THE PERFORMANCE OF BILINGUAL NIGERIAN STUDENTS ON VERBAL AND NONVERBAL TESTS OF INTELLIGENCE

by

Emmanuel Ayotunde Yoloye

This dissertation has been approved for final examination by the members of the student's Dissertation Committee whose written approvals are on file in the Office of Doctoral Studies, Teachers College.

Dissertation Committee:

Robert L. Thorndike, Chairman
Albert S. Thompson, Member of Committee
Walter MacGinitie, Member of Committee

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy under the Joint Committee on Graduate Instruction
Columbia University

1964

ABSTRACT

THE PERFORMANCE OF BILINGUAL NIGERIAN STUDENTS ON VERBAL AND NONVERBAL TESTS OF INTELLIGENCE

Emmanuel Ayotunde Yoloye

Studies concerning the performance of bilingual children on intelligence tests standardized in the environment of their second language have in general yielded two kinds of results. Most studies have indicated that bilingual children make better scores on nonverbal tests than on verbal tests. A few studies, mainly those using Jewish samples show that the bilingual children do equally well on both kinds of tests. On the basis of these findings some researchers have recommended the use of nonverbal rather than verbal tests for the educational guidance of bilingual children.

As a background for the present study, it was noted that the bilingual samples used for most of the reported studies lived in the cultural environment of their second language. It was reasoned that for bilingual samples who lived in the cultural environment of their first language, nonverbal tests also contain elements which constitute handicaps. It was further reasoned that at lower levels of education, the language handicap on verbal tests outweighs the handicap on nonverbal tests. However, schooling reduces the language handicap more rapidly than it reduces handicaps on nonverbal tests; therefore at higher levels of education, the bilingual children may actually perform better on verbal than nonverbal tests.

It was also reasoned that the more useful test for educational guidance in such bilingual schools would be the one that correlated better with school marks.

The study was therefore designed to test the following hypotheses:

1a. The type of intelligence test on which performance is better depends on educational level.

1b. Mean verbal as well as nonverbal IQs increase from the lowest grade to the highest.

1c. Mean verbal IQs increase more rapidly than mean nonverbal IQs from the lowest to the highest grade.

2. Verbal intelligence scores correlate higher with school marks than do nonverbal intelligence scores.

The sample consisted of native Nigerian secondary school boys in forms 1, 3, and 5 from four schools in Ibadan. Nigerian languages; mainly Yoruba, are their first languages, and English is their second. The larger cultural environment is Nigerian.

The verbal and nonverbal batteries of the multilevel edition of the Lorge-Thorndike tests were administered to the boys. Level C was administered to form 1, Level E to form 3, and Level G to form 5.

School marks in the preceding terminal examinations were collected for the sample. Also, information on five background variables; boarder-dayboy status, urban-rural background, father's education, mother's education, and father's occupation were collected by means of a questionnaire.

The pattern of performance in the intelligence tests was the same in all four schools. In forms 1 and 3, mean nonverbal IQs

were significantly higher than mean verbal IQs. In form 5, the reverse was true.

Mean verbal IQs increased significantly from first to fifth form. Mean nonverbal IQs showed a nonsignificant decrease. Mean standard scores showed a progressive increase for both batteries, but verbal scores showed the greater increase.

Verbal and nonverbal intelligence scores correlated to the same extent with school marks.

Of the background variables, only father's education and father's occupation were significantly related to test performance, and the correlation between the two variables was .66. The effect of the background variables tended to be greater on verbal than nonverbal scores, although the effects were generally in the same direction.

It was concluded that, while education reduced handicap on verbal tests, it probably did not reduce handicaps on nonverbal tests. Selection at entrance, and progressive selection in schools may also have affected the results. The study does not provide enough evidence to indicate superiority of one kind of test over the other with respect to educational guidance.

ACKNOWLEDGMENTS

Sincere thanks are expressed to Dr. Robert L. Thorndike for his generous assistance and counsel throughout the course of this study. The guidance and help provided by Dr. Albert S. Thompson and Dr. Walter MacGinitie at all stages of this study are also deeply appreciated.

The cooperation of Dr. Stanley W. Osgood of the Houghton Mifflin Company in supplying free the intelligence tests and granting permission for reproducing parts of the main batteries in the practice test is gratefully acknowledged.

Sincere thanks are expressed to Professor A. Taylor of the University of Ibadan for his help in organizing the administration of the tests. Special thanks are expressed to Mr. Obi C. Nwana of the University of Ibadan for undertaking the arduous task of administering the tests.

Finally, the cooperation of the Principals of Government College Ibadan, Loyola College Ibadan, Ibadan Grammar School, and Ibadan Boys High School in allowing the use of their students for this study is gratefully acknowledged.

TABLE OF CONTENTS

TABLE OF CONTENTS, CONTINUED

LIST OF TABLES

LIST OF TABLES CONTINUED

LIST OF FIGURES

CHAPTER I

PROBLEM AND BACKGROUND

The problem of bilingualism has received the attention of educators for several decades. Many studies have been conducted to estimate its effects on the development of the child. In order to appreciate fully the complexity of the problem, it is necessary to have a clear definition of bilingualism. Singer[1] aptly defined it as a continuum, the extremes of which are "Unilingualism" and "Equilingualism." A man is unilingual if he speaks, understands, thinks in, and is proficient in all aspects of only one language. He is equilingual if he has similarly attained proficiency in all aspects of two languages. Bilingualism then represents different combinations of degrees of proficiency in two languages. "Careful scientific inquiry by breaking the problem into its many parts, disclosed bilingualism to be not a simple condition about the effects of which sweeping generalizations could be made, but a complex problem with many aspects about each of which only the scientist's guarded and carefully limited generalizations would be permissible."[2]

The measurement of bilingualism; problems in learning a

---

[1] H. Singer, Bilingualism and elementary education. Mod. Lang. J., 1956, 448-458.

[2] S. Arsenian, Bilingualism in the post-war world. Psychol. Bull., 1945, 42, 68-86. P. 70.

second language; the effects of bilingualism on language development, school achievement, and mental development; bilingualism and social adjustment: these are some of the many aspects of bilingualism that have been studied. Excellent general summaries of such studies have been made by Arsenian,[1,2] Singer,[3] and Tireman.[4]

In the area of mental development, there has been particular interest in the effect of bilingualism on performance in tests of mental ability. Darcy[5] has made an extensive summary of studies dealing with the effects of bilingualism on the measurement of intelligence. One of the major concerns of the studies was to investigate the effect of language on the performance of bilingual children. Two approaches have been used in such studies; but both can be said to work on the same principle; namely, that the subjects are subjected to two test situations in one of which

---

[1] S. Arsenian, Bilingualism and mental development. Teach. Coll. Contr. Educ., 1937, No. 712.

[2] S. Arsenian, Bilingualism in the post-war world. Psychol. Bull., 1945, 42, 68-86.

[3] H. Singer, Bilingualism and elementary education. Mod. Lang. J., 1956, 40, 448-458.

[4] L. S. Tireman, Bilingual children. Rev. educ. Res. 1941, 11, 340-352; 1944, 14, 273-278.

[5] Natalie T. Darcy, Review of literature on the effects of bilingualism upon the measurement of intelligence. Pedag. Sem., 1953, 82, 21-57.

the use of the second language is reduced to a minimum, or eliminated, and their performances in the two situations are compared.

In the first approach, the content of the test remains the same in both situations; but the language in which it is administered is altered from one situation to the other. An example of this approach is the study by Anastasi and Cordova.[1] The investigators administered the Cattell "Culture Free" Tests forms 2A and 2B to Puerto Rican children in the upper three grades of a New York elementary school. The directions were given in English and Spanish and the resulting scores were compared. The language in which the test was administered was found to have no significant effect on performance.

Goodman et al.,[2] in a similar study of Puerto Rican children, used the Lorge-Thorndike Non-Verbal Intelligence Tests. The results were in agreement with those of Anastasi and Cordova in that the language in which the instructions were given had no significant effect on test performance.

In the second approach, the essential difference between the two test situations is in the kind of content present in the tests. Usually, a verbal and a nonverbal test are given to the

---

[1] Anne Anastasi & F. A. Cordova, Some effects of bilingualism upon the intelligence test performance of Puerto Rican children in New York City. J. educ. Psychol., 1953, 44, 1-19.

[2] S. M. Goodman et al., Puerto Rican study research report. Board of Education City of New York, 1959.

sample and the resulting scores compared. The present study is particularly concerned with the second approach; therefore, studies using this approach will be considered in greater detail.

Two kinds of results have emerged from such studies.

1. The large majority of studies show that bilingual children perform better on nonverbal tests than on verbal tests.

2. In a few studies, notably those involving Jewish samples, the bilingual children did equally well on both kinds of tests.

The finding that bilingual children perform better on nonverbal than verbal tests has been taken as strong evidence of a language handicap in verbal tests. Anastasi, for example, wrote, "The most crucial argument regarding the role of language handicap, however, is provided by the finding that the inferiority of the bilingual groups is greatly diminished and may disappear entirely when nonlanguage tests are employed."[1]

Studies Indicating Language Handicap

Pintner[2] administered the National Intelligence Test, Scale A, Form 1, and the Pintner Non-language Test to all children in the third and fourth grades of a New York City school. The

---

[1] Anne Anastasi, Differential psychology. (3rd ed.) New York: Macmillan, 1963. P. 559.

[2] R. Pintner, Comparison of American and foreign children on intelligence tests. J. educ. Psychol., 1923, 14, 292-295.

children were divided into an American group and a foreign group; the foreign group consisting of Italians, Germans, and Poles. Both groups scored a median MA of 9 years 4 months on the Pintner Non-language Test. On the National Intelligence Test, however, the median MA for the American group was 9 years while the median MA for the foreign group was 8 years 9 months. 37 per cent of the foreign group reached the median MA of the American group on the verbal test. The results were taken as evidence of a language handicap for the foreign group, although no test of statistical significance was performed.

Jamieson and Sandiford[1] compared the performances of 700 Southern Ontario Indians on the two tests of Pintner's study. The sample consisted of children in Primer and Grades 1 to 4 of the elementary school, and had an age range from seven years and four months to sixteen years and one month. The median IQ in the National Intelligence Test was 80; while on the Pintner Non-language Test it was 97. The mean IQ on both tests increased with the grade of the children. As in the Pintner study, no tests of statistical significance were performed.

Pintner[2] obtained results similar to those of his earlier

---

1 E. Jamieson & P. Sandiford, The mental capacity of Southern Ontario Indians. J. educ. Psychol., 1928, 19, 313-328.

2 R. Pintner, The influence of language background on intelligence tests. J. soc. Psychol., 1932, 3, 235-240.

study, using the Pintner Cunningham Primary Mental Test and the Pintner Primary Non-language Test. The sample consisted of 430 children in Grades 1A and 1B in three elementary schools in New York City. The children were divided into a monolingual group and a bilingual group on the basis of their surnames, or judgement by teachers and Pintner's assistants as to their language backgrounds. In two of the schools, the bilingual students did better on the nonverbal than the verbal test. It may be noted that the criterion of bilingualism in this study is far from satisfactory.

