AN INVESTIGATION INTO THE PERFORMANCE OF A GROUP OF DURBAN INDIAN SCHOOL CHILDREN ON THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN

BY

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ABSTRACT

Interest in this research was stimulated as a result of analysing performance of a group of Durban Indian school children, referred to the Durban Child Guidance Clinic as possible cases for remedial education, on A.E. Maxwell's abbreviated form of the Wechsler Intelligence Scale for Children (WISC). The research describes results of applying the full WISC to a carefully selected group of 72 Durban Indian school children in upper junior school levels, and its aims, besides general description of the results of the group and of subgroups, were to investigate Verbal and Performance scale results of the group more fully and to determine whether the abbreviated WISC in question possessed satisfactory validity for the group tested.

The experimental group was found to perform significantly better on the Verbal than on the Performance scale of the WISC, in agreement with results of analysing abbreviated WISC profiles of the Durban Clinic sample, and also in agreement with results of research in which modified Wechsler tests had been applied to youngsters in India. Relative to Performance ability, Verbal ability appeared a more integrated dimension of intellect for the present Indian group. Possible reasons for the WISC pattern obtained were sought within the literature and it was felt that the result could be ascribed largely to cultural background factors. Evidence also suggested the applicability of the WISC to the sample studied, and it was felt to be a suitable scale for the measurement of Indian intelligence, at least in the interim before an individual scale standardised for South African Indian children is devised.

Abbreviated WISC results of the group, derived by means of Maxwell's method, were examined, and there was reason to believe that as far as validity was concerned, there was room for improvement. Alternative abbreviated forms of the WISC, with possible usefulness for Indian children of similar background to the present sample, were accordingly suggested for further research.

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I. INTRODUCTION

The Wechsler Intelligence Scale for Children (WISC,1949) is specifically intended for the measurement of the intelligence of white American children. It has proved a popular test, and Burstein (1965) feels one index of its success to be the number of derivatives in the form of abbreviated scales and foreign language versions to which it has given rise.

The WISC has been applied, either as it stands or in modified and/or translated versions, to groups of children differing widely in background from the test standardisation sample, most frequently either to evaluate the functioning of groups for which no other scale is available, or to assess the test's applicability to the group in question. In the former case, a study of literature reveals that the focus of interest has not been so much upon whether these groups differ from the normative sample in measured intelligence, but on aspects in which they differ. Verbal and Performance scale measures are often employed to describe the performance of such groups, as is the difference between these - the Verbal - Performance discrepancy.

The present writer became interested in the performance of Indian children on the WISC by way of one of its derivatives - A.E. Maxwell's abbreviated or shortened version. This has been one of the instruments administered to Indian children referred to the Non-European section of the Durban Child Guidance Clinic[1] as possible candidates for remedial education, the form being used only when a rough guide to intellectual level is required. Mrs. L.E. Cumming, director of the Durban Clinic, drew the writer's attention to the trend of results of such examinations - there was a tendency, often marked, for Verbal IQ to exceed Performance IQ, this being more noticeable in the case of girls than of boys examined. Mrs. Cumming suggested that the difference be statistically examined, and that, if these results proved of interest, the writer should consider applying the full (unabbreviated) WISC to a more representative group of Indian children to see if trends observed on the shortened version would be replicated when the full test was applied.

The analysis was performed[2] and it was found that the resulting

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1 Hereafter to be referred to as the Durban Clinic.

2 Details and results of the analysis appear in III (A).

significant discrepancy was largely the result of scores of girls tested. Since the sex groups had been poorly matched, since an abbreviated WISC was applied, and since the group had been atypical in that all subjects suffered from scholastic backwardness, it was decided to apply the full WISC to a carefully chosen sample of Indian children in order to ascertain the pattern of results. The purpose of this research will now be outlined.

