

## CHAPTER XVII

### THE EFFECT OF A CHANGE TO A RELATIVELY SUPERIOR ENVIRONMENT UPON THE IQ'S OF ONE HUNDRED CHILDREN

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The problem of the relative constancy of the IQ has been given much attention. The literature reveals conflicting evidence, as may be noted in recent extensive reviews of the subject by Baker (1), Brooks (2), Crissey (3, 4), Dawson (5), Dearborn (6), and Foran (7). Representative of one trend of investigation are the works of Hawk (9), Skeels (15), Skeels and Fillmore (16), and Wellman (19, 20, 21, 22), all of whom report changes in IQ associated with various environmental factors. Hawk reported that training in speech results in an improvement that raises the quantitative intellectual responses of some children suffering from speech handicaps. Skeels and Fillmore report a retarding effect on mental development of poor homes that provide a minimum of mental stimulation. Crissey, studying children in different types of institutions, concluded that "the average [mental level of the environment] tends to set the 'stimulation level' for the group, and children develop as the environment demands development" (3, p. 220).

Wellman (21) from her work on mental growth has concluded that "any theory of intelligence which does not allow for the possibility, but not necessarily the fact, of extreme flexibility during the childhood period must be considered incomplete and definitely misleading . . ." (p. 138).

On the other hand, Lorge and Hollingworth (12) report high stability in the intellectual status of highly intelligent children, and

Lamson (11) could find no change in IQ attendant upon participation in a rich and vital school curriculum, saying:

Whatever the number of years over which the growth was studied; whatever the number of cases in the several groups used for comparisons; whatever the grade groups in which the IQ's were obtained; whatever the length of the interval between initial and final testing; in short, whatever the comparison, no significant change in IQ's has been found. (p. 70)

With these studies and articles like that of Garrett (8) emphasizing the controversial nature of the issue, it was decided to investigate this question at Mooseheart. The purpose of the present investigation, therefore, is to determine the effect of a change to a relatively superior environment upon the mental development of the average, normal, healthy child.

### I. THE MOOSEHEART ENVIRONMENT

The environment of Mooseheart is superior to that of the homes from which most of the resident children come.

This is most obvious from a purely physical standpoint, for every effort is made to see that the *health* of all children is as perfect as can be maintained. Regular physical examinations, a regular program of preventive medicine, carefully controlled diets, and sufficient clothing are all part of a carefully followed system.<sup>1</sup>

The *recreational environment* is also above the average. Indoor and outdoor sports together with extramural competition are freely enjoyed under the supervision of specially trained recreational directors. Motion pictures, plays, speakers from the outside, dances, and similar activities are all a regular part of this aspect of the environment. There is also free time for wandering about over the 1,200 acre tract of land, which includes a lake and woodland areas as well as a modernly operated farm.

Slightly less obvious, but just as systematically cared for, are the social, educational, vocational, and religious aspects of the environment. The *living quarters* are small cottages, each containing not more than 14 children living with a housemother and a cook and, in the case of the older boys, also a housefather. The cooking for each cottage is done in the kitchen of that cottage, so that each is a complete unit in which the customary home activities

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<sup>1</sup> Mooseheart was founded in 1913 by Honorable James J. Davis, United States Senator from Pennsylvania. It is owned and operated by the Loyal Order of Moose as a home and school for dependent children of deceased members of the Order.

are carried on. Each child has certain responsibilities and participates in regular home duties. The children are free to receive visitors and frequently intercottage parties are arranged.

Mooseheart maintains a complete *educational system* from nursery school through high school. The academic standards of this system are nationally recognized as being excellent, and the schools are annually approved by the proper crediting agencies. In regard to educational facilities, then, the Mooseheart environment should be at least as stimulating as is to be found in the average school system.

Perhaps the most unusual aspect of the environment, however, is the *vocational training* offered. During the seventh, eighth, and ninth grades every child spends 3 months at each of several vocations, at the end of which time he or she is expected to specialize in one of them. These vocations include ornamental concrete work, sheet metal work, printing, farming, and machine shop for boys, and beauty-parlor instruction, secretarial training, cooking, and so forth for the girls. The result is that by the time each child is graduated from Mooseheart, he or she should be fully capable of earning a living in some particular line of work. This unique system of education has been in existence at Mooseheart for over 25 years.