Barke's[1] findings in South Wales agreed with those of the studies so far reported. She used the Northumberland Standardized Test and the Pintner Non-language Test. The sample consisted of 395 bilingual children who spoke Welsh at home and English at school, and 302 monolingual children who spoke English. The children's ages ranged from 10 years to 14 years. The monolingual children proved superior to the bilingual children on the Northumberland Test by .8 of a year; while the bilingual children proved superior by .44 of a year on the Pintner.

Hoffman[2] found no correlation between bilingualism and the Pintner Non-language Test scores of 114 Jewish and Italian children

---

1 Ethel M. Barke, A study of comparative intelligence in certain bilingual and monoglot schools in South Wales. Brit. J. educ. Psychol., 1933, 3, 237-250.

2 M. N. Hoffman, The measurement of bilingual background. New York: Bureau of Publications, Teachers College, Columbia Univ., 1934.

in Grades 5 and 6 in New York City. With the Otis Intermediate Test scores however, bilingualism correlated +.24 for the Jewish group and -.35 for the Italian group. Apparently, bilingualism had opposing effects in the two groups. As will be seen in studies reported later in this chapter, the Jewish samples seem to be unique with respect to their performance on verbal tests.

Seidl[1] compared the performance of 120 American born Italian children who heard and spoke only English, with that of 120 American born Italian bilingual children, on the 1916 revision of the Stanford-Binet and the Arthur Point Scale of Performance Tests. Each group consisted of 60 boys and 60 girls in the age range 10 years to 11 years. The monolingual children scored higher than the bilingual on the Stanford-Binet; but the bilingual children proved superior on the Arthur Point Scale.

Havighurst and Hilkevitch[2] used the Kuhlmann-Anderson Test and the Arthur Point Scale with 30 boys and girls of the Sioux Indian tribe. The children's ages ranged from six to fifteen years. Their mean IQ on the verbal test was 82.5 with a standard deviation of 13.5; while their mean score on the Arthur Point Scale was 102.8 with a standard deviation of 19.1. The

---

[1] J. C. Seidl, The effect of bilingualism on the measurement of intelligence. Unpublished Ph.D. thesis, New York: Fordham Univ., 1937.

[2] R. J. Havighurst & R. R. Hilkevitch, The intelligence of Indian children as measured by a performance scale. J. abnorm. soc. Psychol., 1944, 39, 419-433.

investigators also made some effort to estimate the effect of schooling on the scores, and the scanty data available indicated that children who had been to school scored higher than those who had not. It should be noted however, that these comparisons were not the main object of the study; consequently, the usual precautions to ensure validity of the results were not taken.

Darcy[1] selected 212 American preschool children of Italian parentage from 10 nursery schools in Brooklyn and Manhattan. She classified them into bilingual and monolingual groups on the basis of those who spoke Italian at home and those who did not. The 1937 revision of Stanford-Binet Form L, and the Atkins Object-Fitting Test Form A were administered to the two groups. The monolingual group scored higher than the bilingual on the Stanford-Binet; the mean IQs being 98.69 and 90.85 respectively. On the Atkins test, the bilingual group scored higher than the monolingual; the means being 97.50 and 88.95 respectively.

Darcy,[2] in a later study, introduced a new element into the technique of comparing the performances of bilingual children on verbal and nonverbal tests. Hitherto, investigators had used tests which were originally standardized on different samples; therefore,

---

[1] Natalie T. Darcy, The effect of bilingualism upon the measurement of the intelligence of children of preschool age. J. educ. Psychol., 1946, 37, 21-44.

[2] Natalie T. Darcy, The performance of bilingual Puerto Rican children on verbal and on nonlanguage tests of intelligence. J. educ. Res., 1952, 45, 499-506.

performances could only be compared indirectly using a control monolingual group. Darcy chose the Pintner General Ability Test, Verbal Series, Intermediate Test Form B and The Pintner General Ability Test, Non-language Series Form K. The nonlanguage test was standardized on a sample with known ability in terms of the Pintner verbal test norms. Thus, scores on the two tests are more directly comparable than scores on the pairs of tests that had been used in earlier studies. Darcy's sample consisted of 235 Puerto Rican children; 117 boys and 118 girls, in grades 5 and 6 of two elementary schools in New York City. Ages ranged from 124 months to 178 months with a mean of 148.01 months and a standard deviation of 10.62 months. On the nonlanguage test, the mean IQ was 87.84 with a standard deviation of 16.52. On the verbal test, the mean score was 79.56 with a standard deviation of 14.31. The difference in mean IQ was statistically significant.

Jones[1] compared the performances of 117 bilingual Welsh children in the senior classes of five primary schools, on the Jenkins's Scale of Nonverbal Mental Ability and the Moray House Intelligence Test 42. The nonverbal test was administered in Welsh; while the verbal was administered in English. Mean nonverbal IQ was significantly higher than mean verbal IQ in four of the schools. There is of course the question of comparability of the test scores since both tests were not standardized on the

---

[1] W. R. Jones, The language handicap of Welsh-speaking children. Brit. J. educ. Psychol., 1952, 22, 114-123.

same sample.

Kittell,[1] taking a cue from the work of Sanchez,[2] introduced a new dimension into the comparison of test performances of bilingual children. He conducted a longitudinal study on the same children in the third and fifth grades. Scores on the language and nonlanguage sections of the California Short-Form Test of Mental Maturity were compared for two groups of children: a bilingual group and a monolingual group. The bilingual group consisted of children with a foreign language background and contained several ethnic groups. Among other findings, the bilingual children scored higher on the nonlanguage section than on the language section at both grade levels. In the third grade, the mean MAs were 109.88 in the nonlanguage section and 107.06 in the language section. In the fifth grade, the mean MAs were, 152.36 in the nonlanguage section and 139.64 in the language section. The difference was significant in the fifth grade; but not in the third. Both groups increased in mean language MA as well as mean nonlanguage MA. Both groups made greater gains in the nonlangaage than the language MA. However, while there was no significant difference between the mean gain on the nonlanguage test by the two groups,

---

[1] J. E. Kittell, Intelligence test performance of children from bilingual environments. Elem. Sch. J., Nov. 1963, 64, 76-83.

[2] I. Sanchez, Scores of Spanish-speaking children on repeated tests. Pedag. Sem. & J. genet. Psychol., 1932, 40, 223-231.

the bilingual gain on the language test was significantly higher than the monolingual gain. This finding was taken as evidence of a language handicap for the bilingual group in the third grade. This conclusion may be questioned however on the grounds that it is based on the comparison of two critical ratios. The relative gain on the two types of test may not have been significantly greater for the bilingual group.

Studies Indicating no Language Handicap

Murdoch, Maddow, and Berg[1] administered the Otis Advanced Intelligence Scale, the Thorndike Word Knowledge Test, and the International Test to 149 Jewish girls in grade 7A in New York City. Degree of bilingualism was determined by means of a questionaire. No significant correlation was found between the degree of bilingualism and the scores on any of the tests.

Pintner and Arsenian[2] studied 469 native born Jewish children in New York City. All the children were in the sixth or seventh grade, and in the age range ten years one month to fifteen years. The degree of bilingualism of the children was measured by means of the Hoffman Bilingual Schedule. The Pintner Intelligence Test

---

[1] K. A. Murdoch, D. Maddow, & N. L. Berg, A study of the relation between intelligence and the acquisition of English. Yearb. nat. Soc. Stud. Educ., 1928, Part II, 343-353.

[2] R. Pintner and S. Arsenian, The relation of bilingualism to verbal intelligence and school adjustment. J. educ. Res., 1937, 31, 255-263.

Form A, Grades IV-VIII and the Pintner Non-language Test were administered to the children. The correlation between bilingualism and IQ was found to be -.029. No significant difference was found between the IQs of those with high scores and those with low scores on the bilingual schedule on either test.

Levinson[1] administered the Wechsler Intelligence Scale for Children and the Terman Merrill revision of the Stanford-Binet to Jewish preschool children. The children were five and six year olds. They were divided into bilingual and monolingual groups on the basis of parents' information as to whether a foreign language was spoken at home or not. The test scores were analyzed by subtests. No significant differences were found between monolingual and bilingual boys on any of the subtests. Among the girls, however, the monolingual children proved superior to the bilingual children on both the WISC verbal and the WISC performance. The difference was more significant in the verbal than in the performance subtests. Levinson concluded that the girls seemed to manifest a language handicap; but the boys did not. Such a conclusion is however questionable since it is based on the comparison of two critical ratios. It must also be noted that the numbers in the samples were small; ranging from 28 to 31.

---

[1] B. M. Levinson, Comparative study of the verbal and performance ability of monolingual and bilingual native born Jewish preschool children of traditional parentage. J. genet. Psychol., Sept. 1960, 97, 93-112.

Factors Which Could Influence Results

Various factors may play a part in determining the kind of results obtained in comparative studies such as those reviewed above. Some of these factors have to do with the nature of the instruments used; others have to do with the nature of the sample.

Nature of Instruments

When two tests are standardized on different norming samples, their scores are not directly comparable. Most of the studies reported attempted to circumvent this difficulty by having control monolingual groups. This procedure in turn creates the problems of matching and distinguishing between bilingual and monolingual groups within the same culture. Often, the criterion of bilingualism was arbitrary. The Hoffman Bilingual Schedule,[1] which has on occasion been used, in fact measures the extent of bilingual background and not degree of proficiency in the languages spoken.

Nature of the Sample

At the beginning of this chapter, the complexity of the concept "Bilingualism" was stressed. If bilingualism is regarded as a continuum, it is reasonable to expect that the type of bilingualism

---

[1] M. N. Hoffman, The measurement of bilingual background. New York: Bureau of Publications, Teachers College, Columbia Univ., 1934.

present in any sample will depend on what portion of the continuum the sample occupies. Arsenian[1] identified three kinds of bilingualism depending on the larger social environment of the bilingual group concerned.

1. The bilingualism of language minorities such as the German speaking minorities in Hungary, Rumania, or Czechoslovakia.

2. The bilingualism of colonial or former colonial countries such as is found in many countries in Africa.

3. The bilingualism of immigrant minorities such as is found in the United States.

In the first two kinds, especially in the second, the bilingual child is in the cultural environment of his first language. In the third kind, the bilingual child is in the cultural environment of his second language. The distinction between the first and the second kinds of bilingualism enumerated above is in the degree of similarity between the environments of the first and the second languages. The greatest dissimilarity between the two environments is found in the colonial and former colonial countries. Comparative studies with tests standardized in the environment of the second language may therefore be expected to yield different results depending on whether the sample has bilingualism of the first,

---

[1] S. Arsenian, Bilingualism and mental development. Teach. Coll. Contr. Educ., 1937, No. 712.

second, or third kind. Arsenian[1] further enumerates five dimensions which may influence the kind of bilingualism a child has.

