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ABSTRACT

Sixty-five Kikuyu infants were developmentally evaluated (Bayley Test) at two-month intervals during the first year of life. Precocity was demonstrated for mental as well as motor test performance. Familial economic status was positively related to infant performance. Social and demographic variables contributed at least 25% to test score variance, and therefore even in the first year, must be considered in evaluation of psychological development of sub-Saharan African infants. (Author)

AFRICAN INFANT PRECOCITY:

SOME SOCIAL INFLUENCES DURING THE FIRST YEAR

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Abstract

Sixty-five Kikuyu infants were developmentally evaluated (Bayley Test) at two-month intervals during the first year of life. Precocity was demonstrated for mental as well as motor test performance. Familial economic status was positively related to infant performance. Social and demographic variables contributed at least 25% to test score variance, and therefore even in the first year, must be considered in evaluation of psychological development of sub-Saharan African infants.

The work of Geber and Dean reported in 1957 (1), as well as the earlier but less well known work of others (2), has led to the widely-held belief that sub-Saharan African infants are precocious in their psychological development. These studies leave much to be desired methodologically (3). Most were done on samples selected from a hospital or clinic-based population, a procedure which may lead to biased results. Furthermore, cross-sectional rather than longitudinal techniques were the rule in these African studies, which means that the conclusions are based on relatively unreliable scores for individual subjects. Nevertheless, the preponderance of evidence indicates that when compared to infants of the United States, of England, and of France, African infants during their first year of life are precocious in their motor development, and possibly in their mental (perceptual-sensory) development as well.

Several studies (4) suggest that this precocity is less marked for those infants from westernized and/or middle class family backgrounds than for those from traditional and/or lower class families. This suggests that the precocity in sub-Saharan African infants, which might be thought to be genetically based (5), may also be substantially influenced by social factors. Since most African infants are breast-fed in the first year, one cannot account for the suggested negative relation between social class and precocity solely on the basis of poorer nutrition in the urban child.

The purpose of this study therefore is: 1) to investigate whether or not there is developmental precocity, using more reliable individual measures based on longitudinal study of the infants, and 2) to assess the relationship between selected social and demographic variables and development.

The sample comprised 65 infants born between 1 July and 31 December, 1969, residing in a periurban Kikuyu, predominantly agricultural community of 4500 people, approximately 25 miles from Nairobi. There were an estimated total

of 100 infants born in the indicated time period; 90 of their mothers agreed to participate in the study. Seven infants were lost to the study because their families moved from the community or for some other reason their data are incomplete. Eighteen infants served as controls for another segment of this study and were not tested longitudinally. Of the 65 sample infants, 34 were male and 31 female. Twelve were first born; among the others, the median number of older siblings was five, including eleven subjects in the sample having eight or more older siblings.

The Bayley Test (6) in standard form was used for all infant testing. The items used in this test divide into two scales, mental (perceptual-sensory function) and motor (neuro-muscular function). Testing was done by a British-trained Kenyan nurse who was bilingual (Kikuyu, English) and whose family lived near the village. Ten non-study infants were used in the training procedure. Interobserver item agreement for the final two pretest infants reached 85%.

Each infant was tested at approximately two-month intervals beginning in January 1970, on at least four and at most eight occasions. Testing was done in the morning or in the afternoon at times when the infant was judged alert and cooperative. To reduce mother and infant fatigue, transportation to and from the testing site at the project headquarters near the village center was provided for all test sessions. Each infant was examined by one or both of the project's physicians at least twice during the period of testing and at any other time he was brought to the weekly medical clinic conducted by the research staff. All infants were breast-fed during the entire period, the older infants receiving supplementary food. Evidence of gross malnutrition on clinical examination was absent.

Demographic and social information was obtained from interviews of the mothers, and occasionally the fathers, conducted by two college-level female

research assistants of the same ethnic group as the sample. In addition to routine demographic information, data was collected on family structure, educational achievement, economic status and density of the household. A check list was used to obtain a brief description of the material amenities available within the household. The interviewers were not informed of the infant test results.