An extra feature of the Mooseheart environment is liberal *religious and moral training* both in school and home under the direction of two resident chaplains.

The *Mooseheart Laboratory for Child Research* (Reymert, 13) maintains a clinic that systematically follows each child during his stay in an attempt to help him over any personality or educational difficulties that might hinder his living up to the highest possible level of achievement.

The *IQ distribution* at Mooseheart is the same as is found in any normal community, and Thomson (18) has shown that the personality development of these children is no different from that of children living in their own homes.<sup>1</sup> The IQ distribution within each cottage group ranges from low to superior, thereby giving stimulation to the children of lower IQ's in the cottage. Stimulation for children of higher IQ's is provided for by individual attention in the flexible school system.

The *ratio of adults to children* in the population has been mentioned as a factor in determining a stimulating environment. At the present time, Mooseheart has a ratio of one adult to 1.8 children, which is probably higher than in the average private home.

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<sup>1</sup>Based on his P.Q. (personality quotient) investigation at Mooseheart, Thomson states "there is no statistically significant difference which would indicate that the Mooseheart environment is more restrictive in nature than the average home environment."

In summary, it should be noted that Mooseheart is not an orphanage, for all children under 14 years of age in a family are admitted along with the mother, who is given a position in accordance with her training until the youngest child is graduated. The entrance requirements provide that no crippled or feebleminded children shall be admitted. Mooseheart has been referred to by certain state legislatures as 'a model institution.' It is typical of the spirit and interest of the Administration that Mooseheart is designated as "The City of Childhood." With its student bank, Government post office, department stores, power plant, and fire department, it has all the features of a well-rounded small community.

## II. SUBJECTS AND MATERIAL

The student population of Mooseheart is ordinarily 1,000 children, coming from all states of the Union and a few from Canada, equally divided as to sex and normally distributed as to age, varying from infancy to 18½ years (at graduation). From this population, 100 children were selected at random as subjects. At the time of entrance to Mooseheart, the older form of the Stanford-Binet Test had been administered to each child and repeated annually by a group of 6 well-trained examiners, so that at the time of the study, each child had received 5 tests at intervals of one year. The mean IQ of the group at entrance was 95.80, which would be an average group according to Terman's classification (17). Since it was demonstrated by Reymert (14) that the IQ's of behavior-problem children are more variable than those of normal children, no subjects of this type were included. All were physically well. It should be noted here that out of this group, those children who entered Mooseheart after the age of 6 had had no nursery or kindergarten training in their local communities; upon arrival at Mooseheart they were, of course, placed in their appropriate grade on the basis of achievement tests and their former school record. Those children who entered at any time before the age of 6 had all had the benefit of varying degrees of nursery and kindergarten training at Mooseheart.

The age range of the subjects at the time of the first testing—that is, at the time of entrance to Mooseheart—was as follows:

<i>Chronological Age</i>	<i>Number</i>	<i>Chronological Age</i>	<i>Number</i>
3	7	9	13
4	7	10	9
5	7	11	11
6	9	12	5
7	14	13	4
8	13	14	1

### III. PARENTAL BACKGROUND

The occupational status of the fathers of the children who served as subjects was scored according to the classification of employed males in the United States as given in the report of the 14th Census of the United States (Volume IV, 1920). This report classifies occupations in seven groups, grading downward from I to VII:

<i>Group</i>	<i>Occupation</i>
I	Professional
II	Semiprofessional and Managerial
III	Clerical, Skilled Trades and Retail Business
IV	Farmers
V	Semiskilled, Minor Positions, Minor Business
VI	Slightly Skilled Trades, and other occupations requiring little training or ability
VII	Day Laborers of all Classes

On such a classification of occupations, the fathers of this group fell into the following distribution:

<i>Group</i>	I	II	III	IV	V	VI	VII
Percentage	0	2.0	30.0	6.0	0	20.0	42.0

The median occupational status of the group was placed at Group VI, obviously indicating that the economic level of the fathers of these children was not high.