1. The degree of bilingualism.
2. Degree of difference between the two languages.
3. Age of beginning the second language.
4. Method of learning the second language.
5. Attitude towards the second language.

The unique verbal competence of Jewish bilingual children has in part been attributed to their attitude towards the English language. "The Jewish child will eventually have to make his way in an English-speaking society, and English is therefore of primary importance to him. . . . Those national groups which are in large part oriented towards the possibility of returning to their country of origin may regard English more as a temporary expedient."[2]

If degree of bilingualism is interpreted in terms of proficiency in the languages rather than simply bilingual background, then the educational level of the bilingual child becomes a very important factor in his relative performance on verbal and nonverbal tests. Sanchez[3] showed that verbal IQs of Spanish speaking

---

[1] S. Arsenian, Bilingualism and mental development. Teach. Coll. Contr. Educ., 1937, No. 712.

[2] Anne Anastasi, Differential psychology. (3rd ed.), New York: Macmillan, 1963. P. 560.

[3] I. Sanchez, Scores of Spanish-speaking children on repeated tests. Pedag. Sem. & J. genet. Psychol., 1932, 40, 223-231.

bilingual children in New Mexico increased with the amount of exposure to English. Studies by Lorge[1] and the Adjutant General's Office[2] show that the effect of schooling in improving verbal test performance is probably universal. Studies by Kittell[3] and Arthur[4] however suggest that the effect is greater for bilingual than monolingual children.

Pintner obviously recognized the role of education when he wrote, "The language handicap will presumably be greatest in grade 1, diminishing thereafter as the child grows older. At what grade this language handicap will be entirely overcome will depend upon many factors, notably the opportunity to mix in an English-speaking environment and the general intelligence of the individual."[5]

---

1 I, Lorge, Schooling makes a difference. Teach. coll. Rec., 1945, 46, 483-492.

2 The Adjutant General's Office, The army classification test. Psychol. Bull., 1945, 42, 760-768.

3 J. E. Kittell, Intelligence test performance of children from bilingual environments. Elem. Sch. J., 1963, 64, 76-83.

4 Grace Arthur, The predictive value of the Kuhlmann-Binet Scale for a partially Americanized school population. J. appl. Psychol., 1937, 21, 359-364.

5 R. Pintner, The influence of language background on intelligence tests. J. soc. Psychol., 1932, 3, 235-240. Pp. 239-240.

Some Unresolved Issues

The foregoing discussion raises certain issues, two of which are here selected for consideration. The first concerns the influence of educational level and cultural environment on the verbal and nonverbal test performances of bilingual children. A second important issue concerns the choice of tests for educational guidance of bilingual children.

Influence of Educational Level and Cultural Environment

Results of previous studies have tended to emphasize the language handicap of bilingual children. The fact that nonverbal tests also contain elements that constitute handicaps for children in certain cultures has also been recognized; but in general, such handicaps have been regarded as less serious than those on verbal tests. However, while it has been established that schooling reduces the language handicap, due to increased proficiency in the second language; it is doubtful whether schooling reduces the handicaps on nonverbal tests to the same extent. If the bilingual child is in the cultural environment of his second language, then the environment as well as the schooling would reinforce each other in reducing any handicap on the nonverbal tests. If, however, the child is in the cultural environment of his first language; then handicaps resulting from the environment are less likely to be reduced. In such a situation, it is conceivable that while the

language handicap may be dominant at the lower educational levels, at the higher educational levels, the language handicap has been overcome to such an extent that the bilingual child may actually show better performance on verbal than nonverbal tests. An assumption made by the above reasoning needs to be emphasized; namely, the handicap on the nonverbal tests is more a function of the general cultural environment than of schooling; while the reverse is true for verbal tests.

Two examples of the kind of handicap present in nonverbal tests will be given to clarify the above reasoning. Hudson,[1] studying pictorial depth perception among different cultural groups in South Africa, pointed out the culture bound nature of the pictorial depth cues: object size, object superimposition, and perspective. Further, he showed that recognition of these cues was not related to level of education among the African samples; neither was it related to intelligence. Among the white samples, recognition of the cues was related to both intelligence and educational level, although the intelligence factor did not seem to operate beyond the primary school level. Hudson explained the results by postulating that recognition of the depth cues depended on informal rather than formal training. The depth cues are not formally taught in school; but are informally learnt in home environments providing the necessary stimuli such as wall pictures,

---

[1] W. Hudson, Pictorial depth perception in subcultural groups in Africa. J. soc. Psychol., 1960, 52, 183-208.

newspapers and magazines. If such stimulating elements are absent, the effects of educational level and intelligence are nullified.

Huxley[1] stated, probably correctly, that most African languages are deficient in abstract terms. Both verbal and nonverbal tests require abstractions. If the vocabulary necessary for characterizing such abstractions are absent in a given African language, then the child who speaks only that language can be expected to have difficulty in acquiring the mental sets necessary for such abstractions. The result would be the manifestation of a perceptual deficiency on such tests. Learning the necessary vocabulary in another language should make up some of the perceptual deficit. However, the learning of vocabulary does not automatically lead to the acquisition of the corresponding concepts. Therefore, the perceptual deficit may be expected to be made up more slowly than the vocabulary deficit. Much of the handicap on verbal tests in a second language is due to simple vocabulary deficiency, in the sense that the concepts or objects corresponding to such vocabulary are not absent in the first language. Therefore, education in the second language should reduce the overall handicap on verbal tests more rapidly than it does the handicap on nonverbal tests where most of the deficiency is conceptual in nature.

With respect to the removal of language handicap in verbal

---

[1] J. Huxley, Africa view. London: Chatto & Windus, 1936.

tests, the finding of McKillop and Yoloye[1] is relevant. They found that the mean score of a sample of undergraduates at the University of Ibadan, Nigeria, in the Vocabulary Test G-T, was no different from the mean score of a comparable American sample. This finding is an indication of the extent to which language handicap may be reduced by education.

Relevance of Tests for Educational Guidance

Some of the researchers in the area of bilingualism have advocated the substitution of nonverbal for verbal tests with bilingual children. Barke wrote, "It is indicated that under conditions of bilingualism, intelligence tests of a nonverbal nature should be used in preference or in addition to those in which success is conditioned by linguistic ability."[2] Havighurst and Hilkevitch wrote, "A performance test of intelligence would be more valuable for educational placement and guidance of Indian children in the South West than an intelligence test which requires much use of the English language."[3]

---

[1] Anne McKillop & E. A. Yoloye, The reading of university students. Teach. Educ., Nov. 1962, 3, 93-107.

[2] Ethel M. Barke, A study of comparative intelligence of children in certain bilingual and monoglot schools in South Wales. Brit. J. educ. Psychol., 1933, 237-250. Pp. 249-250.

[3] R. J. Havighurst & R. R. Hilkevitch, The intelligence of Indian children as measured by a performance scale. J. abn. soc. Psychol., 1944, 39, 419-433. P. 433.

The question arises: does better performance on a nonverbal test necessarily imply that the nonverbal test is more useful than the verbal? Obviously, the usefulness of a test depends on the purpose for which it is to be used. For diagnosis, probably a combination of the two types of tests is the best. For prognosis, the test that correlates higher with the criterion is the more useful. For the purpose of matching samples from different cultures however, the test that is least biased against either culture is best.

School achievement is one of the most important criteria expected to be correlated with intelligence test scores. Gates,[1] in a very detailed study, showed that verbal tests correlate higher with school marks than nonverbal tests. Various other studies have confirmed Gates's findings. Examples are provided by MacArthur and Elley,[2] Sniffen,[3] and Lorge and Thorndike.[4] If these findings are

---

[1] A. I. Gates, The correlation of achievement in school subjects with intelligence tests and other variables. J. educ. Psychol., 1922, 13, 129-139; 223-235; 277-285.

[2] R. S. MacArthur & W. B. Elley, The reduction of socioeconomic bias in intelligence testing. Brit. J. educ. Psychol., 1963, 33, 107-119.

[3] A. M. Sniffen, A correlational study of group intelligence tests with achievement in Reading and Arithmetic in grade 4. Unpublished doctoral dissertation, New York Univ., 1963.

[4] I. Lorge & R. L. Thorndike, The Lorge-Thorndike Intelligence Tests technical manual. Boston: Houghton Mifflin, 1962.

also true of bilingual students, then, in spite of language handicap, verbal tests would still be more useful for educational guidance.

Problems Investigated

The present study sought to answer the following questions about the performance of bilingual students living in the social environment of their first language.

1. Is the pattern of performance on verbal and nonverbal intelligence tests the same for all educational levels when tests standardized in an environment of the second language are used?

2. Which type of test, verbal or nonverbal, is more relevant to school achievement?

Hypotheses

In connection with the first question, the foregoing discussion makes it reasonable to expect that the handicap on both verbal and nonverbal tests would be reduced with increasing education. However, since verbal material is more directly taught in the schools, the handicap on verbal tests should decrease more rapidly than that on nonverbal tests. Consequently, the type of test on which the students show a better performance should depend on educational level. Superiority in nonverbal tests is more likely at lower educational levels, but the reverse is more likely at higher educational levels.

In connection with the second question, since the English langauge plays such a crucial role in secondary school instruction in the country of the present study, it is reasonable to expect that verbal IQs would correlate much higher with school marks than nonverbal IQs would.

The nature of the sample for the present study is described in detail in the next chapter, but it is useful to note at this point the situation to which the hypotheses which follow apply. The subjects are all native Nigerian secondary school boys. Their first language is Nigerian and their second is English, while their general cultural environment is Nigerian. The intelligence tests used were standardized in the United States. The hypotheses were as follows.

1a. The type of intelligence test on which performance is better depends on educational level.

1b. Mean verbal as well as nonverbal IQs increase from the lowest grade to the highest.

1c. Mean verbal IQs increase more rapidly than mean nonverbal IQs from the lowest to the highest grade.

2. Verbal intelligence test scores correlate higher with school marks than do nonverbal intelligence test scores.

CHAPTER II

DESIGN AND PROCEDURE

Four aspects of the design of this study are worth emphasizing.

1. The sample consisted of bilingual children in the cultural environment of their first language. Secondary school children were chosen because it was believed that, at this level, comprehension of instructions in English would present little difficulty.

2. The design was cross sectional in that samples were chosen from three different educational levels and from four different schools.

3. The verbal and nonverbal tests used were originally standardized on the same American sample; therefore their converted scores are directly comparable. Further, the instructions for the two batteries were equally verbal; differences in the scores may thus be attributed to the nature of the tasks the tests sampled.