Within this rapidly changing community, there was noticeable variation in the social and economic circumstances of the families for such variables as: the amount of land available to each family, the educational level of the parents, the maintenance of traditional practices (e.g., the practice of polygamy) and the contact with the urban environment of Nairobi. Thirty-four families had some cash income either from jobs in Nairobi or cash crop farming. Thirty-one were subsistence farmers. Land ownership ranged from holdings of less than two acres (33 families) to more than four acres (8 families). The education of the parents varied from no formal schooling (27 mothers, 10 fathers) to graduation from primary school (7 mothers, 7 fathers). Forty-four of the families were monogamous, nine polygamous, five mothers unmarried and nine mothers lived in households where fathers were absent because of separation, divorce or death. The ages of the mothers ranged from 20 to over 40 years, of the fathers from the mid-20's to over 50 years. Household composition varied from nuclear households of mother, father, and children (20 families) to complex, extended and/or polygamous families (45 families).

Test results were first analyzed by comparing the performance of Kikuyu infants on individual test items against United States standards (6). For each item, the number of infants able to perform the task described by the test item earlier than the United States median age for performance of that task,

and the number unable to perform the task at the United States median age were tabulated. These two numbers do not always total 65 since occasionally infants were able to perform the task at the first test session which was at an age greater than the United States median age, or were unable to perform the task at the last test session which was at an age less than the United States median age. If 41 or more infants were found to perform the task earlier than the United States median, Kikuyu infants were said to surpass United States performance at the five percent significance level. If 41 or more infants were found unable to perform the task at the United States median age, Kikuyu infants were said to lag behind the United States performance at the five percent significance level (7).

Kikuyu infants surpassed United States performance on 38 items for the mental test and 20 items on the motor test; they lagged behind United States performance for seven items on the mental test and two items on the motor test. There was no apparent pattern in the type of items which differentiated the two groups, though our impression is that Kikuyu infants lagged behind the United States performance on items involving implements which were less familiar in their environment than in the United States.

These findings suggest that if Kikuyu infants were scored by United States standards using items passed at a given age, they would tend to show performance superior to United States expectations. In fact, this is so. Each infant was given a Developmental Quotient (D. Q.) for the mental and motor tests using United States conversion tables (6) at each of his first four test sessions. The four D.Q.'s were averaged to get a single score for each infant on each test. The mean mental score for 65 Kikuyu infants was 108.4 (s.d. = 24.4); the mean motor score was 129.5 (s.d. = 38.9). The expected United States average score would be 100.0, with expected standard deviation ranging from

16 (if test-retest reliability is 100%) to 8 (if test-retest reliability is 0%). The variabilities of the Kenya sample are somewhat but not significantly larger than that expected in a United States sample. On both the mental and motor tests, Kikuyu youngsters score significantly better (t-test, $p < .01$) than would be expected in a United States group.

The precocity on the motor test corroborates the findings of Geber and are quite similar to the Uganda findings of Kilbride (8) obtained using the Bayley Test on a cross-sectional sample. The finding of precocity on the mental test, though not unanticipated, was surprisingly clear, and consistent with reports for African infants and United States black infants (9, 10). The Kikuyu infants indeed performed better than the United States black group on the mental test, as well as on the motor test. This finding is possibly attributable to the fact that in this study testing was done by a bilingual, bicultural tester, from the same ethnic group as the infant. This may be an important issue in infant testing, especially for infants between the ages of 6 and 12 months, in view of the likelihood of the development of stranger anxiety in this period of development. However, it should also be noted that maternal caretaking within the Kikuyu community involves more physical contact with the infant in the first six months of life, and therefore, might also account for those differences (11).

For purposes of presentation of our results, the grand total of 376 test sessions (65 infants, 4-8 sessions per infant) was subdivided by the age of the infant to the nearest month at the time of testing. Mean scores were calculated for each month. No infant is included twice in the computation of a single mean, but he does contribute to several of the means. Because of the variability in the age of the infant at the first test session and the variable number of sessions per infant, the number of observations at any month

varies from a low of 7 at the age of 5 months to a high of 55 at 8 months. Figure 1 presents the mean number of items passed at each age for the mental test, and in Figure 2 for the motor test. The vertical line represents a positive and negative deviation of one standard deviation. It is obvious that the Kikuyu mental and motor scores exceed combined United States white and black (10) and United Kingdom white (12) scores at all points during the first 12 months of life.

In order to examine the relationship between test performance and selected social and demographic variables, using a polynomial regression and a repeated measures design (13), we computed a Kenya-Kikuyu curve for both mental and motor scores and a test score for each infant relative to that curve. For convenience, these scores were standardized to a mean of 100 and a standard deviation of 16.

