with increase in mean score.

On the basis of these assumptions, mental age values for Gesell Schedules are presented in Table 2.

NELSON AND RICHARDS: FELS MENTAL AGE VALUES

REFERENCES

- (1) Bayley, Nancy. Mental growth during the first three years: a developmental study of sixty-one children by repeated tests. *Genet. Psychol. Monog.*, 1933, 14, 1-92.
- (2) Bayley, Nancy. The development of motor abilities during the first three years. *Monog. Soc. Res. Child Develop.*, 1935, 1, No. 1, 1-26.
- (3) Gesell, A.: The mental growth of the preschool child. A psychological outline of normal development from the birth to the sixth year, including a system of developmental diagnosis. New York, Macmillan, 1925, x + 447.
- (4) Thurstone, L. L.: The absolute zero in intelligence measurement. *Psychol. Rev.*, 1928, 35, 175-197.