The educational level of the mothers showed the following percentage distribution (owing to incomplete records it was not possible to obtain this same information about the fathers):

<i>School Grade</i>	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Percentage	5.0	0	0	15.0	4.0	65.0	0	3.0	5.0	3.0

The median educational level of the group was placed at Grade VIII. This, coupled with the fact that 65 percent of the mothers had but a grade-school education, shows that the educational level of the group was not high, but probably equals the average for the country.

A sociological survey showed that 80 per cent of the original homes were in towns with a population under 50,000.

#### IV. RESULTS

Critical ratios were obtained, for the entire group of subjects, between the entrance year and each succeeding year in order to determine the general effect of the Mooseheart environment. These are shown in the following tabulation:

<i>Test</i>	<i>Num- ber</i>	<i>Mean</i>	<i>S. D.</i>	<i>Critical Ratio of Difference</i>
First	100	95.80	14.45	...
Second	100	96.75	14.85	1.44
Third	100	96.75	14.10	1.50
Fourth	100	96.10	14.95	.44
Fifth	100	96.30	14.45	.77

These results show that, as far as the group as a whole is concerned, there is no significant difference between its average IQ at entrance to Mooseheart and its average after 4 years' stay in this environment. This is made more evident by the fact that the critical ratio between the mean entrance score and the mean 4-year score is less than that between the average IQ at entrance and the average IQ at the end of the first year. When the mean entrance score was compared with the average for all four succeeding years, a gain of .68 points was obtained.

At the time of the first meeting the subjects were arbitrarily divided into age groups, one group consisting of those children of 6 years of age and under; a second group, those of 7, 8, and 9 years; and a third group, of those 10 to 14 years, inclusive. Critical ratios were then determined between the entrance year and each succeeding year for all groups (Table I).

TABLE I.—DIVISION OF IQ'S INTO THREE AGE GROUPS, SHOWING MEANS, STANDARD DEVIATIONS, AND CRITICAL RATIOS OF DIFFERENCE BETWEEN ENTRANCE TEST AND EACH SUCCEEDING TEST

<i>Test</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Crit. Ratio of Diff.</i>
30 Children 6 Years Old and Under			
1st test (entrance)	96.66	14.07	...
2nd test	102.00	14.83	4.48
3rd test	104.80	11.67	7.20
4th test	101.80	12.36	4.58
5th test	103.25	9.46	5.23
40 Children 7, 8, and 9 Years Old			
1st test (entrance)	96.32	12.32	..
2nd test	97.00	13.52	.74
3rd test	96.85	14.93	.51
4th test	95.46	13.14	.94
5th test	97.00	11.60	.80
30 Children 10 to 14 Years Old			
1st test (entrance)	92.00	12.32	..
2nd test	92.21	12.36	.20
3rd test	91.66	12.95	.32
4th test	91.06	13.66	.86
5th test	91.65	11.40	.35

Both individual and collective scores of this distribution indicate, we find, a significant increase in IQ only in the cases of young children; that is, those 6 years of age and under.<sup>1</sup> There was, moreover, no one

<sup>1</sup> Because of the fact that there were 8 children in the third group (10 to 14 years) whose IQ's were all well below 90 and 4 children whose IQ's were well above 110, the average IQ of this group at entrance was lower than that of the other groups. The standard deviation, however, of this group is approximately the same as that of the others. While, as may be seen, there is a 4.66 difference between the mean IQ of the group of children who were 6 years and under and those who were 7, 8, and 9 years, and 4.3 difference between the children 7, 8, and 9 years and those between 10 to 14 years, these differences are not statistically significant.

child among the younger group who showed an unusually large IQ advancement—the greatest increase from one year to another was but 11 points—nor were there any more children of superior mental ability in this group than in either of the other two. The average improvement in test score over the four-year period was 6.15 points, as compared to a gain of .26 points for subjects 6 years and under, and a loss of .36 points for the children 10 to 14 years old.