PURPOSE OF THE STUDY

The general purpose of the present study was to investigate and describe the performance of a group of Durban Indian schoolchildren on the WISC. While overall results were to be reported, certain aspects of performance were to receive special attention. These were:

a. The Verbal-Performance discrepancy scores of the group and of sub-groups divided by sex and according to the distribution of normals (non-failing subjects) and retards (those for whom scholastic backwardness had assumed such proportions that failure had resulted) actually found in the standards from which children were to be drawn.

b. Factor analysis of WISC scores of the group was to be undertaken in order to ascertain whether or not division of subtests into Verbal and Performance groups was statistically justified for the experimental group.

c. The applicability of Maxwell's short form of the WISC for the experimental group was to be studied. If found unsuitable, alternative short forms were to be suggested.

LIMITATIONS OF THE STUDY

It will later be indicated that the experimental group used was not large and that it was representative of only one section of the Durban Indian community. "Limiting" the group was carried out in order to control numerous extraneous variables which might have influenced results, but it does have the effect of rendering the present results of acceptance only with groups similar to the sample used.

A RATIONALE FOR THE RESEARCH

Is there theoretical justification for administering a test standardised for a specific culture to members of another cultural group? This will depend on interpretation of results obtained. If these are used to suggest innate, unalterable inferiority of the "deviant" group, such usage of tests is highly questionable while environmental sources of variation are barely defined let

alone capable of control.[1]

Hebb (1949) and Vernon (1965) are among those who suggest, however, that there is a sense in which it is legitimate to assess the intelligence of groups which, while deviating from populations for which tests were standardised, are still aspiring to "Western type" intelligence, with "Western" tests. These groups will have to be assessed (for job placement, for example) in terms of the norm of the dominant culture. Is the South African Indian aspiring towards "Western type" intelligence? The Indian people are a heterogeneous group and there is, as Logue (1956) points out, no one Indian outlook. The following observation, cited by Hey (1961, p.1) perhaps expresses the opinion of a number of the people, however:

> " 'Only in Education, and in South Africa, in the context of White man's Education .... can you really make headway in a White man's world. '
>
> Indian Lawyer."

Indian school children follow essentially the same educational syllabuses as Europeans, and write the same Senior Certificate examinations. Final scholastic assessment is therefore made with reference to the same standard. It therefore appears not out of place to assess Indian intelligence by means of a test which is used to assess intelligence of Europeans in this country. One does, of course, require information regarding the applicability of the WISC to South African European children, since the test continues in use in spite of the fact that the New South African Individual Scale (1964 has been released. At the time of writing, only the Wechsler-Bellvue had been standardised for Europeans in this country (Liddicoat and Roberts,1962) and several changes in the original form were found to be necessary. One might go even further and ask just how applicable the WISC, standardised as it was two decades ago, is to present day American youngsters.

In the writer's opinion, questions such as the above do not detract from the value of the present research. The position to which she adheres is that the WISC and Maxwell's abbreviated version of this have been in use with Indian children in Durban. Because of this, it is in the interests of test users and psychometrists to know more about the functioning of Indian children on the test. This research is offered as a contribution towards such knowledge.

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1 With reference to the situation in Africa, the work, inter alia, of Biesheuvel (1943) and Irvine (1966) with Africans and that of Logue (1956) and Ramphal (1961, 1966) has provided a great deal of information regarding sources of variation affecting test scores of Non-Europeans. Vernon's excellent summaries (1965,1969) are more general in their applicability.

II. SELECTIVE REVIEW OF RELEVANT LITERATURE

This review will focus upon aspects of research with the WISC (and adult Wechsler scales when appropriate) of relevance to the present study. Digressions will, however, be made to include other studies of interest in placing our own results in perspective, particularly with regard to the performance of Indian children on other tests. Main topics of interest in this study are:

A. Verbal and Performance Scales, and possible reasons for discrepancies between these scale results for individuals and for groups

B. Results of factor analyses of the WISC, with particular reference to the question of whether the division of subtests into Verbal and Performance groups is entirely justified on statistical grounds

C. Short forms of the WISC.

A. VERBAL AND PERFORMANCE SCALES OF THE WISC, AND VERBAL-PERFORMANCE DISCREPANCIES

David Weschsler's three[1] intelligence scales - the Wechsler-Bellvue (W-B,1939), the Wechsler Intelligence Scale for Children (WISC, 1949), and the Wechsler Adult Intelligence Scale (WAIS,1956) - yield separate Verbal and Performance IQ's in addition to Full Scale IQ. The subtests which comprise the two scales of the WISC (A downward extension of the W-B, applicable to children aged 5 through 15), follow:

Verbal Subtests	Defining Symbol[2]	Test Meanings[3]
General Information	I	Information from past experience and education.
General Comprehension	C	Practical knowledge and social judgment
Arithmetic	A	Concentration and arithmetic reasoning.
Similarities	S	Logical and abstract thinking ability.
Vocabulary	V	Word knowledge from experience and education.
(Digit Span)	D	Attention and rote memory.
Performance Subtests		
Picture Completion	PC	Visual alertness and visual memory.
Picture Arrangement	PA	Interpretation of social situations.
Block Design	BD	Analysis and formation of abstract desi
Object Assembly	OA	Putting together of concrete forms.
Coding A and B	Co	Speed of learning and writing symbols.
(Mazes)	Ma	Planning and following a visual pattern

(The two tests in parentheses are often omitted or given alternatively should any test in the same subscale prove unsuitable or invalid for any reason)

1 The Wechsler Scale for Infants and Pre-schoolers was released after this section had been written. As we have been unable to study it,no mention of it is made in the text.

2 We follow the convention of designating Verbal subtests by a single letter, and Performance subtests by means of two defining letters. These abbreviations will appear, when convenient, in the text, and in tables.

3 Test meanings are supplied by Wechsler (1951, p.382)

Wechsler (1949) states that division of subtests into Verbal and Performance scales (" as these labels indicate") is only one way of grouping them. Speaking specifically of the adult scales (1958), he does consider this division useful. With reference to the WISC, Glass and Zimmerman (1968, p.5) consider this breakdown an "outstanding characteristic" of the test. Judging from the amount of literature pertaining to Verbal-Performance discrepancies, a number of test users have followed Wechsler in endorsing the usefulness of this division.

Before reviewing studies in which discrepancies of groups have been noted, we shall discuss what is meant by a WISC discrepancy score in the light of Seashore's (1951) analysis of performance of the WISC standardisation sample.

THE MEANING OF A WISC DISCREPANCY SCORE

Seashore (1951) has made a careful analysis of the performance of the WISC standardisation sample in terms of discrepancy scores[1] and this analysis is considered helpful to understanding of the question. Seashore is careful to state that a discrepancy score, for an individu may mean virtually nothing more than that an error of measurement has been involved. For this reason discrepancies must be considered in the light of standard errors of measurement of the scales as reported by Wechsler (1949, p.13). These are given in IQ points for groups of 200 children at each of three age levels as follows:

TABLE I

STANDARD ERRORS OF MEASUREMENT OF THE WISC SCALES

	AGE 7½	AGE 10½	AGE 13½
Verbal Scale	5.19	3.00	3.00
Performance Scale	5.61	4.98	4.74
Full Scale	4.25	3.36	3.68

A child in the 10½ year group obtaining a Verbal IQ of 100 and a Performance IQ of 92 would obtain a discrepancy of + 8 points. Standard errors of measurement are three points for the Verbal scale and approximately five points for the Performance scale. The possibility must be entertained that his Verbal IQ might be as low as 97, and his Performan IQ as high as 97 - in fact he might display no discrepancy whatsoever. On the other hand, his Verbal IQ might be as high as 103, and his Performance IQ as low as 87 - a discrepancy of +16 points, all of which could be accounted for within one standard error of measurement.

