Educational Research
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rere20

ENVIRONMENTAL CONDITIONS AFFECTING INTELLIGENCE

R. Lynn [a]
[a] Exeter University
Published online: 09 Jul 2006.

To cite this article: R. Lynn (1959) ENVIRONMENTAL CONDITIONS AFFECTING INTELLIGENCE, Educational Research, 1:3, 49-61, DOI: 10.1080/0013188590010304

To link to this article: http://dx.doi.org/10.1080/0013188590010304

ENVIRONMENTAL CONDITIONS AFFECTING INTELLIGENCE

by R. LYNN
(*Exeter University*)

1. Introduction

It is now agreed by authorities such as Burt and Vernon that in western society inheritance is the major factor determining differences in what teachers understand by intelligence. This has been made clear by the two previous articles in the present series. Nevertheless, environment counts for a great deal and since education at home and at school acts through the environment, it is important to examine what we know about environmental influences. Relatively few studies have attempted to examine this question at all closely, partly because of the difficulty of isolating the suspected variables. However, there is enough evidence to suggest that there are at least five broad environmental factors of importance. This paper presents the evidence for these factors and discusses the mechanisms by which they work.

2. Schooling and Intellectual Stimulation

Perhaps the first place we should look for an environmental variable affecting intelligence is the school. However, since in western culture virtually all children go to school it is extremely difficult to determine the effect of this factor. We may plausibly assert that schooling increases the functional or operational intelligence and that universal compulsory education has certainly made the adult populations of western countries more able to think and act effectively in complex situations. The differences disclosed when scores on non-verbal tests achieved by technically advanced and educated groups are compared with those coming from underdeveloped countries are probably to be ascribed, at least in part, to differences in educational stimulation. Nevertheless, it must be admitted that it is difficult to show this in any conclusive way, since in the first place the so-called ' culture free ' tests may well be biased in favour of western populations; and secondly, the degree of intellectual attainment of a community is fairly certainly the result of the type of home conditions and the material standard of living as well as of education. Even within our own society differences between groups are difficult to interpret. For example, there is a well known study of Gordon showing that children brought up on canal boats with interrupted and intermittent schooling scored progressively lower on intelligence tests as they got older. This has frequently been interpreted as demonstrating the adverse effects of an irregular schooling on measured intelligence. However, it is now known from McLaren's study that the association of socio-economic status with intelligence gets progressively greater as the child grows older throughout the population, whether the child's schooling is irregular or not. It seems, therefore, that Gordon's findings could be due to any of the factors depressing intelligence test scores which are associated with the underprivileged home.

A field in which the effects of schooling have been effectively studied is nursery school education. Here a large accumulation of evidence indicates that, for children

enjoying an ordinary family life, nursery school attendance has no effect on measured intelligence. Stoddard *et al.*, summarise nine studies of which eight report that there is no tendency for intelligence to be increased by nursery school attendance. Those studies such as Wellman's which appear to find increases in intelligence with nursery schooling can probably be explained in other ways. In this, 652 children attended pre-school in the U.S.A. for one year. The mean initial I.Q. was 117; and at the end of the year at pre-school the mean I.Q. was 124. 29 children attended the pre-school for 4 years; their mean initial I.Q. was 116, their mean final I.Q. 127. These findings may appear to suggest that nursery school attendance does something to raise the child's I.Q. as measured by tests. It should be observed, however, that these were children of high socio-economic status and since the association of I.Q. and socio-economic status probably increased with the age of the child, rises in I.Q. would be expected to occur even without the nursery school training.

On the other hand, gains both in measured intelligence and in operational ability may be present in special circumstances, such as where the intellectual stimulation is intense, or where, the home environment having been exceptionally poor in intellectual stimulation, the school makes up for it.

Certain researches support this hypothesis. McCandlass studied two groups of 6 four-year-old children with I.Q.'s over 124 who were matched for intelligence. The experimental group was given intense intellectual stimulation in which the children were given a great deal of personal attention and made to plan activities for themselves. After 6 months the mean I.Q. of these children had risen above that of the control group. It is likely, however, that these experiences were rather similar to test situations, and the gain in I.Q. might be regarded as a practice effect rather than as a genuine rise in real intellectual ability. It is also somewhat doubtful, bearing in mind the evidence from studies of the inconstancy of the I.Q., whether this gain would be maintained for long.