4. Information on other variables usually found to affect test scores were collected for the sample, not for the purpose of controlling for them, but in order to obtain preliminary information about their effects which may be useful in later follow up studies.

The Sample

Native Nigerian secondary Grammar School boys from four schools in Ibadan, Western Nigeria, were used. The educational levels

selected were forms one, three, and five. Form one in the Nigerian schools corresponds roughly to grade seven in an American school. Similarly, form three corresponds to grade nine and form five corresponds to grade eleven or twelve.

The four schools represent the four main types of secondary Grammar Schools in Nigeria. The Government College is government owned and is one of the best in the country in terms of facilities and academic standards. Loyola College is sponsored by a religious organization, namely, the Roman Catholic Mission. In terms of quality and reputation, schools in this category would rank next to the government colleges. The Ibadan Grammar School is a community school sponsored by the people of Ibadan. However, it has had such a long association with the Anglican Mission that, in character and standards, it is closer to the religious schools than to other community schools. The Ibadan Boys High School is a private school, with an individual as proprietor. Schools in this category generally rank below the others in quality. There are, of course, other factors that determine the quality of a school besides its type, for example, the age and location of the school.

Data were collected from the third and fifth forms in Government College; the first, third, and fifth forms in Loyola College and Ibadan Boys High School; and the first and fifth forms in Ibadan Grammar School.[1] The entire population available in each

---

[1] Efforts were made to collect data for all three forms in all schools, but due to administrative difficulties, Government College form one and Ibadan Grammar School form three were left out.

form was used. The form sizes ranged from 32 to 70 and the total sample size for the study was 516.

Details of the composition of each form with respect to five background variables are given in Table 1, on the following page. The variables are boarder-dayboy status, urban-rural background, father's education, mother's education, and father's occupation. For the economy of space, the following abbreviations have been used in the tables.

GCI for Government College Ibadan.

LCI for Loyola College Ibadan.

IGS for Ibadan Grammar School.

IBHS for Ibadan Boys High School.

Language Background

Nigeria was a British colony but became independent in 1960. English is consequently the second language for Nigerian children. Usually, instruction is in a Nigerian language during the first two years of elementary school. English is introduced in about the third year and is more and more extensively used for instruction as one moves up the educational ladder. In the secondary grammar schools, all instruction is in English except for the local languages which are taught as school subjects. The result is that each secondary grammar school boy speaks his own native language as well as some amount of English. Judging by the names, about 85 per cent of the present sample have Yoruba as their first language.

Table 1

Percentage Composition of Each Form of Each School in Terms of Five Background Variables

Variables	IBHS Form 1	IBHS Form 3	IBHS Form 5	LCI Form 1	LCI Form 3	LCI Form 5	IGS Form 1	IGS Form 5	GCI Form 3	GCI Form 5
Boarder-Dayboy										
Boarder	15	50	97	91	67	78	22	75	100	100
Dayboy	85	50	3	9	33	22	78	25	0	0
Urban-Rural										
Urban	68	67	66	81	71	68	88	89	73	77
Rural	32	33	34	19	29	32	12	11	27	23
Father's educ.										
Above Elem.	58	48	50	84	59	65	78	91	77	88
Elem. or lower	42	52	50	16	41	35	22	9	23	12
Mother's educ.										
Above Elem.	19	22	12	57	24	29	58	64	55	55
Elem. or lower	81	78	88	43	76	71	42	36	45	45
Father's occup.										
Prof. Teach. CS[a]	34	20	24	47	39	33	55	53	57	52
Trade, Skilled[b]	42	33	38	15	26	25	35	28	14	15
Farmer	15	24	22	16	16	28	3	0	14	6
Others	9	23	16	22	19	14	7	19	15	27

[a] Professionals, Teachers, and Civil Servants.

[b] Traders and Skilled Workers.

Instruments

Three kinds of instruments were used in collecting the necessary data.

The Lorge-Thorndike Intelligence Tests Form 1[1]

The new multilevel edition of the Lorge-Thorndike Intelligence Tests consists of two batteries: a verbal battery and a nonverbal battery. Both are a series of tests of abstract intelligence. For each battery, there is a graded series of items divided into eight different but overlapping scales for use within the grade range 3-13. There are five subtests in the verbal battery: vocabulary, verbal classification, sentence completion, arithmetic reasoning, and verbal analogies. In the nonverbal battery, there are three subtests: pictorial classification, pictorial analogies, and numerical relationships.

Both batteries were standardized on the same sample in the United States and each yields a deviation IQ with a mean of 100 and standard deviation of 16 for the norm sample. The multilevel design with the overlapping scales was made a basis for obtaining scaled scores that are comparable from level to level. Thus the scores from the two batteries are comparable in both dimensions required for this study.

---

[1] I. Lorge, R. L. Thorndike, & Elizabeth Hagen, Manual for administration, The Lorge-Thorndike Intelligence Tests. (multilevel ed.) Boston: Houghton Mifflin, 1964.

Teacher-made Tests

In the Nigerian grammar schools, a report on the academic performance of the students is issued to parents at the end of each school term. The report consists of number grades achieved on tests designed by the respective subject teachers. Such tests are presumed to measure the student's achievement in the school subjects during the term.

Background Questionaire

The appendix contains a background questionaire which was used to obtain information about five background variables for the sample. The variables were, boarder-dayboy status, urban-rural background, father's education, mother's education, and father's occupation.

Procedure

The intelligence tests were administered by the same person in all the forms. Level C was administered in the first form, Level E in the third form, and Level G in the fifth form. A practice test consisting of items belonging exclusively to level A was prepared with the intention of having it precede the main batteries during the testing sessions. However, the proctor used this test only with the first sample, which was Government College Form 1. He reported that he discontinued the use of the practice test with later samples on the grounds that it extended the testing

time beyond the limits which the school principals were prepared to allow, and it also caused undue fatigue in the students. The students in Government College form 1 were in fact unable to complete the tests, hence data for this form was not available for analysis. In subsequent testing sessions, the proctor did, however, go carefully through the practice items in the main batteries and, in his opinion, the students had no difficulty in understanding what was required of them. The order of administration of the tests in each form was the verbal battery first, followed by the nonverbal battery. The standard procedure outlined in the manual was followed, but the length of time allowed for each subtest was one and a half times the time specified in the manual. Coffman[1] reported that on the Preliminary Scholastic Aptitude Test, African students applying for the ASPAU scholarships to study in American Universities, required approximately one and a half times as much time as comparable American students to attempt the same number of test items.

Each subject completed a copy of the questionaire. Also, scores in the terminal examinations in the preceding term were collected from the class record books. The intelligence tests were administered during the first two weeks of June 1964. The school marks were obtained during the school term which ended in early May 1964.

---

[1] W. E. Coffman, Evidence of cultural factors in responses of African students to items in an American test of scholastic aptitude. Research memorandum (RM-63-6) Princeton: Educational Testing Service, July 1963.

Computational Methods

In order to test hypothesis 1a, the mean IQs were computed for both tests in each form. t tests were used to test the significance of the differences between verbal and nonverbal IQs in each form. Data from each school were analyzed separately.

In order to test hypothesis 1b, the mean IQs were cross tabulated by school and form, verbal and nonverbal IQs being tabulated separately. A two way analysis of variance was performed to test the significance of form and school effects on both kinds of IQs.

In order to test hypothesis 1c, the difference scores, i.e. nonverbal minus verbal IQs for each subject, were tabulated by school and form, and a one way analysis of variance was performed to test the significance of form effect.

In order to test hypothesis 2, product moment correlations were calculated between class marks on the one hand and verbal, nonverbal, and combined IQs on the other. The class marks were composites obtained by simple addition of scores in various school subjects. The subjects included in each composite varied from form to form, but were limited to seven or more of the following: English literature, English language, History, Geography, Religion, Latin, French, Yoruba, Biology, General Science, Mathematics, Physics, and Chemistry.

In order to test the effect of the five additional background variables, it was necessary to use carefully drawn random

samples rather than the entire sample for two reasons. In the first place, some categories were not represented in some schools. Thus, there are no dayboys in Government College, and practically no farmers' sons in Ibadan Grammar School. Secondly, since scores were found to depend on both school and form, it was necessary to choose equal numbers from each school and form, for each category of each variable. The sampling design is shown in Table 2. The forms from which the samples were drawn are those in which all the categories of the relevant variable were most abundantly represented. t tests were performed for the first four variables, and a one way analysis of variance was carried out to test the effect of father's occupation.

Table 2

Sampling Design for Testing the Effect of Five Background Variables

Variable	Forms	Sample[a]
Boarder-Dayboy	IBHS 3 LCI 3	20 per category per form
Urban-Rural	IBHS 3 LCI 3 GCI 3	14 per category per form
Father's educ.	IBHS 3 LCI 3	20 per category per form
Mother's educ.	LCI 3 & 5 GCI 3 & 5	10 per category per form
Father's occup.	IBHS 1, 3, 5 LCI 1, 3, 5	8 per category per form

[a]In every instance, the sampling was random.

CHAPTER III

RESULTS AND CONCLUSIONS

The results supported in part, hypotheses 1a, 1b, and 1c, but did not support hypothesis 2. Some of the unhypothesized results may be useful for further studies, but it must be emphasized that they are only suggestive.

Performance and Educational Level

The mean verbal and nonverbal IQs in the different forms are given in Table 3. Relative performance on the two kinds of tests follows the same pattern in all the four schools. In the first and third forms, mean nonverbal IQ is significantly higher than mean verbal IQ. In the fifth form, however, the position is reversed, mean verbal IQ is higher than mean nonverbal IQ, and the difference is statistically significant in two of the schools. Thus the results support hypothesis 1a. It may be concluded that at the lower levels of education, language handicap is so great that performance on the nonverbal test is better than on the verbal; however, at the higher educational levels, the language handicap has been reduced to such an extent that the greater overall handicap is manifested on the nonverbal tests by the bilingual students. It should be noted that the same pattern of relative achievement occurred in each school even though Table 4 and Table 5 show that there is significant school effect on the actual scores in both tests.

Table 3

Mean Verbal and Nonverbal IQs at Different Forms in Four Schools

Schools & Forms	Verbal Mean	Verbal SD	Nonverbal Mean	Nonverbal SD	D[a]	t
IBHS						
1 (N=59)	75.02	6.02	84.17	11.54	9.15	7.247**
3 (N=60)	76.02	9.47	80.82	13.88	4.8	3.920**
5 (N=40)	85.63	7.87	80.63	9.37	-5.0	3.315**
LCI						
1 (N=64)	84.05	7.42	92.81	10.77	8.76	8.58**
3 (N=63)	85.38	8.03	91.87	11.19	6.49	7.404**
5 (N=37)	91.95	9.97	89.30	10.29	-2.65	1.648
IGS						
1 (N=32)	78.38	8.62	88.50	12.79	10.12	5.951**
5 (N=56)	92.37	8.21	89.70	13.06	-2.67	1.898
GCI						
3 (N=70)	93.24	8.78	100.99	12.46	7.75	5.593**
5 (N=35)	103.70	12.47	95.31	15.81	-8.39	3.636**

[a] D = Mean nonverbal IQ minus mean verbal IQ.