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1 For the sake of brevity, we propose to use Seashore's terminology, and to this effect we quote him:
"By a 'discrepancy score' on the WISC we shall mean the numerical difference between a child's Verbal IQ and his Performance IQ. We shall always subtract his Performance IQ from his Verbal IQ. If V > P, the sign is plus; if P > V, the sign is minus." (1951, p.63)

When one takes into account that the normal distribution allows for three standard errors of measurement, and that discrepancy scores were found to be normally distributed at each age level, the problem becomes even more formidable! Seashore says:

" Much as we want to eliminate errors of measurement, we shall have to live with the plus or minus notion for a long time ... Since each of the scores in a pair being compared is subject to error, the possibilities of some found differences not being due to real differences in abilities are great." (1951, p.65)

What of "found differences" within the standardisation sample itself? The WISC was standardised so that, for the normative sample, mean discrepancies were equal to zero. The distribution of discrepancies, however, indicated that these could be quite large without a reason having to be sought. Seashore found that for all eleven age groups of the standardisation sample, mean discrepancies were in fact equal to zero. Standard deviations of discrepancy scores were similar for all age groups and were in the region of 12.5 points of IQ. The distribution of these scores was, at each age level, found to approximate a normal distribution "about as closely as is possible with real data". Thus about two-thirds of the sample (at each age level) showed a discrepancy of less than 13 points, and for the remaining one third, discrepancies were larger and approximately equally distributed in V>P and P>V categories. One would expect, in the light of Seashore's information, that discrepancy scores would range from +37.5 to -37.5 for 99.9 per cent of the sample.

"The data force upon test interpreters a conclusion of practical, everyday importance. While the theoretical average subject has a Verbal IQ equal to his Performance IQ, all the individual Johns, Marys, and Joes who are real and separate clinical cases can be expected to have relatively large differences between their Verbal and Performance IQ's. In fact, equal IQ's will be rare. Furthermore,V will be greater that P about as often as P will be greater than V." (Seashore, 1951, p.64)

Since there were no important age differences in discrepancy scores, Seashore was able to draw up a cumulative percentage table of the 2200 children in the standardisation sample obtaining discrepancy scores (regardless of sign) of increasing magnitude (p.64). This table indicates that only four per cent obtained zero discrepancy scores (the median discrepancy was about eight points) and only one per cent of the group obtained discrepancy scores of 35 points or more.

Seashore feels that in individual cases one must be wary of attaching any unusual meaning to a discrepancy. It may be important, but other information should be available to support this conclusion. For a group, it appears that a test of the significance of the differenc between Verbal and Performance IQ's might well be supplemented by an examination of the distribution of discrepancy scores in the light of Seashore's findings before any suspicion of abnormality of functioning

is entertained.

GROUP DIFFERENCES IN VERBAL AND PERFORMANCE IQ'S

A survey of literature suggests that Verbal-Performance discrepancies may characterise the performance of groups of individuals defined according to certain criteria. Defining characteristics may primarily be divided into two main categories: pathological and non-pathological. It is to the latter category that more attention will be devoted in this review.

PATHOLOGICAL CHARACTERISTICS

It is not proposed to review this aspect of research in any detail as it is with normal children that the present research is concerned, and it is the opinion of many reviewers that other variables must be controlled before a pattern can be ascribed to pathological factors. What is said here will therefore be brief and of a general nature.

The discrepancy score as a possible aid to diagnosis of certain clinical features has enjoyed more popularity as far as the adult scales are concerned than it has with the WISC. Wechsler has suggested and in part had confirmation of the fact that, for specified groups, discrepancies tend to lie in specified directions. He writes as follows:

> "As regards the diagnostic implications of differences between Verbal and Performance ability as a whole, the findings are that in most mental disorders impairment of function is generally greater in the performance than in the verbal sphere. With occasional exceptions, this holds for psychoses of nearly every type, for organic brain disease and to a lesser extent for the psychoneuroses." (1958, p.159)

Discrepancies in the other direction have been observed for adolescent sociopaths and mental defectives (Wechsler, 1944, 1958).

Substantiation of the above patterns has by no means been complete, however, as competent reviews by Rabin (1945), Watson (1946,1953), Rabin and Guertin (1951), Guertin et al (1956), Guertin et al (1962), and Guertin et al (1966), which treat the subject in detail, have pointed out. There appear to be numerous factors which must be taken into consideration before the influence of pathology manifests itself. Watson enumerates some of these:

> "That tremendous overlap between diagnostic groups has been found is not surprising. Many factors are at work which may blur the influence of pathology - the age, sex and intelligence of a patient may serve to blur a pattern....". (1946,p.542)

We would add to this list the influence of cultural background. Machover (1943) appears to have been one of the first to suggest that "... no clinical designation of a particular pattern as indicative of mental pathology is safe without reference to the cultural level of the

subject." (p.84) and subsequent research with the Wechsler tests, to which we shall refer in the following section, has only served to reinforce this caution.