The most convincing demonstration of the stimulating effects of education comes from studies of orphanage children. In a study by Skeels, Updegraff, Wellman and Williams an entire orphanage of pre-school children was divided into two groups, matched for age, I.Q., sex, nutritional status, and length of residence in the orphanage. The age range was $1\frac{1}{2}$-$5\frac{1}{2}$ years, and the mean I.Q. of the two groups about 80.

The control groups experienced the normal life of the orphanage and had little contact with adults. The experimental group lived exactly the same life, except that it spent the day in pre-school, in which there was contact with adults through teaching and play. Skeels and his collaborators present a number of results, of which a typical finding is the advance of 9 I.Q. points shown by the experimental group after nearly a year's (309 days) schooling (Table 1).

Table 1

	Number of Children	Binet I.Q. at Entrance	Age in months	Merrill Palmer I.Q. after 309 days	Standard Deviation
Pre-school ..	23	79	45	93	13
Control	23	79	44	84	12

In a similar study made by Dawe two groups of 11 orphanage children of pre-school age were matched and the experimental group was given intensive training, consisting of looking at books and pictures, listening to poems and stories and going on excursions with adults. Each child received an average of 50 hours of such special training. Table 2 shows the I.Q.'s of the two groups before and after training:

Table 2

	Initial S.B. I.Q.	S.B. I.Q. after Training
Experimental ..	81	95
Control ..	82	80

The differences in intelligence after the training of the experimental group is significant.

The evidence that among normal children nursery school experience does little to raise the I.Q. should probably not be interpreted to show that intellectual stimulation has no effect on real ability to learn but rather that there is not sufficient difference in intellectual stimulation for most children from adequate homes between staying with their mothers and going to nursery school. Where, however, the home is a poor one or where the child comes from an unstimulating orphanage environment, and if the difference in intellectual stimulation is large, considerable gains in measured intelligence may appear. There is no evidence, however, to show that these gains affect the child's learning ability or that they are permanent.

It is, of course, well known from the work of Vernon and others that direct coaching in intelligence tests may raise the I.Q. some 9 points; but this rise is regarded as spurious in the sense that the coaching does not carry over into other fields than those of test performance and even there does not last. Apart from this, it should not be too difficult to determine how far the best schooling can develop a child's effective ability to learn in comparison with the worst schooling. Two recent studies have some bearing on this question. Pidgeon, in this journal, brings together evidence which suggests that factors in the school may affect not merely measured attainments but measured intelligence as well. And the present writer reports a highly significant tendency for large schools to enhance attainment in the G.C.E. examinations.

3. Intellectual Quality of the Home

There is a considerable accumulation of evidence to show that there is a positive association between a child's score in intelligence tests and his performance in school and the intellectual and socio-economic quality of his home. Data of this sort, however, may be easily explained by the inheritance of ability and does not show unequivocally that the intellectual quality of the home is an environmental variable affecting the child's intelligence. For direct evidence isolating this variable we have to turn to studies of children brought up in foster homes of different intellectual status. If there is any association between a child's intelligence and that of his foster parents, this association cannot be due

to heredity and must be ascribed to the effects of the environment. There are several studies showing that such an association exists.

In Leahy's study an investigation was made of the association between children's intelligence and the intelligence of their foster parents. There were 194 adopted children, all of whom were placed before they were six months old; at the time of testing there was an age range of 5-14 years. The mean I.Q., assessed by the 1916 Stanford Revision of the Binet, was 111. This group of children was matched with a control group of children living with their own parents.

The foster parents and the real parents were given the Otis Self-Administering Test and the Stanford-Binet Vocabulary Test. The intelligence of the parents was correlated with that of the children and the results are shown in Table 3.

Table 3

CHILD'S I.Q. CORRELATED WITH OTHER FACTORS

Correlated Factor	Adopted Children	Control Children
Father's Otis Score	.19	.51
Mother's Otis Score	.24	.51
Midparent Otis Score	.21	.60
Father's S.B. Vocabulary ..	.26	.47
Mother's S.B. Vocabulary ..	.24	.49
Midparent S.B. Vocabulary ..	.29	.56

The significant though relatively small correlations between the measured intelligence of the children and that of their foster parents suggests that the intellectual status of the parents is an environmental factor affecting the child's mental development. If the intellectual standard of the foster parents had no effect on the intelligence of the child, there should be no correlation between them. There are, however, two factors which may detract from the value of this evidence. The correlations may be spuriously high owing to the factor of selective placement, by which placement officers tend to put children of ' good ' parents into ' good ' foster homes. But probably this factor would not account entirely for the positive correlations. Secondly, intelligent foster parents may tend to have intelligent foster children because they possess some character quality rather than because they are intelligent as such. It might be that they set more store by intellectual inquiry and success and in some way pass this enthusiasm over to the child, so that the child works harder at educational tasks and strives to develop his own effective ability.