These scores were then used as the dependent variables in a step-wise multiple regression analysis (13) utilizing as independent variables 33 selected social and demographic variables including such items as sex, birth order, age, education of parents, an evaluation of the modern attitudes of the mother, degree of contact with the urban environment of Nairobi, family structure, modern amenities available within the household, economic status of the family, and the household density within different age groups.

The results are shown in Table 1. The four indicated variables contributed the largest share to multiple correlation coefficient (+.51) for the mental test score. Two of these variables, economic status and modern amenities available, yield individual correlation coefficients of +.37 and +.36 with mental test score, each significant at the 5% level. Infants in families with greater economic resources and with more modern amenities such as calendars, clocks, books, etc. performed better on the mental test. There was a negative

relationship, though not significant, between the number of individuals aged 21 to 40 and mental test performance, possibly indicative of multiple households competing for scarce resources on a relatively small piece of land. The positive relationship, again not significant, between the number of individuals in the age range 12 to 20 and mental test score probably reflects the effect of additional caretaking for the child provided by adolescent females.

The same type of analysis for motor test score indicates that four of the variables made the largest contribution to the multiple correlation coefficient of +.45. The only significant positive correlation, between the number of individuals in the household past age 40 and motor ability, suggests additional caretaking of the infant by an older woman or grandmother. The negative correlation, though not significant, between a number of other children under age 3 in the household and the motor score probably reflects a dilution of caretaking because of the competitive presence of other very young children. The economic factor, as in the case of the mental test, and the sex of the child, is positively correlated though not significantly so, with performance on the motor test.

Another way to look at the relationship between the test scores and social and demographic variables is shown in Tables 2 and 3. Those infants born to fathers of higher income, more training, and education, score higher on the mental test than do infants born of fathers with less income, training, and education. Similarly, for the motor scores, those infants with fathers in the upper economic range score higher than other infants. In the case of the density of the household, those infants where there are two or more individuals aged 41 to 60, score the highest whereas those without such individuals score the lowest.

The body of results for both mental and motor tests do not support the observations of Geber (4) suggesting that infant precocity is negatively related to social class, and to the observations by Bayley (10) which indicate that there is no relationship between performance and social class. While it is difficult to directly compare the results of this study with the findings of these other studies, whatever differences found may be due to sampling procedure and testing methodology. Our sample consisted of approximately 90% of the available infant population and was drawn from the general community and not from a hospital or clinic population. Our testing was repeated several times during the infant's first year in contrast to cross-sectional methods employed in these other studies.

A definitive explanation of why sub-Saharan African infants are precocious in their mental and motor development during their first year of life, and why their test performance is apparently influenced by the economic level of their families and other social factors, cannot yet be given. From what is known about traditional Kikuyu marriage customs (14), it is possible that the bride wealth system has produced assortive mating on the basis of social and economic status. This assortive mating over many generations, could lead to the developmental differences observed, even in the relatively restricted range of social and economic differences currently observed within this community. However, despite any selection pressures that may have been operative in the past, current social and economic conditions are positively related to the infant's psychological development in the first year.

This finding of a relationship between social and demographic variables and infant precocity in the first year of life, is particularly interesting if the observations of Parkin and Warren (15) are correct. They found only a few significant differences between African infants of high income families,

African infants of low income families, and European infants of middle class background born in Kampala, when examined in the first five days of life, using a modified Prechtl (16) examination procedure. None of the differences reported favored one group over the other. Assuming that Kikuyu infants are similarly non-precocious at birth, then our findings of precocity developing during the first year, while conceivably genetically determined, support theories emphasizing environmental influences during the first year.

Another possible environmental influence is nutrition. As noted earlier, there was no evidence for gross malnutrition among the infants, nor were there any infants lost to the study because of illness or death. Whether malnutrition of mothers, related to the economic level of the family, caused intrauterine deprivation of some infants, is not known. If such deprivation were present, it would act to diminish the differences in performance between the Kikuyu and western Caucasian babies. Since, as has been shown, Kikuyu babies surpassed western Caucasian babies on both mental and motor tests throughout the first year of life, it is an unlikely explanation of the findings.