Interest in the Verbal-Performance discrepancy as a "clinical sign" has been transferred to the WISC, presumably because of its similarity to the W-B, and the fact that the tests overlap for the ages 10 through 15. This has been in spite of a caution by Wechsler:

> "The clinical examiner who works with both adults and children is cautioned to avoid assuming that similar materials have the same clinical meaningfulness at all ages or that similar tests tap identical abilities at all ages." (1949, p.2)

Research in which the WISC and the W-B have been compared for the same groups of subjects has been undertaken, inter alia, by Dellatre and Cole (1952), Vanderhorst et al (1953), Knopf et al (1954) and Price and Throne (1955) and these investigators have agreed that while the two instruments may measure intelligence in a similar fashion, pattern analysis cannot usefully be transferred from one instrument to the other thus reinforcing Wechsler's caution.

Two conclusions are drawn from this section. The first is that if one is working with essentially normal subjects who nevertheless deviate from the standardisation sample in specified ways, discrepancies if they occur, should be viewed in the light of these specified factors before recourse is made to consideration of these as indicative of pathology. A second conclusion is that since a pattern on the W-B and on the WISC may not have the same meaning, a review of research should be confined primarily to studies using the WISC. For this reason, W-B studies will be mentioned only if considered appropriate and helpful.

NON-PATHOLOGICAL CHARACTERISTICS

In this section, possible reasons for discrepancies, or, to use Shinagawa's (1963) terms "Verbal dominance" or "Performance dominance" of non-pathological groups will be considered. While it is extremely difficult to define such groups clearly due to overlap of characteristics, it has been decided to classify groups in terms of:

1. Cultural and subcultural background;
2. Level of intellectual achievement;
3. Personality factors; and
4. Sex.

The studies to be reviewed in this section have not all reported <u>significant</u> discrepancies, as in a number of cases this has not been the primary concern of the investigator/s. Our concern here must then, in some cases, be with the <u>trend</u> of results obtained from different groups.

While attention will be focussed upon the main topic of interest (Verbal-Performance discrepancies) reference will also be made to other topics of interest, which we shall want to draw upon in discussing our own results, within this framework.

1. CULTURAL AND SUBCULTURAL BACKGROUND

Indians

The writer has been unable to locate any published research dealing with WISC performance of South African Indians. Performance of Indians in their homeland on revisions of Wechsler 's tests is of interest, although it must be realised that

(a) "Indians" are not a homogeneous group due to the presence of religions, language and caste differences among them, which in turn reflect different origin. (Meston,1963).

(b) The Indian born in Natal may well perform differently from the Indian in the homeland on intelligence tests, his background, schooling and possibly his upbringing having differed.

(c) The studies to be reviewed here have not used the Wechsler tests as they stand, but have incorporated revisions and/or translations.

Interest in the applicability of the WISC to Indian children appears to have arisen fairly recently with the work of Mukherjee (1960) who reported on the applicability of a "try-out" form for a Gujarati-speaking group of 116 children aged 6 through 15. While this study makes no mention of the relation between Verbal and Performance scores, it is of interest in that it illustrates the potentia usefulness of modified WISC scales for Gujarati children. Mukherjee reports that of the 191 WISC items used, "59 were simply modified ... to suit the Gujarati condition, 18 items were newly constructed, and the rest kept identical with the WISC items." (p.118). Item analysis indicated the applicability of the test to the group. Of the 191 items, only 33 were rejected as totally unsuitable, and the subtests Comprehension, Picture Arrangement, Object Assembly,and Mazes, contained no rejected items.

Malin's (1964) report on the standardisation of an adaptation of the WISC for English, Hindi and Marathi speaking children is more informative from our point of view. Two adaptations worthy of note were the complete re-organisation of Vocabulary, and the abdandonment of Picture Arrangement as too culturally biased. The test was given to 20 boys and 30 girls at each of the 11 age levels used by Wechsler, careful attention being paid to the urban/rural distribution. Since we shall want to refer to Malin's results later, we report these here.