A study by Burks attempted to control the factor of selective placement in a study of 204 children adopted before the age of one year, at which age it is impossible to assess intelligence. The mean I.Q. of these adopted children was 107, and the correlation between their I.Q. and that of their adopting parents was +.20. This correlation is significantly lower than the correlation of +.50 between the I.Q.'s of children and parents in a control group of children brought up by their natural parents. Even though it is not entirely certain that selective placement has been quite eliminated in this study, it is unlikely that the whole of the difference in the correlations can be explained by it.

The other possibility, that it is the personality qualities of intelligent parents rather than intelligence as such, that affect the growth of the child's intellectual skills, is suggested by a study of Freeman, Holzinger and Mitchell. In this research 401 children were placed with adopting parents at an average age of 4.2 years. The investigators then related the intelligence scores of the adopted children to various indices of the prosperity, education and occupation of the adopting parents, and a correlation of +.48 was obtained. It is true that these children were adopted quite late when there are greater changes of selective placement, but this factor is to some extent controlled by the finding that the correlation was equally high in a group of 156 children placed before the age of two years. This correlation of .48 is markedly higher than those obtained by Burks and Leahy and this difference must be due to the different assessments of the adopting parents. It looks, therefore, as if the intelligence of the parents is a less important factor than the extent to which they attain middle class ideals; the higher correlation in the Freeman study suggests that the inculcation of middle class values may do more to develop the child's effective ability than purely intellectual stimulation as such. These values include such character qualities as persistence and ambition which undoubtedly motivate learning and may well affect the acquisition of skills required to score well in an intelligence test.

4. Contact with adults

Apart from the direct intellectual stimulation which adults may give either by teaching or by more informal day-to-day contacts, there is evidence that children who live in home conditions where there is a large amount of contact between mother and child do better on tests of intelligence and educational attainment. Here the influence is not so much the intellectual quality of the stimulation, as the quantity and quality of the attention and contact the mother gives, which directly affects the child's emotional and social growth, his feeling of security, and his willingness to put forth an intellectual effort.

That this is a factor is shown in an investigation by Skodak of the homes of 103 children brought up by foster parents. He assessed the characteristics of each home objectively by the use of a 'Home practice Inventory'. This inventory comprised ratings on a five point scale of such items as play equipment, social contacts, behaviour control, parents' cultural interests, the participation of the parents in the children's play, the frequency of play with other children, and the physical equipment of the home. This measure of the foster home environment correlated +.49 with the children's I.Q., assessed at the later pre-school age. The relationship of home inventory score to the child's I.Q. is shown in Table 4.

Table 4

HOME INVENTORY SCORE

	40+ to 49	50 to 59	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119
Number ..	1	3	4	23	27	21	20	4
Mean I.Q.	87	90	102	109	113	113	121	127

This correlation of +.49 is somewhat higher than that found between the intelligence scores of foster parents and their foster children's I.Q.'s. This difference adds force to the suggestion that the emotional relationship and the amount of contact between parents and child may be a more important factor influencing the child's measured ability than parental intellectual stimulation as such.

A confirmatory study is that of Van Alstyne. Various aspects of the home were related to intelligence (Kuhlmann-Binet) of 75 three-year-old children, and it was found that the children's intelligence showed a higher correlation with the amount of parental contact than with the intellectual stimulation which comes from reading. The correlations obtained are shown in Table 5.

Table 5

Child's Mental Age by:	Coefficient of Correlation
1. "Opportunity for use of constructive materials" ..	+.50
2. Number of hours adults spend daily with child ..	+.32
3. Number of playmates in home	+.16
4. Number of hours father reads to child	+.06

This study shows clearly that the amount of adult contact is related to the test score of the child. But the study does not isolate this variable to the exclusion of others, and it might be that the parents who spend most time with their children are also more intelligent. If this were so, the superior intelligence of their children might be due to any number of causes. On the other hand, it may be that the interest parents take in their children is a personality trait not directly related to ability as such but a separate influence affecting ability.