At present, it can be stated that some sub-Saharan African infants during the first year of life are precocious in their mental and motor development as compared to western Caucasian infants. Part of the superior performance found in the first year is probably related to genetic factors, since one would expect that environmental factors, such as malnutrition, would tend to lower the performance of African infants. In agreement with others (17), we recognize that genetic factors account for a large proportion of the variability of mental and motor test performance. However, we would like to point out that the remaining variance, approximately 25%, is not simply random variation, but can be associated with identifiable social and demographic variables predictive of precocious psychological development.

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Figure 1. Comparison of Mental Test Performance (Bayley) for Kikuyu, U.K. White, U.S. Black, U.S. White infants during first year.

Figure 2. Comparison of Motor Test Performance (Bayley) for Kikuyu, U.K. White, U.S. Black, U.S. White infants during first year.

Table 1

Multiple Regression Analysis of Bayley Test Scores with Demographic Factors (N=65)

Mental	Correlation Factor vs. Test
Multiple Correlation Coefficient=+.51	
Economic	+.37*
Modern amenities	+.36*
Number of household members aged 21-40	-.22
Number of household members aged 13-20	+.20

Motor	Correlation Factor vs. Test
Multiple Correlation Coefficient=+.45	
Number of individuals >aged 40	+.30*
Economic	+.26
Number of household members <3 years	-.23
Sex of infant ♀>♂	+.17

*$p < .05$

Table 2

Relationship of Mental Test Scores (Kenya Norms)

to Selected Social Factors

	N	Kenya D.Q.
Father's Education		
Standard 7-8, Form 1-11	30	105.6
No information	10	100.5
No education	10	97.8
Standard 1-6	15	89.9
Cash Income		
Yes	34	102.1
No	24	89.3
No information	7	104.4
Father's Occupation		
Farmer, > 2 acres	6	106.0
Position requiring training	29	104.6
Position requiring no training	11	92.5
Farmer, < 2 acres	8	85.3
No information	11	107.4