** Significant at .01 level

Table 4

Mean Verbal IQs in Forms 1, 3, and 5 in Four Schools, Arranged to Show Inter-School and Inter-Form Variation

	Form 1		Form 3		Form 5	
Schools	Mean	SD	Mean	SD	Mean	SD
IBHS	75.02 (59)	6.02	76.02 (60)	9.47	85.63 (40)	7.87
IGS	78.38 (32)	8.62	x[a]		92.37 (56)	8.21
LGI	84.05 (64)	7.42	85.38 (63)	8.03	91.95 (37)	9.97
GCI	x[a]		93.24 (70)	8.78	103.70 (35)	12.47

[a] x = no data collected for this form

Note. 1. The numbers in parentheses are values of N.

2. A two way analysis of variance yielded the following F ratios:

School effect; $F_{(3,4)} = 11.77^{*}$

Form effect; $F_{(2,4)} = 10.11^{*}$

* Significant at .05 level

3. School-Form interaction was significant; therefore the F ratios were calculated with the mean square interaction as denominator.

Table 5

Mean Nonverbal IQs in Forms 1, 3, and 5 in Four Schools, Arranged to Show Inter-School and Inter-Form Variation

Schools	Form 1		Form 3		Form 5	
	Mean	SD	Mean	SD	Mean	SD
IBHS	84.17 (59)	11.54	80.82 (60)	13.88	80.63 (40)	9.37
IGS	88.50 (32)	12.79	x[a]		89.70 (56)	13.06
LCI	92.81 (64)	10.77	91.87 (63)	11.19	89.30 (37)	10.29
GCI	x[a]		100.99 (70)	12.46	95.31 (35)	15.81

[a] x = no data collected for this form.

Note. 1. The numbers in parentheses are values of N.

2. A two way analysis of variance yielded the following F ratios:

School effect; $F_{(3,4)} = 8.63^{*}$

Form effect; $F_{(2,506)} = 2.80$

*Significant at .05 level

3. F ratio for school effect was calculated with the mean square interaction as denominator. F ratio for form effect was calculated with the mean square error as denominator.

Growth Patterns for Verbal and Nonverbal Ability

The growth in mean test scores from the lowest to the highest form was studied in two ways.

Pattern for Mean IQs

Table 4 shows that mean verbal IQ increases significantly from the first to the fifth form in all the schools. This result is in agreement with hypothesis 1b. Table 5 on the other hand, shows that mean nonverbal IQ decreases from the first to the fifth form in three schools, although the overall decrease was not found to be statistically significant. This result is not in agreement with hypothesis 1b.

Table 6 shows that the difference scores (nonverbal minus verbal) decrease significantly from the first form to the fifth form in all four schools. In other words, the mean verbal IQs increase significantly more rapidly than the mean nonverbal IQs. This result supports hypothesis 1c.

The difference between the predictions of the combined hypotheses 1a, 1b, and 1c, and the actual empirical results are clearly illustrated in Figure 1 and Figure 2. In Figure 1, the points A, B, and C represent the three possible kinds of positions where form 1 might be on the horizontal axis; namely, before the intersection, at the intersection, or after the intersection of the verbal and nonverbal curves. The slopes of both curves are positive. Figure 2 shows the empirical results using the data from Ibadan Boys High

Table 6

Mean Difference Scores in Forms 1, 3, and 5 in Four Schools, Arranged to Show Inter-Form Variation

Schools	Form 1		Form 3		Form 5		
	Mean	SD	Mean	SD	Mean	SD	F
IBHS	9.3 (59)	9.8	4.8 (60)	9.4	-5.0 (40)	9.4	26.6**
IGS	10.1 (32)	9.5	x[a]		-2.7 (56)	10.4	32.1**
LCI	8.8 (64)	9.5	6.5 (63)	9.9	-2.6 (37)	9.6	21.6**
GCI	x[a]		7.7 (70)	11.4	-8.1 (35)	13	43.0**

[a] x = no data collected for this form.

** Significant at .01 level

Note. 1. The numbers in parentheses are values of N.

2. Difference scores were obtained by subtracting verbal IQ from nonverbal IQ for each individual. A positive difference means better performance on the nonverbal test. A negative difference means better performance on the verbal test.

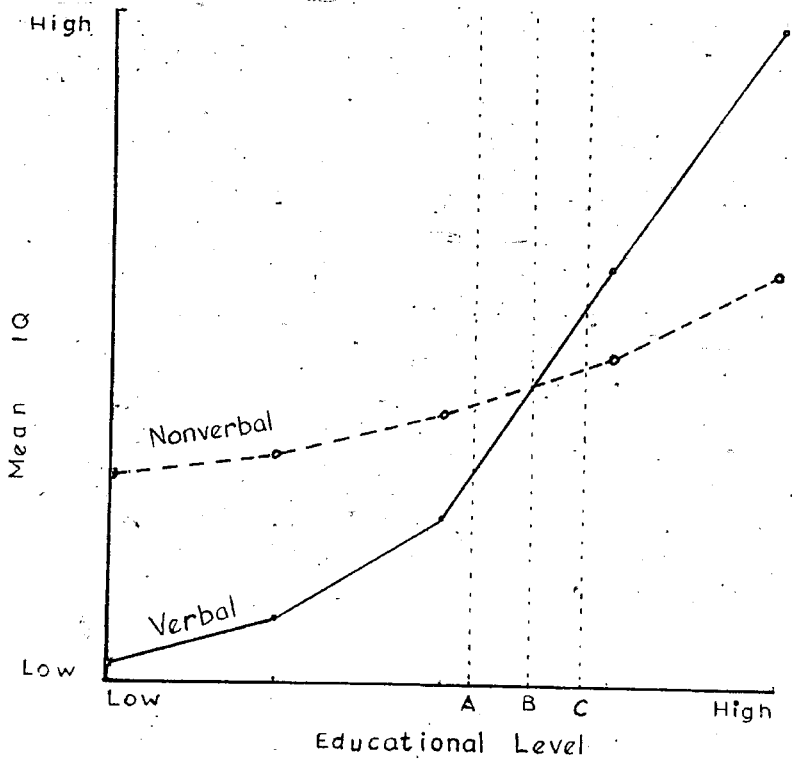


Fig. 1 Predicted pattern of growth for verbal and nonverbal IQs.

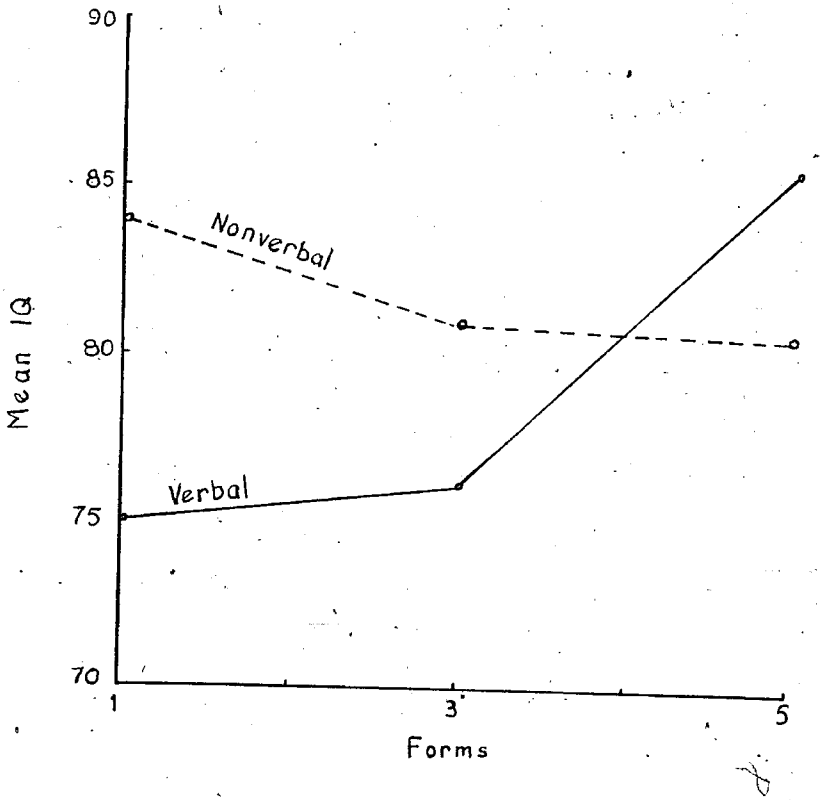


Fig. 2 Empirical pattern of growth for verbal and nonverbal IQs in IBHS.

School as a typical example. The verbal curve has a positive slope; while the nonverbal curve has a negative slope.

It may be concluded therefore that, in comparison with the norm sample, the verbal handicap of the bilingual children decreases with their level of education, while their handicap on nonverbal tests tends to increase or remain constant.

Pattern for Mean Standard Scores

Tables computed by the authors of the Lorge-Thorndike Intelligence Tests allow the conversion of raw scores at any test level into standard scores on a continuous scale which makes possible the comparison of performance at different age or grade levels. Thus, standard scores at different educational levels can be arranged to show growth from a common base.

Table 7 and Table 8 show the mean standard scores for the various forms on the verbal and nonverbal batteries. The mean scores show an increase from the first to the fifth form on both batteries. The rate of increase on the verbal battery is however greater than that on the nonverbal.

Table 9 shows the mean ages of the samples in the different forms. Using the mean ages in the first, third and fifth forms in Ibadan Boys High School and Loyola College, as bases, corresponding standard scores for the norm samples were read off from the tables provided by the test authors. The resulting standard scores are shown in Table 10 and Table 11. The tables show that verbal and nonverbal scores increase at about the same rate for the norm sample.

Table 7

Mean Verbal Standard Scores in Forms 1, 3, and 5 in Four Schools, Arranged to Show Growth from a Common Base

Schools	Form 1	Form 3	Form 5	D[a]
IBHS	459 (59)	509 (60)	571 (40)	112
IGS	463 (32)	x[b]	602 (56)	139
LCI	471 (64)	525 (63)	594 (37)	123
GCI	x[b]	561 (70)	644 (35)	83

[a] D is the gain in standard scores between the lowest and the highest form.

[b] x = no data collected for this class.

Note. The numbers in parentheses represent the values of N.