Birth order and intelligence

The finding that eldest, youngest and only children are better achievers and more intelligent than intermediate children is indirect evidence supporting the hypothesis that the amount of parental or maternal contact is a variable affecting the child's intelligence. Studies of family position and intellectual attainment are of two sorts: (i) studies of eminent men, where more eldest sons have been found eminent than would be expected by chance and where more youngest sons have been found eminent than intermediate sons (Galton; Yoder; Ellis). (ii) Studies of children; Godfrey Thompson, in his Scottish Survey of 1947, found that the superiority of the only, eldest and youngest children was revealed clearly in the test scores. The mean scores for 3, 4 and 5-child families are shown in Table 6.

Table 6

	3-Child Families			4-Child Families				5-Child Families				
	1/3	2/3	3/3	1/4	2/4	3/4	4/4	1/5	2/5	3/5	4/5	5/5
Mean Score ..	38.85	37.65	38.43	36.15	34.63	34.40	36.31	33.14	31.27	32.01	32.67	33.64

Similar figures appeared for children from 6, 7 and 9 child families, although the findings are less reliable in families of these sizes. These differences can hardly be ascribed to an hereditary factor, since whether a child is an intermediate or youngest is a matter decided *after* his birth. Nor is there any obvious factor such as the age of the mother which could account for the superiority both of the eldest and the youngest. The explanation of this difference seems to lie in some environmental factor and this may well be the amount of contact the child has with adults; intermediate children would tend to get less attention from their parents than eldest and youngest. This hypothesis is supported by the finding that twins were less intelligent by about 5 I.Q. points than singletons. The survey provided evidence that this difference could not be due to family size or socio-economic level; it could be attributed to the greater attention which mothers are able to give single children.

A large-scale study of the intelligence of French children by Tabah and Sutter revealed a further tendency which supports the hypothesis that there is a relationship between maternal contact and children's intelligence. When two-child families were considered, it was found that the mean intelligence score of children was higher when there was a longer interval between the births. When there was a long interval, the children scored almost as highly as only children. This finding occurred within each of the five occupational categories into which the sample was divided, and so cannot plausibly be attributed to social class differences. This study confirms the Scottish finding that twins are less intelligent than singletons, even when socio-economic factors are controlled.

It is not at all certain how the influence of the amount of attention a child gets from adults should be explained. It might work simply through the greater amount of intellectual stimulation which a large amount of attention will afford. On the other hand, it may be that maternal attention has its effect primarily on the child's personality and only secondarily on his intelligence. This interpretation is supported by the evidence of maternal deprivation which will be reviewed in the next section.

5. Maternal Deprivation and Emotional Security

Many writers have regarded emotional security during the first five years of the child's life as an important influence affecting the child's intellectual development. The emotional security of a child depends on a constant and uninterrupted relationship between child and mother (or mother substitute) such as is more or less generally found in normal families but not in the older type of institution for orphans. A number of studies of the effects of maternal deprivation have been reviewed by Bowlby, who concludes " When deprived of maternal care, the child's development is almost always retarded—physically, intellectually and socially " (p. 13).

It is generally considered that the intellectual retardation of maternally deprived children is a secondary result of a more deep-rooted personality disturbance. Children separated from their mothers tend to become first extremely anxious for affection and attention, and then listless, apathetic, and emotionally withdrawn. The intellectual retardation is held to be a consequence of these emotional reactions.

It is not easy to find evidence which supports this theory to the exclusion of other explanations, although there is undoubtedly a large body of evidence which shows that

children brought up in orphanages and thereby maternally deprived do tend to be below average in intellectual and scholastic attainment. This evidence is obviously open to several interpretations, of which perhaps the most plausible are: (1) children in orphanages are born from unintelligent parents and inherit their low intelligence. There is, in fact, evidence that children in orphanages do tend to have parents of low intelligence (e.g. Stoddard); (2) children in orphanages do not have so much contact with adults as children in families and consequently do not have the same opportunity to learn; (3) children in orphanages lack mother love and consequently develop inadequate personalities which adversely affect their intellectual development.