TABLE II.—DIVISION OF CHILDREN INTO TWO GROUPS ON THE BASIS OF IQ RANGES AT TIME OF ENTRANCE, SHOWING MEAN IQ, STANDARD DEVIATION, AND CRITICAL RATIOS OF DIFFERENCE BETWEEN ENTRANCE TEST AND EACH SUCCEEDING TEST

<i>Test</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Crit. Ratio of Diff.</i>
49 Children, 70 to 94 IQ			
1st test (entrance)	84.95	7.30	...
2nd test	84.70	7.95	.50
3rd test	84.75	7.70	.41
4th test	84.60	7.95	.70
5th test	84.10	5.35	1.77
51 Children, 95 to 130 IQ			
1st test (entrance)	105.55	8.35	...
2nd test	106.05	9.00	.91
3rd test	106.45	9.40	1.61
4th test	106.20	7.90	1.31
5th test	106.40	6.60	1.61

The IQ distribution at entrance was arbitrarily divided into two sections: those IQ's that ranged from 70 to 94 in one class, and those that ranged from 95 to 130 in another. Again, the entrance scores of each group were compared to those of the following years.

The critical ratios of Table II show that there is a tendency for high-normal or superior children to exhibit a slightly greater increase in IQ. This is evidenced by the fact that subjects of this group gained an average .72 point in IQ during the 4-year period, while subjects



of the other group lost an average of .41 point in IQ during the same length of time. It was further noticed that the superior children exhibited the same constancy of intellectual development that Hollingworth (10) mentions.

As a further means of differentiation, the children were classified according to the monthly incomes of their fathers. This resulted in three income groups, the first from 0 to \$75.00 per month, the second from \$76.00 to \$150.00 per month, and the third from \$151.00 to \$225.00 per month (Table III).

On inspection of this classification, we again see no significant rise in IQ. As a matter of fact, the differences were even less significant than in former distributions. The first two groups, however, did show an average gain in IQ of .66 point and .56 point, respectively, over the four-year period, whereas the third group lost an average of .24 points. In addition, no significant difference was found between the entrance and yearly scores of one group when compared with the entrance and yearly scores of another group.

When the subjects were distributed according to the amount of time that had elapsed between the deaths of their fathers and their entrance to Mooseheart, three groups resulted—the first from 0 to 12 months, the second from 13 to 24 months, and the third 25 or more months. All three groups showed an average IQ increase over the 4-year period, yet none was enough to be a significant change. The first group exhibited an average gain in IQ of .79 point during 4 years; the second, of .53 point; the third, of .92 point. There was, moreover, no significant difference to be found between the entrance and yearly scores of one group when compared to entrance and yearly scores of another group.

Again, the children were classified according to the type of schooling they had received before entrance to Mooseheart. Those who had attended school, or kindergarten, or preschool regularly were placed in one group; those who had attended irregularly, in a second group. In each of these groups, as in the case of all others, the average IQ at entrance was compared statistically with the average IQ for each succeeding year.

In this classification 'irregular schooling' means that a child has been out of school for short periods, off and on, for more than a year

TABLE III.—CLASSIFICATION OF CHILDREN INTO THREE GROUPS ACCORDING TO AMOUNT OF MONTHLY INCOME OF FATHERS, SHOWN WITH CRITICAL RATIOS OF DIFFERENCE BETWEEN ENTRANCE TEST AND EACH SUCCEEDING TEST

<i>Test</i>	<i>Mean</i>	<i>Stand- ard De- viation</i>	<i>Crit. Ratio of Diff.</i>
Income, 0 to \$75: 30 Cases			
1st test (entrance)	95.28	12.90	..
2nd test	95.35	16.73	.05
3rd test	96.21	17.11	.65
4th test	96.00	15.93	.56
5th test	96.20	13.96	.82
Income, \$76 to \$150: 40 Cases			
1st test (entrance)	96.90	13.10	..
2nd test	97.55	15.35	.61
3rd test	97.15	14.85	.28
4th test	97.35	15.25	.43
5th test	97.80	14.50	.91
Income, \$150 to \$225: 30 Cases			
1st test (entrance)	95.00	13.51	..
2nd test	96.64	14.22	.31
3rd test	94.42	14.85	.48
4th test	95.00	14.03	.00
5th test	95.00	14.58	.00

or has had more than one year out of school in his record. Most cases showed the first condition.