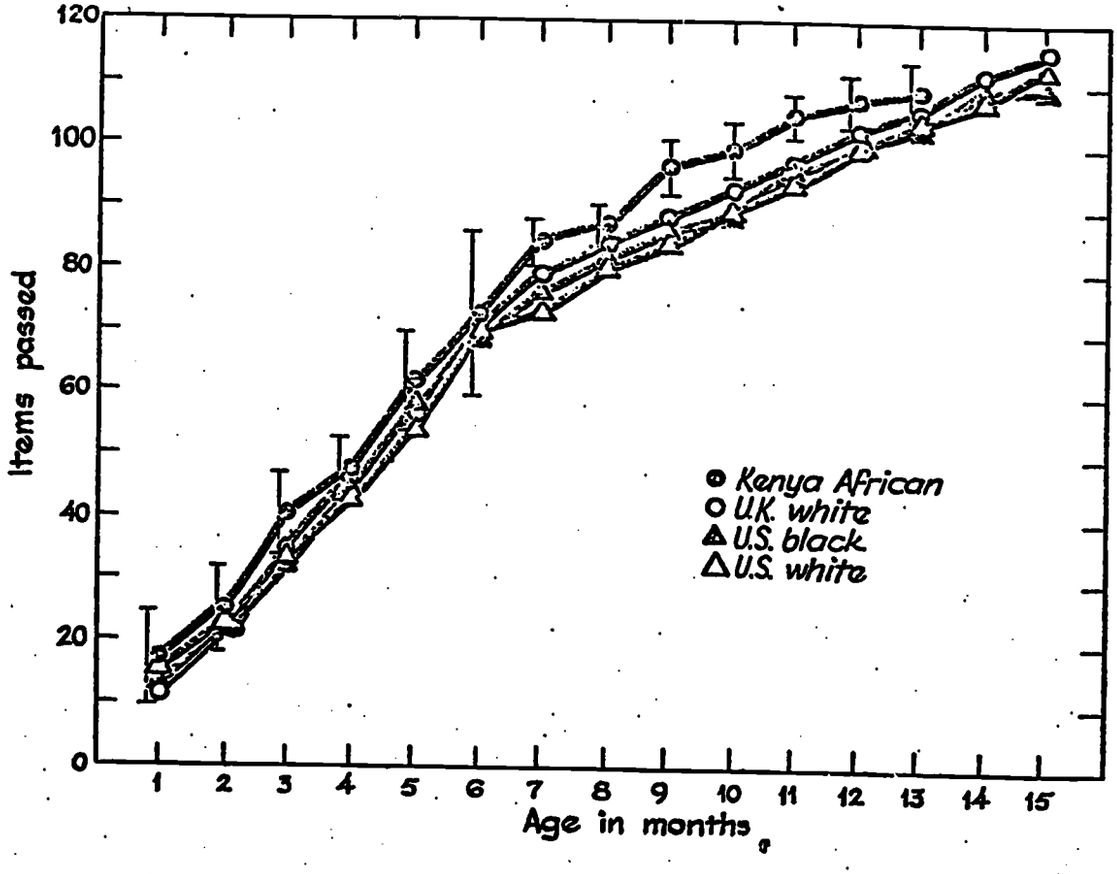
Table 3

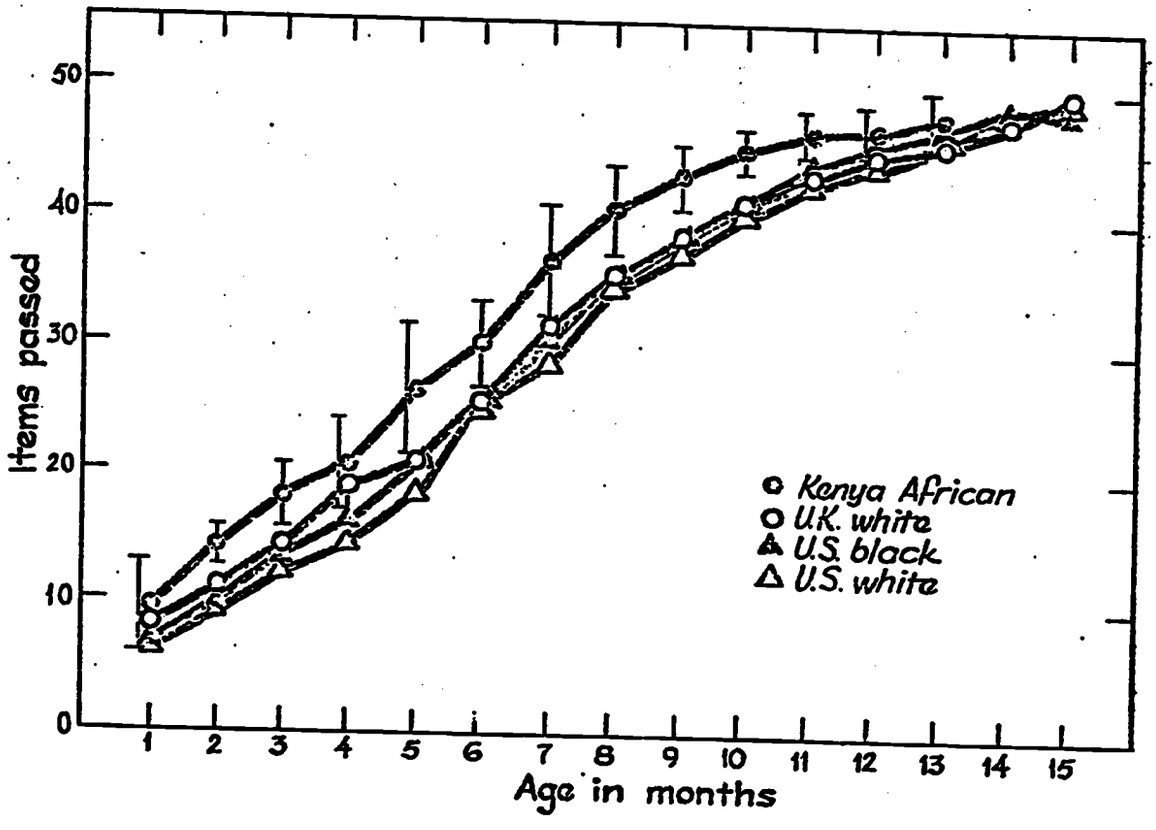
Relationship of Motor Test Scores (Kenya Norms)

to Selected Social Factors

Presence of individuals > 41

	N	Kenya D.Q.
Two	15	106.9
One	17	103.7
None	28	95.2
No information	5	93.1
Cash Income		
Yes	34	102.7
No	24	89.5
No information	12	100.4


Items passed
Age in months
Kenya African
U.K. white
U.S. black
U.S. white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Kenya African
U.K. white
U.S. black
U.S. white