Table 8

Mean Nonverbal Standard Scores in Forms 1, 3, and 5 in Four Schools, Arranged to Show Growth from a Common Base

Schools	Form 1	Form 3	Form 5	D[a]
IBHS	489	515	540	51
	(59)	(60)	(40)	
IGS	497	x[b]	575	78
	(32)		(56)	
LCI	506	543	570	64
	(64)	(63)	(37)	
GCI	x[b]	580	595	15
		(70)	(35)	

[a] D is the gain in standard scores between the lowest and the highest form.

[b] x = no data collected for this class.

Note. The numbers in parentheses are the values of N.

Table 9

Mean Age in Forms 1, 3, and 5 in Four Schools

Schools	Form 1		Form 3		Form 5	
	Mean	SD	Mean	SD	Mean	SD
IBHS	14-5 (59)	1-2	16-7 (60)	1-2	18-7 (40)	1-3
IGS	13-9 (32)	0-11	x[a]		17-11 (56)	1-0
LCI	13-9 (64)	0-9	15-5 (63)	0-11	17-5 (37)	0-9
GCI	x[a]		15-4 (70)	1-1	17-6 (35)	0-9

[a] x = no data collected for this form.

Note. 1. The number before the hyphen represents years and the number after the hyphen represents months. Thus 14-5 means 14 years and 5 months.

2. The numbers in parentheses are values of N.

Table 10

Verbal and Nonverbal Standard Scores for Norm Samples with Ages Corresponding to the Mean Ages of the IBHS Sample

	Test Level and Age			
Test	Level C 14-5	Level E 16-7	Level G 18-7	D[a]
Verbal	576	619	652	76
Nonverbal	571	611	645	74

[a] D is the gain in standard scores between the lowest and the highest age.

Table 11

Verbal and Nonverbal Standard Scores for Norm Samples with Ages Corresponding to the Mean Ages of the LCI Sample

	Test Level and Age			
Test	Level C 13-0	Level E 15-5	Level G 17-5	D[a]
Verbal	544	600	637	93
Nonverbal	536	595	628	92

[a] D is the gain in standard scores between the lowest and the highest age.

In Figure 3, the verbal and nonverbal curves corresponding to thr standard scores have been plotted for the Ibadan Boys High School sample and the comparable norm-sample. The graph shows that the two verbal curves are converging with increasing age; while the nonverbal curves are diverging. These results are in agreement with the pattern of growth for the mean IQs. The convergence of the verbal curves indicates decreasing handicap; while the divergence of the nonverbal curves indicates increasing handicap.

Correlations of IQs with School Marks

School marks were available in nine forms. The numbers of students who took the same set of subjects in the fifth forms were small, however, because in the fifth form students take only those subjects which they intend to offer for the West African School Certificate examination. Correlations between the composite school marks and the verbal, nonverbal, and combined IQs are shown in Table 12. The mean correlations over the nine forms were: .27 for verbal, .27 for nonverbal, and .30 for combined IQs. Thus, both verbal and nonverbal test scores correlate with school marks to the same extent. These results do not support hypothesis 2.

It is noteworthy that correlations between school marks and the intelligence test scores in the Nigerian schools are low compared with the values usually obtained in the United States.

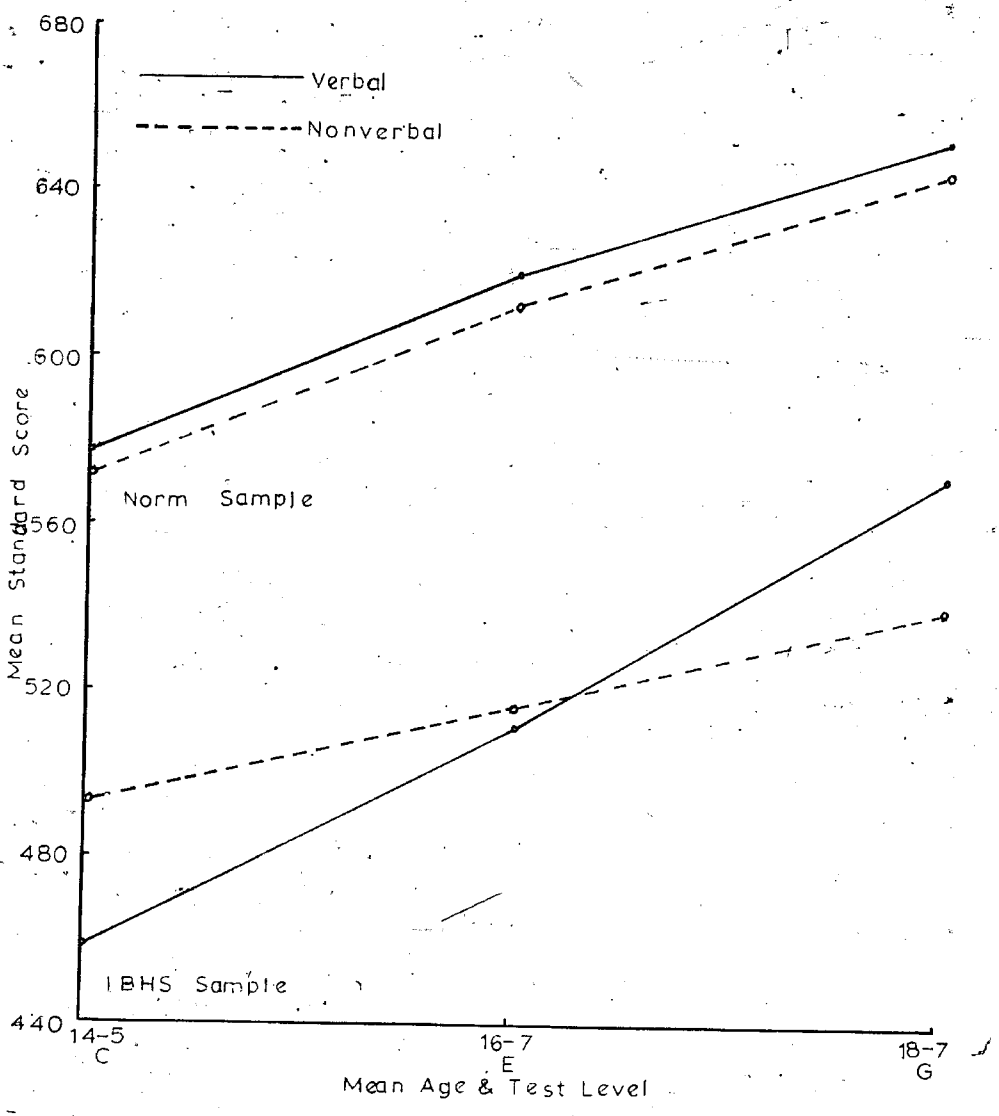


Fig. 3 Verbal and nonverbal growth from a common base for Norm and IBHS samples.

Table 12

Correlation of School Marks in Nine Forms with Verbal, Nonverbal, and Combined IQs

Forms	Verbal	Nonverbal	Combined	$r_{v,nv}$[a]
IBHS 1 (N=51)	.20	.29*	.29*	.55*
IBHS 3 (N=35)	.42*	.42*	.36*	.72*
IBHS 5 (N=17)	.21	-.21	.00	.29
LCI 1 (N=64)	.08	.25*	.21*	.49*
LCI 3 (N=57)	.32*	.32*	.35*	.60*
LCI 5A (N=16)	.25	.32	.33	.49*
LCI 5B (N=17)	.25	.33	.36	.32
IGS 1 (N=28)	.62*	.55*	.62*	.72*
GCI 3 (N=57)	.08	.23*	.19	.42*

[a] $r_{v,nv}$ is the correlation between verbal and nonverbal IQs.

* Significantly different from zero.

Note. $r_{v,nv}$ for the entire sample = .66

Studies reported in the technical manual[1] of the earlier edition of the Lorge-Thorndike tests give correlations between school grades and verbal scores ranging from .52 to .76, and between school grades and nonverbal scores ranging from .39 to .56.

Unhypothesized Results

Further analysis of the data revealed additional information which, while not hypothesized or rigorously tested, is nevertheless interesting and may be useful for future research.

Correlations of IQs with Individual School Subjects

Table 13 gives mean correlations of various school subjects with verbal, nonverbal, and combined IQs. The values reported suggest that the verbal tests show their highest correlations with literary subjects such as English language, English literature, History, and Geography. The nonverbal battery on the other hand, shows its highest correlations with Mathematics and the Science subjects. The combined intelligence test score shows a more even distribution of correlations over all school subjects than the verbal or nonverbal taken separately.

Correlation between Verbal and Nonverbal Scores

Table 12 shows the correlations between the two batteries in

---

[1] I. Lorge & R. L. Thorndike, The Lorge-Thorndike Intelligence Tests technical manual. (revised ed.) Boston: Houghton Mifflin, 1962.

Table 13

Mean Correlations of Various School Subjects with Verbal, Nonverbal and Combined IQ Scores

Subjects	No. of Forms	Verbal	Nonverbal	Combined
English Lit.	4	.37	.18	.29
English Lang.	9	.32	.20	.29
History	9	.23	.17	.21
Geography	5	.20	.20	.22
Religion	7	.14	.10	.13
Latin	4	-.02	.10	.05
French	3	.15	.24	.23
Yoruba	3	.18	.17	.18
Art	3	-.05	.17	.10
Biology	6	.12	.14	.14
Gen. Science	3	.30	.28	.32
Mathematics	9	.08	.25	.20
Physics	4	.23	.26	.27
Chemistry	5	.16	.26	.21
Agriculture	2	.17	.29	.16
Music	1	.15	.21	.21
Workshop	1	.07	.45	.33
Nature Study	1	.10	.34	.27
Health Science	1	-.09	.02	-.04

the various forms. The values obtained are somewhat lower than those reported for United States samples in the technical manual[1] of the earlier edition of the Lorge-Thorndike tests. The small numbers used in the present study must, however, be noted. The correlation for the entire sample is .66, which is close to values obtained with United States samples.

Variability of Verbal and Nonverbal IQs

The standard deviations of the IQs for the Norm sample is 16. The standard deviations for the Nigerian sample are considerably lower. Seven of the ten verbal standard deviations lie between six and nine while seven of the ten nonverbal standard deviations lie between nine and 13. (See Table 3).

The smaller variability in the Nigerian sample is probably due to the fact that students are selected into the secondary schools by entrance examinations. The secondary school population in Nigeria is therefore more homogeneous than the secondary school population in the United States. Further, the smaller variability in the verbal IQs as compared with the nonverbal is probably due to the fact that the entrance examinations to the secondary schools are essentially verbal in nature.

There is another possible explanation. In the Nigerian culture, performance on a test given in English depends much more

---

[1] I. Lorge & R. L. Thorndike, The Lorge-Thorndike Intelligence Tests technical manual. (revised ed.) Boston: Houghton Mifflin, 1962.

exclusively on the school experience and much less on the general home and cultural environment, than is the case in the United States. Since this school environment is relatively uniform for all the students, the variability of IQ may be expected to be small. The fact that the variability on the nonverbal test is greater than on the verbal test may be due to the fact that performance on verbal tests depends more on school environment than does performance on nonverbal tests.