A series of studies by Spitz and his collaborators has been designed to show the ill-effects of maternal deprivation on the development (both intellectual and emotional) of young children. The early development of four groups of children in different environments was studied, namely: (*a*) a Foundling Home, an institution for children whose mothers were unable to care for them outside the institution. There were seven or eight children to one nurse, and the children were kept in solitary confinement for reasons of hygiene and had no contact with adults most of the day; (*b*) a Nursery, a penal institution for delinquent girls. The girls who gave birth to a child while they were in the institution were allowed to care for the child until it was one year old and there was considerable contact between mother and child; (*c*) Normal professional parents; (*d*) Peasant families.

The children were tested during the first four months of life and at the end of the first year by the Hetzer-Wolf baby tests. These tests are concerned with general physical and mental development, including intelligence, and give a Development Quotient similar to the I.Q. Spitz found that the maternally deprived (Foundling Home) children showed a marked fall in D.Q. at the end of the year and were greatly retarded in comparison with the other groups. These results are shown in Table 7.

Table 7

Environment	No. of cases	Development Quotients	
		Average 1-4 months	Average 9-12 months
Foundling Home	61	124	72
Professional ..	23	133	131
Peasant	11	107	108
Nursery	69	101	105

This work has been criticised by Pinneau on a number of grounds. In the first place, Pinneau points out that three studies have shown that the Hetzer Wolf tests are poorly standardised, in such a way that they are too easy in the early months and too hard in the later months of the first year. This faulty standardisation would have the result that any group of children would show a fall in D.Q. during their first year of life. However, Spitz's three control groups do not show such a fall and the difference remains to be

explained. Pinneau further points out that the foundling home children were with their mothers during the first six months of life, and that almost all the drop in D.Q. occurred before the children were six months old, i.e. before they had been separated from their mothers. If this is so, it would be wrong to attribute the decline in D.Q. to maternal deprivation. Spitz does not reply very adequately to this criticism and he gives rather little information about the mothers of the Foundling Home children. It is also not clear whether Spitz has made longitudinal studies of the same children or whether the samples comprise different combinations of children at different ages.

Goldfarb attempted a study which would isolate the factor of maternal care in childhood, and control both hereditary influences and the intellectual stimulation that comes from contact with adults. In his investigation 30 children were examined, of whom 15 had been transferred direct from their mothers to foster homes within the first nine months of life, and 15 had been placed in an institution from about 6 months of age to $3\frac{1}{2}$ years, and then transferred to foster homes. The institution had high standards of physical hygiene but provided very little adult-child contact. " Their only contacts with adults occurred during the few hurried moments when they were dressed, changed or fed by nurses." The mothers of the institution children were slightly superior to those of the foster home children, as assessed by educational, occupational and mental status. Differences between the two groups of children can therefore be ascribed to their different circumstances in infancy.

Goldfarb tested the two groups of children when their ages ranged from 10 to 14 years, and found that the children brought up in the institution for their first three years were retarded in comparison with the foster home children. Table 8 shows these differences, all of which are significant at the 1 per cent. level.

Table 8

Function Tested	Institution Children	Foster Children
Intelligence (Wechsler)	72.4	95.4
Ability to conceptualise:		
Weigh	2.4	6.8
Vigotsky	0.5	4.7
Reading	5.1	6.8
Arithmetic	4.7	6.7

These findings cannot very plausibly be explained by the intellectual stimulation theory. It might be supposed that the foster home children simply retained the lead which individual attention for two or three years in infancy would give them. But, considering the acknowledged inconstancy of the I.Q. between the ages of three and ten, it is doubtful whether this could account for the differences in the two groups at the ages of ten to fourteen. It seems most plausible to attribute Goldfarb's findings to the effects of deprivation on the personality, rather than to any lack of intellectual stimulation. As Bowlby points out, maternal deprivation tends to impair character development and

produce a personality lacking in powers of concentration and persistence, and this might well reduce the level of operational or functional intelligence.

6. Attitude of Parents to Intellectual Attainment

It seems likely that parents who value intellectual and cultural achievements will tend to have intelligent children. It is parents of this sort who constitute what is known as ' a good home '. This variable is not easy to isolate, however, since these parents are generally of higher than average ability themselves and the high ability of their children might be attributed to hereditary factors or to direct teaching. Yet there is some evidence that the parents' attitude to intellectual values is a further factor affecting the child's ability as shown in tests of all intellectual kinds.

The study of Kent and Davis has the great merit that it demonstrates a relationship between parental attitudes to educational success and the child's measured intelligence and reading attainment, and at the same time attempts to show that the intelligence of the parents is not related to their attitude to success, thereby ruling out the factors of heredity and direct learning.