The economic background of the children in the regular attendance group was superior, on the whole, to that of the children in the irregular attendance group. The occupational status of parents and the educational level reached by the mothers bear this out:

<i>Occupational Group</i>	<i>Percentage of Fathers in Each Classification</i>	
	<i>Regular School Attendance</i>	<i>Irregular School Attendance</i>
I	0	0
II	5.0	0
III	38.0	12.5
IV	10.0	5.0
V	0	0
VI	25.0	12.5
VII	22.0	70.0

It is readily seen that the median occupational level of the fathers of children who attended school regularly would be at Level IV, while that of the fathers of the children who attended school irregularly would be at Level VII.

TABLE IV.—CLASSIFICATION OF CHILDREN ACCORDING TO AMOUNT OF SCHOOLING RECEIVED BEFORE ENTRANCE TO MOOSEHEART, SHOWING MEAN IQ'S, STANDARD DEVIATIONS, AND CRITICAL RATIOS OF DIFFERENCE BETWEEN ENTRANCE TEST AND EACH SUCCEEDING TEST

<i>Test</i>	<i>Mean</i>	<i>Stand- ard De- viation</i>	<i>Crit. Ratio of Diff.</i>
Regular Attendance at School: 40 Children			
1st test (entrance)	98.10	10.30	...
2nd test	98.60	11.45	.63
3rd test	98.80	12.10	.83
4th test	98.95	11.65	1.06
5th test	99.00	10.70	1.50
Irregular Attendance at School: 40 Children			
1st test (entrance)	86.00	12.05	...
2nd test	86.35	11.60	.41
3rd test	86.65	13.40	.72
4th test	87.50	14.50	1.48
5th test	87.00	14.45	.99

Similarly, the educational level of the mothers of those who attended school regularly was higher (90 percent of them reaching eighth grade or higher) than was the educational level of the mothers of those who attended school irregularly (only 57 percent of these reaching the eighth grade).

The difference in average IQ at entrance between the two groups seems to denote the difference in the socio-economic status of the parents of the two groups. The point to be noted in Table IV, however, is that, once these environmental factors had been improved, the average IQ of the group attending irregularly did not change significantly, which also corresponds with the findings of Lamson (11).

## V. SUMMARY

1. In order to test the effect of a relatively superior environment on the IQ's of children, the case histories of 100 children at Mooseheart were examined. The age range at the time of entrance to Mooseheart was from 3 to 14 years, and the IQ range from 70 to 130. All were physically well and had been in the superior environment of Mooseheart for 4 years. Each child had been given the old form of the Stanford-Binet test at entrance and had been examined yearly with the same test.

2. That the environment of Mooseheart is superior to most of the homes from which the subjects came was shown by a sociological survey of parents' employment and education. The average male parent belonged to the "slightly skilled trades and other occupations requiring little training or ability," though 42 percent were day laborers. The median educational level of the mothers was Grade VIII. A comparison of the Mooseheart environment with the environment provided by the parents showed the former to be vastly superior in all respects.

3. A comparison of the entrance-test scores of the whole group with those of each succeeding year showed no significant gain in IQ, even after 4 years' stay in the environment.

4. By dividing the subjects into age levels, it was found that children of 6 years and under, both individually and as a group, showed a significant gain in IQ after one year's residence at Mooseheart. Small but significant gains continued throughout the four years' testing period for this group. The other age groups—one consisting of children

of 7, 8, and 9 years, and the other of children from 10 to 14 years—showed no significant gain.

5. By dividing the subjects according to IQ, with one group ranging from 70 to 94, and the other from 95 to 130, it was found that change to the relatively superior environment of Mooseheart did not cause a significant rise in IQ in children whose mental ability is either above or below the normal limits.

6. The subjects were further compared from the points of view of economic background of parents, length of time that had elapsed between death of father and entrance to Mooseheart, and regularity of previous schooling. None of these classifications showed a significant gain in IQ over entrance score.

## VI. CONCLUSIONS

Indications from our study, then, seem to be that if the removal of children from a relatively inferior to a relatively superior environment is to have an advantageous effect on their IQ's, such change should be made before they reach the age of 6, because, for children from school-entrance age on, the IQ remained constant over 5 annual examinations following upon a change to a relatively superior environment.