Effect of other Background Variables

Tables 14-18 report the effects of the five background variables investigated. Only father's education (Table 16) and father's occupation (Table 18) show effects which are statistically significant. Children from more educated homes tended to score higher than children from less educated homes. Similarly, children of professional men, teachers and civil servants tended to score higher than children of traders and skilled workers. The lowest scores were made by the children of farmers.

It should be noted that the correlation between father's education and father's occupation, as classified in this study, is .66. As has been found out in other cultures, both education and occupation of fathers are indices of socioeconomic status.

Further inspection of the tables show that the effects of the background variables tend to be less on nonverbal scores than on verbal although the effects are generally in the same direction.

Table 14

Mean Verbal and Nonverbal IQs for Boarders and Dayboys

	Boarders (N=40)		Dayboys (N=40)		
Kind of Test	Mean	SD	Mean	SD	t
Verbal	81.03	9.46	78.5	10.88	1.099
Nonverbal	88.93	14.26	84.1	14.10	1.520

Table 15

Mean Verbal and Nonverbal IQs of Boys from Urban and Rural Background

	Urban (N=42)		Rural (N=42)		
Kind of Test	Mean	SD	Mean	SD	t
Verbal	84.05	9.69	82.19	10.28	.823
Nonverbal	89.93	13.45	90.93	15.17	.307

Table 16

Mean Verbal and Nonverbal IQs according to Father's Education

	Above Elem. (N=40)		Elem. or Lower (N=40)		
Test	Mean	SD	Mean	SD	t
Verbal	82.0	8.51	76.75	8.61	2.645**
Nonverbal	88.2	15.01	82.83	11.75	1.770

** Significant at .01 level

Table 17

Mean Verbal and Nonverbal IQs according to Mother's Education

	Above Elem. (N=40)		Elem. or Lower (N=40)		
Test	Mean	SD	Mean	SD	t
Verbal	95.35	10.95	92.43	10.54	1.188
Nonverbal	95.93	14.13	93.8	13.32	.702

Table 18

Mean Verbal and Nonverbal IQs according to Father's Occupation

Test	Prof. Teach[a] C.S. (N=48) Mean	SD	Trader Skilled (N=48) Mean	SD	Farmer (N=48) Mean	SD	F(2,141)
Verbal	85.19	12.23	81.98	7.98	79.17	9.75	4.766**
Nonverbal	88.27	12.13	86.50	9.35	83.42	12.78	2.128

[a] Professionals, Teachers, Civil Servants.

** Significant at .01 level

CHAPTER IV

DISCUSSION

The most outstanding finding of the present study is the consistent pattern obtained from school to school when verbal and nonverbal scores of the bilingual students are compared at different educational levels. Also important is the growth pattern for scores in each battery considered separately, since it was the combination of these individual patterns that yielded the overall pattern. One important question needs to be answered: what factor or factors determined the growth pattern for the scores on the individual batteries?

Possible Factors in Growth Pattern

At least two factors could have determined the pattern of growth of the IQs with educational level. They are (1) education and (2) selection.

Education

The basic assumption underlying hypothesis 1a, 1b, and 1c may be summarized as follows. Bilingual students in the cultural environment of their first language are handicapped on both verbal and nonverbal tests. Education in the schools progressively removes the major handicap on the verbal tests, i.e. the language handicap. Education also reduces some of the handicap on the nonverbal tests; but not to the same extent as on the verbal tests.

The empirical results call for a modification of the last assumption. In order to reduce a handicap, the growth within the bilingual sample has to be more rapid than that within the norming sample. An increase in handicap such as seemed to be found in this study implies that ability to cope with the nonverbal items is increasing less rapidly among the Nigerian sample than among the norm sample. This interpretation is in agreement with Figure 3. Apparently, the source of handicap on nonverbal tests is much less a function of school education than actual exposure to the cultural environment. Therefore, the more exposure the norm samples have had to the American environment, the bigger the difference between them and their Nigerian counterparts in nonverbal ability, as measured by tests developed in the American culture, becomes.

With this modification in the last assumption, the factor of education would satisfactorily explain the change in pattern from lower to higher forms.

Selection

Since the study was cross sectional rather than longitudinal, the progressive selection and drop out rate within the schools would influence mean test performance within the school. The less able students are usually the ones selected out; therefore progressive selection within the school could account for higher mean IQs in the upper forms. In particular, the verbal curve rises most rapidly and the nonverbal curve falls least rapidly between the

third and fifth forms (Figure 2), a situation which would be predicted by the fact that the most rigorous selection usually takes place between the third and fifth forms in the Nigerian schools. The selection factor alone, however, would not satisfactorily explain the fact that one curve has a positive slope while the other has a negative slope. It must also be remembered that in Nigeria, as in the United States, progressive selection is based largely on the same kind of criteria; mainly, ability to cope with verbally oriented school subjects. Consequently, the selection factor is operating within the norm sample as well as within the Nigerian sample. Further, in Nigeria as well as in the United States, verbal and nonverbal IQs have significant positive correlations with each other; therefore, there is no reason to expect that the students who get to the top forms are those who have high verbal but low nonverbal ability.

Another kind of selection that could influence the growth patterns is that due to the secondary school entrance examinations. The basic mental ability of students selected from one year to the other may vary. Thus, the students admitted in five consecutive years may be progressively more intelligent or vice versa. As in the case of progressive selection within the school, however, this selection at entrance would not satisfactorily explain the opposite trends in the growth pattern for verbal and nonverbal IQs.

Undoubtedly, both education and selection contributed to the results, but the educational factor is probably dominant.

Intelligence Test Scores and School Marks

The generally low correlations of both tests with school marks could be due to various reasons. The criteria in school marks in the Nigerian schools may be different from those in the United States. Examinations in the Nigerian schools are generally of the essay type; there is therefore probably more subjectivity in the school marks than would normally be found in the United States. Secondly, the unfamiliarity of the Nigerian students with the kind of testing procedure used for the Lorge-Thorndike tests, and various other cultural handicaps such as differences between American and British English, may have introduced additional sources of error into the intelligence test scores. Thirdly, the low correlations may be a function of the very small variability of IQs in the Nigerian sample.

The fact that the two batteries correlate to the same extent with school marks in the present study is particularly surprising. Considering the crucial role of English as a medium of instruction in the Nigerian schools, one would expect that the chances of a higher correlation between the verbal test and school marks should be even greater in the Nigerian schools than in the United States schools. Further studies are needed to identify the factors leading to the unexpected results. It is possible that the same factors responsible for the low correlations discussed in the preceding paragraph may be partially responsible here also.

On the question of which battery is preferable for use in the Nigerian schools, no firm statement can be made on the basis of this study. The correlations with school marks indicate that there is little to choose between the two.

With respect to the matching of samples from Nigeria with samples from the United States, the verbal tests are likely to be less biased against the Nigerians in the higher forms than the non-verbal tests. At the lower forms, the reverse would be the case.

Limitations of Conclusions

The sample in the current study has a particular kind of bilingualism which differs from the kinds found in other countries like the United States and the United Kingdom, with respect to the larger cultural environment. As pointed out earlier, the larger cultural environment of the Nigerians is that of their first language, while bilingual samples in the United States, for example, live in the larger cultural environment of their second language.

The schools used for this study are in a very urban environment, Ibadan being the largest city in Nigeria. The majority of the sample also had an urban background in their elementary school days. The generalizability of the results to the whole country is therefore limited.

Relationship to Past Studies

Regarding performance on verbal and nonverbal tests, the findings

for the first and third forms in the present study are in agreement with the majority of findings in past studies of the same kind. There are two important differences between this study and previous ones. In the first place, the samples for this study have been drawn from higher educational levels than in previous studies. Most previous researchers worked with elementary school children. It is conceivable that results similar to that obtained in the fifth form in this study might have been obtained in previous studies had higher grades been tested. However, if as postulated earlier in this chapter, growth in nonverbal performance is largely a function of exposure to the cultural environment of the second language, the complete reversal of pattern as found in this study is unlikely if the bilingual children live in the environment of their second language. The results of Kittell's[1] study, for example, showed that growth of the bilingual students in nonverbal ability was the same as for the monolingual students.

Secondly, the present study emphasized the developmental approach by investigating progressive changes from one form to the other, instead of treating the sample as one unit. Of all the previous studies, only Kittell's emphasized this approach.

With respect to correlation of school marks with intelligence test scores, the results of the present study show a departure from

---

[1] J. E. Kittell, Intelligence test performance of children from bilingual environments. Elem. Sch. J., Nov. 1963, 64, 76-83.

previous studies.

Suggestions for Future Studies

A repetition of this study longitudinally would control for the factors of selection and some of the other background variables. It would be informative to see if the pattern established by the present study is also obtained.

Similar studies among children with other kinds of bilingualism are needed to determine whether the larger cultural environment does in fact influence the pattern of performance.

Carefully controlled studies need to be carried out to identify factors responsible for the low correlations of the intelligence scores with school marks in this study, and the fact that both types of test correlated to the same extent with school marks.

CHAPTER V

SUMMARY

Studies concerning the performance of bilingual children on intelligence tests standardized in the environment of their second language have in general yielded two kinds of results. Most studies have indicated that bilingual children make better scores on nonverbal tests than on verbal tests. A few studies, mainly those using Jewish samples show that the bilingual children do equally well on both kinds of tests. On the basis of these findings some researchers have recommended the use of nonverbal rather than verbal tests for the educational guidance of bilingual children.

As a background for the present study, it was noted that the bilingual samples used for most of the reported studies lived in the cultural environment of their second language. It was reasoned that for bilingual samples who lived in the cultural environment of their first language, nonverbal tests also contain elements which constitute handicaps. It was further reasoned that at lower levels of education, the language handicap on verbal tests outweighs the handicap on nonverbal tests. However, schooling reduces the language handicap more rapidly than it reduces handicaps on nonverbal tests; therefore at higher levels of education, the bilingual children may actually perform better on verbal than nonverbal tests.

It was also reasoned that the more useful test for educational guidance in such bilingual schools would be the one that correlated

better with school marks.

The study was therefore designed to test the following hypotheses.

1a. The type of intelligence test on which performance is better depends on educational level.

1b. Mean verbal as well as nonverbal IQs increase from the lowest grade to the highest.

1c. Mean verbal IQs increase more rapidly than mean nonverbal IQs from the lowest to the highest grade.

2. Verbal intelligence scores correlate higher with school marks than do nonverbal intelligence scores.

The sample consisted of native Nigerian secondary school boys in forms 1, 3, and 5 from four schools in Ibadan. Nigerian languages; mainly Yoruba, are their first languages, and English is their second. The larger cultural environment is Nigerian.