In this study, I.Q.'s and reading ages of 118 normal eight-year-old children were tested, and the mothers of these children were interviewed in their homes. On the basis of informal conversation, Kent classified the mothers into four groups according to the type of discipline and relationship which they imposed on the child. These four groups were as follows: (*a*) *Demanding* parents set high standards especially in school work, and rewarded ungenerously; (*b*) *Normal* parents were more tolerant and their expectations are related to the child's needs, abilities and spontaneous interests, but they had positive standards; (*c*) *Overanxious* parents were ceaselessly anxious lest their child should fall short of what they expect, but their behaviour was inconsistent; (*d*) *Unconcerned* parents were indifferent to the child's success and failure and their discipline was haphazard, inadequate and inconsistent.

Table 9 shows the number of parents in each group, the mean I.Q. of the children as measured by the revised Stanford Binet (Form M) and the Performance Scale of the WISC. and the mean reading age as assessed by Schonell's Graded Reading Test. It is clear from the table that the parents who value intellectual standards and put pressure on their children produce the children with higher intelligence test scores, especially on the verbal side.

Table 9

	Normal	Demanding	Overanxious	Unconcerned
Number of children ..	41	38	30	9
Mean Binet I.Q.	109.9	124.2	107.3	97.0
Mean WISC I.Q.	110.4	113.4	100.7	103.0
Mean Schonell Reading Age	8.4	9.1	8.0	6.4

Many studies of this type are open to the objection that the similarities of parents and children could be explained directly by inheritance. This possibility is eliminated in the Kent and Davis study. The authors obtained information about the occupational status of the fathers and by dividing them into five groups according to the registrar-general's classification, showed that there was no significant tendency for the more ambitious parents to belong to the higher social classes.

Kent and Davis' study is supported by such evidence as we have about the discipline used by the parents of geniuses, for it is common to find that very talented people have been brought up in an atmosphere of great intellectual pressure. Before Beethoven was ten years old he was frequently made to play the violin through the night and when Thomas Arnold was three his birthday present was Smollet's *History of England* in twenty-four volumes. Cox has shown that the family histories of geniuses show that many of them have had ' demanding ' parents in the sense used by Kent and Davis.

Socio-economic status and intelligence

The frequently found positive association of socio-economic status with intelligence and educational attainment (e.g. McLaren) might be attributed to the more favourable attitude of higher class parents to intellectual attainments. Although this association is often attributed to hereditary influences, the fact that it gets progressively larger with the age of the child suggests that environmental factors play some part. Indeed, two studies report that there is no association at all between socio-economic status and the measured ability of babies aged eighteen months (Furfy and Muchlenbein; Bayley), although the tests we have for this age are rather unreliable. But in so far as the effects of superior socio-economic status are environmental, they should probably be attributed either to the effect of the parents' attitude to intellectual success, or to the greater opportunities the children have for learning, or indeed to a combination of both.

III. Conclusion

It looks as if there are at least two mechanisms by which the environment affects a child's ability as shown in school and in the affairs of life. The first is the child's direct learning from the environment and copying from adults. The richer and more varied the intellectual stimulation, the greater the child's opportunity for learning and copying, and the more ' intelligent ' he becomes. This mechanism would account for the tendency of a child's measured intelligence to be associated with intellectual stimulation, the intellectual quality of the home, and the amount of contact with adults.

The second mechanism is more complex and involves the whole personality. It seems as if certain environmental conditions in childhood can have a permanent effect on the personality, and this will in turn manifest itself in the way in which the child uses his ability. Only some process affecting the whole personality seems able to explain the effects on a child's measured intelligence and attainment, of maternal deprivation in infancy and the attitude of the parents to intellectual attainments.

In the state of present-day knowledge it is not at all clear how such a mechanism would work. In psychoanalytic terms, it might be explained by identification; if the parents have intellectual values, the child will incorporate these values into his superego

in the same way as he incorporates standards of cleanliness and moral behaviour. When we are considering educational attainment, these acquired character qualities are especially important and the lack of them may account for many of the disappointing failures of clever working class children in England when they get to the grammar school. " Many," as Burt says, " seem to lack the spur of ambition." It may well be that not only educational attainment, but functional ability itself is enhanced by the right character qualities; and that the child acquires these from his parents through the process of identification.