It should be noted in interpreting these results that the preschool group, which showed a significant rise in IQ, had all had some measure of nursery and kindergarten training whereas the older group had had no such training. Might it not be, then, that the rise in IQ of the preschool group is due in considerable measure to the fact that the solving of several of the items in the preschool range of the scale depends upon specific information (such as, sex, last name, parts of body, and so forth) and that such information is being gradually supplied in nursery and kindergarten training?

## REFERENCES

- (1) BAKER, H. J. "Intelligence and its measurement." *Rev. Educ. Research*, 5: 1935, 187-198.
- (2) BROOKS, F. D. "Mental development in adolescence." *Rev. Educ. Research*, 6: 1936, 85-101.
- (3) CRISSEY, O. L. *Mental Development as Related to Institutional Residence and Educational Achievement*. (University of Iowa Studies, Studies in Child Welfare, 13, No. 1; Iowa City, 1937) 81 pp.

- (4) CRISSEY, O. L. "The mental development of children of the same IQ in differing institutional environments." *Child Develop.*, 8: 1937, 217-220.
- (5) DAWSON, S. "Environmental influence on mentality." *Brit. Jour. Psychol.*, 27: 1936, 129-134.
- (6) DEARBORN, W. L. "The mental and physical development of public-school children." *School and Soc.*, 41: 1935, 585-593.
- (7) FORAN, T. G. *A Supplementary Review of the Intelligence Quotient.* (Catholic University of America Research Bulletin, 4, No. 9; Washington, D. C., 1929) 42 pp.
- (8) GARRETT, H. E. "Again the 'Inconstant IQ.'" *Jour. Consult. Psychol.*, 2: 1938, 200.
- (9) HAWK, S. S. "Does the IQ change with speech training?" (Booklet published by University of Southern California).
- (10) HOLLINGWORTH, L. S., and KAUNITZ, R. M. "The centile status of gifted children at maturity." *Ped. Sem. and Jour. Genet. Psychol.*, 45: 1934, 106-120.
- (11) LAMSON, E. E. "To what extent are intelligence quotients increased by children who participate in a rich vital school curriculum?" *Jour. Educ. Psychol.*, 29: 1938, 67-70.
- (12) LORGE, I., and HOLLINGWORTH, L. S. "Adult status of highly intelligent children." *Ped. Sem. and Jour. Genet. Psychol.*, 49: 1936, 215-226.
- (13) REYMERT, M. L. "The Mooseheart laboratory for child research." *Amer. Jour. Psychol.*, 43: 1931, 302-303.
- (14) REYMERT, M. L. "Re-test reliability of the Stanford Revision of the Binet-Simon intelligence tests and differences in reliability between problem and non-problem children." [In Proceedings] *Onzieme Congres International de Psychologie*, Paris, 1938, 571 pp. (p. 439).
- (15) SKEELS, H. M. "Mental development of children in foster homes." *Ped. Sem. and Jour. Genet. Psychol.*, 49: 1936, 91-106.
- (16) SKEELS, H. M., and FILLMORE, E. A. "The mental development of children from underprivileged homes." *Ped. Sem. and Jour. Genet. Psychol.*, 50: 1937, 427-439.
- (17) TERMAN, L. M. *The Measurement of Intelligence.* (Houghton Mifflin Co.: Boston, 1916) 362 pp.
- (18) THOMSON, W. A. "An evaluation of the P.Q. (personality quotient) test." *Character and Personality*, 6: 1937-1938, 274-292.
- (19) WELLMAN, B. L. "The effect of pre-school attendance upon the IQ." *Jour. Exper. Educ.*, 1: 1932-1933, 48-69.
- (20) WELLMAN, B. L. "Growth in intelligence under differing school environments." *Jour. Exper. Educ.*, 3: 1934-1935, 59-83.
- (21) WELLMAN, B. L. "Mental growth from preschool to college." *Jour. Exper. Educ.*, 6: 1937-1938, 127-138.
- (22) WELLMAN, B. L. "Our changing concept of intelligence." *Jour. Consult. Psychol.*, 2: 1938, 97-107.