The verbal and nonverbal batteries of the multilevel edition of the Lorge-Thorndike tests were administered to the boys. Level C was administered to form 1, Level E to form 3, and Level G to form 5.

School marks in the preceding terminal examinations were collected for the sample. Also, information on five background variables; boarder-dayboy status, urban-rural background, father's education, mother's education, and father's occupation were collected by means of a questionaire.

The pattern of performance in the intelligence tests was the same in all four schools. In forms 1 and 3, mean nonverbal IQs were significantly higher than mean verbal IQs. In form 5, the reverse was true.

Mean verbal IQs increased significantly from first to fifth form. Mean nonverbal IQs showed a nonsignificant decrease. Mean standard scores showed a progressive increase for both batteries, but verbal scores showed the greater increase.

Verbal and nonverbal intelligence scores correlated to the same extent with school marks.

Of the background variables, only father's education and father's occupation were significantly related to test performance, and the correlation between the two variables was .66. The effect of the background variables tended to be greater on verbal than nonverbal scores, although the effects were generally in the same direction.

It was concluded that, while education reduced handicap on verbal tests, it probably did not reduce handicaps on nonverbal tests. Selection at entrance, and progressive selection in schools may also have affected the results. The study does not provide enough evidence to indicate superiority of one kind of test over the other with respect to educational guidance.

BIBLIOGRAPHY

Adjutant General's Office, The Army Classification Tests. Psychol. Bull., 1945, 42, 760-768.

Anastasi, Anne. Differential psychology. (3rd ed.) New York: Macmillan, 1963.

Anastasi, Anne, & Cordova, F. A. Some effects of bilingualism upon the intelligence test performance of Puerto Rican children in New York City. J. educ. Psychol., 1953, 44, 1-19.

Arsenian, S. Bilingualism and mental development. Teach. Coll. Contr. Educ., 1937, No. 712.

Arsenian, S. Bilingualism in the post-war world. Psychol. Bull., 1945, 42, 68-86.

Arthur, Grace. The predictive value of the Kuhlmann-Binet Scale for a partially Americanized school population. J. appl. Psychol., 1937, 21, 359-364.

Barke, Ethel M. A study of comparative intelligence in certain bilingual and monoglot schools in South Wales. Brit. J. educ. Psychol., 1933, 3, 237-250.

Coffman, W. E. Evidence of cultural factors in responses of African students to items in an American test of scholastic aptitude. Research memorandum, (RM-63-6) Princeton: Educational Testing Service, July 1963.

Darcy, Natalie T. The effect of bilingualism upon the measurement of the intelligence of children of preschool age. J. educ. Psychol., 1946, 37, 21-44.

Darcy, Natalie T. The performance of bilingual Puerto Rican children on verbal and nonlanguage tests of intelligence. J. educ. Res., 1952, 45, 499-506.

Darcy, Natalie T. Review of literature on the effects of bilingualism upon the measurement of intelligence. Pedag. Sem., 1953, 82, 21-57.

Gates, A. I. The correlation of achievement in school subjects with intelligence tests and other variables. J. educ. Psychol., 1922, 13, 129-139; 223-235; 277-285.

Goodman, S. M. et al. Puerto Rican Study research report. Board of education City of New York, 1959.

Havighurst, R. J., & Hilkevitch, R. R. The intelligence of Indian children as measured by a performance scale. J. abnorm. soc. Psychol., 1944, 39, 419-433.

Hoffman, M. N. The measurement of bilingual background. New York: Bureau of publications, Teachers College, Columbia Univ., 1934.

Hudson, W. Pictorial depth perception in subcultural groups in Africa. J. soc. Psychol., 1960, 52, 183-208.

Huxley, J. Africa view. London: Chatto & Windus, 1936.

Jamieson, E., & Sandiford, P. The mental capacity of Southern Ontario Indians. J. educ. Psychol., 1928, 19, 313-328.

Jones, W. R. The language handicap of Welsh-speaking children. Brit. J. educ. Psychol., 1952, 22, 114-123.

Kittell, J. E. Intelligence test performance of children from bilingual environments. Elem. Sch. J., Nov. 1963, 64, 76-83.

Levinson, B. M. Comparative study of the verbal and performance ability of monolingual and bilingual native born Jewish preschool children of traditional parentage. J. genet. Psychol., Sept. 1960, 97, 93-112.

Lorge, I. Schooling Makes a difference. Teach. Coll. Rec., 1945, 46, 483-492.

Lorge, I., & Thorndike, R. L. The Lorge-Thorndike Intelligence Tests technical manual. Boston: Houghton Mifflin, 1962.

Lorge, I., Thorndike, R. L., & Hagen, Elizabeth. Manual for administration, The Lorge-Thorndike Intelligence Tests. (multilevel ed.) Boston: Houghton Mifflin, 1964.

MacArthur, R. S., & Elley, W. B. The reduction of socioeconomic bias in intelligence testing. Brit. J. educ. Psychol., 1963, 33, 107-119.

McKillop, Anne, & Yoloye, E. A. The reading of university students. Teach. Educ., Nov. 1962, 3, 93-107.

Murdoch, K. A., Maddow, D., & Berg, N. L. A study of the relation between intelligence and the acquisition of English. Yearb. nat. Soc. Stud. Educ., 1928, Part II, 343-353.

Pintner, R. Comparison of American and foreign children on intelligence tests. J. educ. Psychol., 1923, 14, 292-295.

Pintner, R. The influence of language background on intelligence tests. J. soc. Psychol., 1932, 3, 235-240.

Pintner, R., & Arsenian, S. The relation of bilingualism to verbal intelligence and school adjustment. J. educ. Res., 1937, 31, 255-263.

Sanchez, I. Scores of Spanish-speaking children on repeated tests. Pedag. Sem. & J. genet. Psychol., 1932, 40, 223-231.

Seidl, J. C. The effect of bilingualism on the measurement of intelligence. Unpublished Ph. D. thesis, New York: Fordham Univ., 1937.

Singer, H. Bilingualism and elementary education. Mod. Lang. J., 1956, 40, 448-458.

Sniffen, A. M. A correlational study of group intelligence tests with achievement in Reading and Arithmetic in grade 4. Unpublished doctoral dissertation, New York Univ., 1963.

Tireman, L. S. Bilingual children. Rev. educ. Res., 1941, 11, 340-352; 1944, 14, 273-278.

APPENDIX

Background Questionaire

(PLEASE PRINT ALL INFORMATION IN CAPITAL LETTERS.)

1. Name _____ (last) (first) (middle)

2. Form _____

3. Boarder _____ or Dayboy _____

(Put an X in the box after the appropriate status.)

4. Present School _____

5. Elementary Schools attended:

School	Town	Province	No. of Years

6. Secondary Schools attended:

School	Town	Province	No. of Years

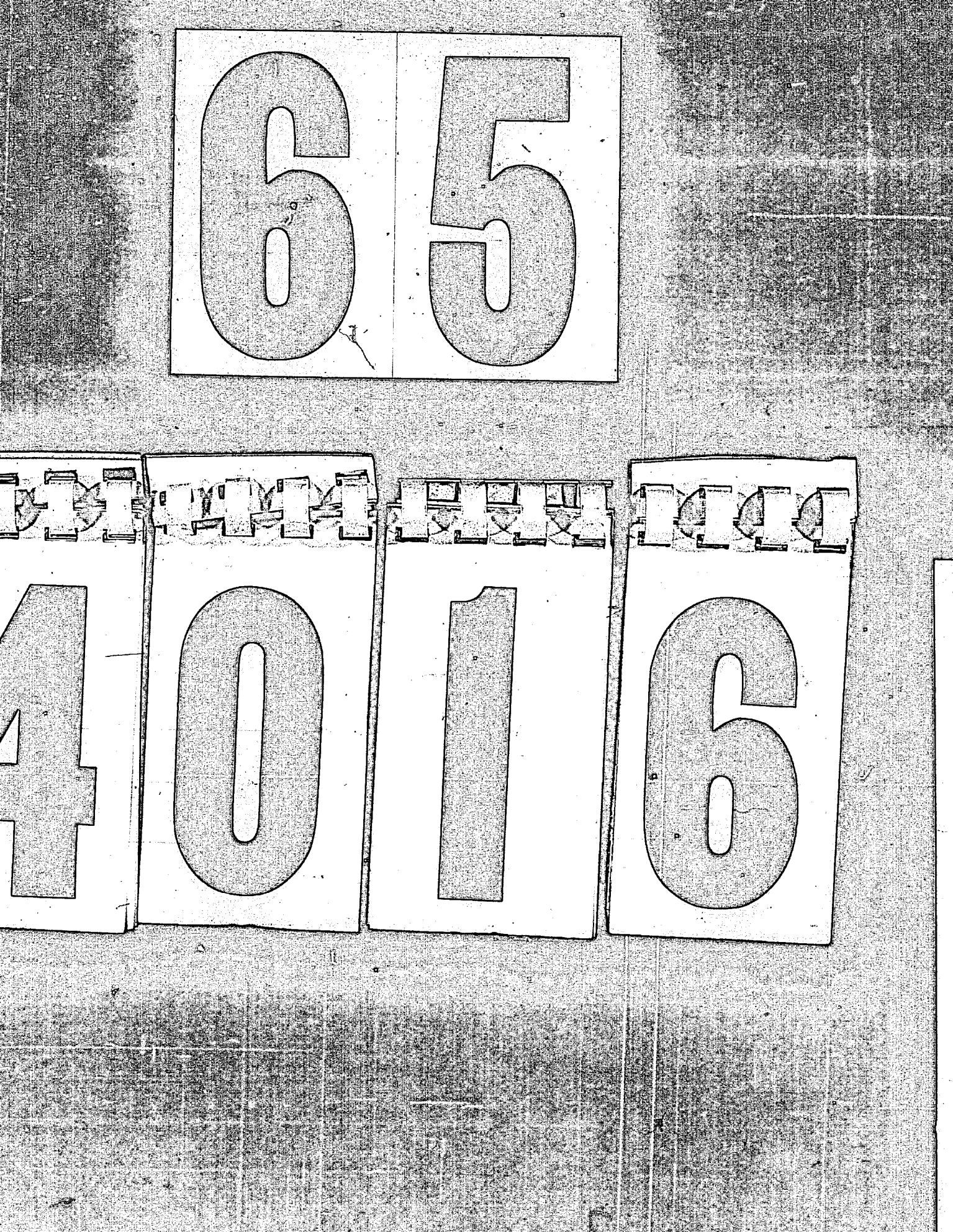
7. Father's Occupation _____

8. Mother's Occupation _____

9. Educational Level of parents:

	No schooling	Elementary school	Higher than Elem. Schl. but not Graduate	University Graduate
Father				
Mother				

(put an x in the appropriate box)


65
4016