In behaviourist terms these personality traits would be conceptualised as one or more acquired drives and intelligence itself as a system of habit strengths. This view of intelligence is consistent with the recent trend away from the view of intelligence as innate potential which intelligence tests measure inadequately and towards the conception of intelligence simply as the level of competence at which an individual is functioning at a particular time, as " the general all-round ability that an individual manifests in his daily life adjustments " (Vernon), or even as an acquired skill (Davis). The nature of the acquired drives contributing to the development of these habit strengths is more problematical. Terman cites such traits as persistence, application and the desire to excell, but are these all to be regarded as acquired drives? The problem of isolating and differentiating the many postulated acquired drives is in considerable confusion.

One of the most commonly postulated acquired drives, that of anxiety, probably has some effect on the development of intellectual skills. Although anxiety is commonly found to have a disorganising effect on complex learning in experimental situations, there is some evidence for Davis' theory that it acts as a motivating and socialising force in many real life learning situations (Burt; Lynn). Such evidence as there is about the effects of upbringing on the personality of the child supports this hypothesis. It is generally held that the child who has a great deal of maternal attention (sometimes called maternal over-protection) becomes nervous and anxious (e.g. Mayer Gross, Slater and Ross, Levy; Banister and Ravden). As we have seen maternal attention also tends to produce children who are ' intelligent ', and maternal deprivation children who are ' unintelligent'. Davis' theory would explain this as follows. The attention and love which mothers give their children make them concerned to obtain adult approval and educational success. This concern is what Davis calls socially necessary anxiety, and it acts as a motivating force making children put effort into their school work. As a result of this they learn more quickly the intellectual skills that secure a high intelligence quotient.

The question remains of what the schools can do to raise their children's intelligence and attainment levels. The evidence suggests that the basic personality patterns are laid down in the home at an age before the children arrive at school. The schools' task seems chiefly to arouse the potential of motivation which is present in the great majority of children. Traditionally, this has been done by the competitive system, by arousing the interests of the children, and by the personality of the teacher arousing inspiration. It must be admitted that at the present we have much speculation but very little precise knowledge of the relative effectiveness of these motivators and it is perhaps in this field that some of the most urgent research needs to be done.

References

1. BANISTER, H. and RAVDEN, M., "The problem child and his environment." *Brit. J. Psychol.*, 1944, 34, 60-65.
2. BAYLEY, N., *Mental Growth during the First Three Years: a developmental study of sixty-one children by repeated tests.* Genet. Psychol. Monogrs., 1933, 14, 1-92.
3. BOWLBY, J., *Maternal Care and Mental Health.* World Health Org., Monograph Series, No. 2, Geneva, 1951.
4. BURKS, B. S., "The relative influence of nature and motive on mental development: a comparative study of foster parent–foster child resemblance and true parent–true child resemblance." *Year B. Nat. Soc. Stud. Educ.*, 1928, 27 (1), 219-316.
5. BURT, C., *The Backward Child.* London: Univ. London Press, 1937.
6. BURT, C., *Intelligence and Fertility.* London: Eugenics Society and Hamish Hamilton, 1946.
7. BURT, C., Symposium on the selection of pupils for different types of secondary schools. *Brit. J. Educ. Psychol.*, 1947, 17, 57-71.
8. COX, C. M., *The Early Mental Traits of Three Hundred Geniuses.* London: O.U.P., 1926.
9. DAVIS, A., "Socialisation and Adolescent Personality." In *Readings in Social Psychology*, ed. Newcomb, T. M. and Hartley, E. L. New York: Holt, 1944.
10. DAVIS, D. R., "Nurture and Intelligence." *Bull. Camb. Inst. Educ.*, 1954, 1, 1-9.
11. DAWE, H. C., "A study of the effects of an educational programme upon language development and related mental functions in young children." Univ. Iowa: Unpublished *Ph.D. thesis*, 1940.
12. ELLIS, H., *A Study of British Genius.* Boston: Houghton Mifflin, 1926.
13. FREEMAN, F. N., HOLZINGER, K. J. and MITCHELL, B. C., "The influence of environment on the intelligence, school achievement and conduct of foster children." *Year B. Nat. Soc. Stud. Educ.*, 1928, 2 (1), 103-217.
14. FURFY, P. H. and MUCHLENBEIN, J., "The validity of infant intelligence tests." *J. Genet. Psychol.*, 1932, 40, 219-223.
15. GALTON, F., *English Men of Science: their nature and nurture.* London: Macmillan, 1874.
16. GOLDFARB, W., "Effects of early institutional care on adolescent personality." *J. Exp. Educ.*, 1943, 12, 106-129.
17. GORDON, H., "Mental and scholastic attainments among retarded children: an inquiry into the effects of schooling on the various tests." Educ. Pamphlets, Bd. Educ., London, No. 44, 1923.
18. JONES, H. E., "Environmental influences on mental development." In *Manual of Child Psychology*, ed. Carmichael, L. New York: Wiley, 1946.
19. KENT, N. and DAVIS, D. RUSSELL. "Discipline in the Home and Intellectual Development." *Brit. J. Med. Psychol.*, 1957, 30, 27-33.
20. LEAHY, A. M., *Nature-nurture and Intelligence.* Gent. Psychol. Monogr., 1935, 17, 236-308.
21. LEVY, D. M., *Maternal Overprotection.* New York: Columbia Univ. Press, 1943.
22. LYNN, R., "Personality factors in reading achievement." *Proc. Roy. Soc. Med.*, 1955, 48, 996-998.
23. LYNN, R., "The Relation of School Size to Educational Attainment. *Brit. Journ. Soc.* (in the press).
24. MAYER GROSS, W., SLATER, E. and ROTH, M. *Clinical Psychiatry.* London, 1954.
25. MCCANDLASS, B. R., "The effect of enriched educational experiences upon the growth of intelligence of very superior children." University of Iowa, 1938. Unpublished *M.A. thesis.*
26. MCLAREN, V. M., "Socio-economic status and reading ability—a study in Infant reading." In *Studies in Reading*, Vol. II. Scottish Council for Research in Edu., 1950, No. 34. London: Univ. London Press.
27. PEEL, E. A., *The Psychological Basis of Education.* London: Oliver and Boyd, 1956.
28. PIDGEON, D. A., "School differences in ability and attainment." *Ed. Res.*, Vol. I, No. 3.
29. PINNEAU, S., "The infantile disorders of hospitalism and anaclitic depression." *Psychol. Bull.*, 1955, 52, 429-462.
30. SKEELS, H. M., UPDEGRAFF, R., WELLMAN, B.L. and WILLIAMS, H. M., "A study of environmental stimulation: an orphanage preschool project." Univ. Iowa, *Stud. Child Welfare*, 4, 1938.
31. SKODAK, M., "Children in Foster Homes." Univ. of Iowa, *Stud. Child Welfare*, 1939, 16, No. 1.
32. SPITZ, R. A., "Hospitalism: a follow-up report." *Psychoanal. Stud. Child*, 1946, 2, 113-117. New York: International Univer. Press.
33. SPITZ, R. A., "Anaclitic depression." *Psychoanal. Stud. Child*, 1946, 2, 313-342. New York: International Univer. Press.
34. SPITZ, R. A., "Reply to Dr. Pinneau." *Psychol. Bull.*, 1955, 52, 453-459.
35. STODDARD, G. D., *et. al.*, "Environment and the I.Q." The 39th Year Book Nat. Soc. Stud. Educ. *Intelligence: its Nature and Nurture.* Dr. I. Bloomington: Public School Publishing Co., 1940.
36. STODDARD, G. D., *The Meaning of intelligence.* New York: Macmillan, 1943.
37. TABAH, L. and SUTTER, J., "Le niveau intellectuel des enfants d'une même famille." *Ann. Hum. Genet*, 1954, 19, 120-150.
38. TERMAN, L. M., *et. al.*, *Genetic Studies of Genius.* Stanford University Press, 1926.
39. THOMPSON, G., "Intelligence and Family Size. In *The Trend of Scottish intelligence.* London: Univ. London Press, 1949.
40. VAN ALSTYNE, D., *The Environment of Three Year Old Children.* Teach. Coll. Contrib. Educ., No. 366, 1929.
41. VERNON, P. E., "Recent Investigations of Intelligence and its Measurement." *Eugenics Review*, 1951, 125-137.
42. VERNON, P. E., "Symposium on the effects of coaching and practice in intelligence tests." *Brit. J. Educ. Psychol.*, 1954, 24, 57-63.
43. WELLMAN, B. L., *Iowa Studies on the effects of schooling.* 39th Year Book Nat. Soc. Stud. Educ., 1940.
44. YODER, A. H., "A study of the boyhood of great men." *Ped. sem.*, 1894, 3, 134-156.