TABLE II

WISC MEANS OF MALIN'S INDIAN GROUP

VERBAL SUBTESTS	MEAN	PERFORMANCE SUBTESTS	MEAN
I	12.1	PC	9.97
C	13.2	BD	9.7
A	12.2	OA	7.1
S	11.5	Co	10.5
V	10.9	Ma	9.1
D	11.2		
Group mean (9% above U.S.level)	11.8	Group mean (5% below U.S.level)	9.1
(From Malin,1964,p.130)			

It may be seen that relative to the American standardisation sample, this group performed better on Verbal subtests and in inferior fashion on Performance subtests. Malin considered whether the adaptation had rendered the Indian version too easy, but this was discounted after scores of an American sample on the Indian and conventional WISC's were analysed. Malin states that the Verbal-Performance discrepancy of the Indian group was proved to be a result of environmental factors, but he is not specific regarding what these were.

Of interest, also, are the results of applying modified and translated versions of the adult scales to Indian subjects as has been done by Majumdar (1964), Pasricha and Pagedar (1965), and Kundu (1967).

Majumdar reports work with a Bengali adaptation of the WAIS administered to 225 male adolescents in Calcutta secondary high schools. An interesting result in the same direction as that of Malin was that on the Performance scale the Bengali mean was from 9 to 12 points below the U.S. mean, the discrepancy from the norms on the Full Scale being from 7 to 9 points. Verbal mean scores were slightly above those of the standardisation sample of comparable ages, but by smaller amounts. Majumdar's interpretation (he, again, is not specific) is that: "This may probably be due to the fundamental difference in teaching techniques in school levels. Students in Western countries seem to be more practical minded than their Indian counterparts." (p.13).

An interesting comment is made by Pasricha and Pagedar (1965) who reported on an item analysis following the administration of a Gujarati version of the WAIS to mainly middle class students aged 13 to 17. Translation and adaptation were found to make a difference to difficulty value of some of the items, and analysis of these suggested that cultural factors were involved:

"Items concerned with academic courses and everyday life became easier, while those which required specific knowledge became more difficult for the Gujarati group." (p.17).

Kundu's (1967) report on the application of Bengali adaptations of the W-B and Terman-Merrill (Form M) to 50 university of Calcutta students of each sex is of interest, particularly since he reported results for the sexes separately. Significant differences favouring males were found on Full and Performance scales of the W-B. For both sexes, Verbal IQ exceeded Performance IQ (by 7.6 points for males and 12.3 points for females). Terman-Merrill IQ was found to correlate fairly highly with W-B Verbal and Full Scales, but to a low extent (.24 for females and .31 for males) with the Performance scale. Kundu suggests that general ability may influence the Verbal scale and the Terman-Merrill, whereas specific abilities may largely underlie Performance scale results. This, taken together with the results of Pasricha and Pagedar, suggests that Performance scales of Wechsler tests may be inferior measures of intelligence for Indian adolescents.

From these studies we have the following suggestions:

1. Indian children and adolescents tend to obtain higher Verbal than Performance means on modified Wechsler tests. The only study which has reported sex differences suggests that the discrepancy may be greater in the case of females.

2. Indian groups are not rated in inferior fashion on Verbal sections of the tests employed : it is on the Performance scales that inferiority relative to the U.S. norms is apparent. Since Verbal scales may depend more upon general ability, and Performance scales more upon specific abilities, the latter, even after modification, may be inferior measures of intelligence for Indian youngsters.

3. On the W-B, Kundu's male subjects performed in superior fashion to females on the Full and Performance Scales. Little confidence can be placed in these results, however, for Kundu expresses doubts regardin adequate matching of sex groups. Socio-economic status was not controlled, age was difficult to assess, and female students appeared shy and hesitant, a fact which Kundu feels " probably affected assessment of correct IQ's, at least in some of the cases." (p.115).

The general trend of these results will now be compared with those of investigators who have tested Indian children on other scales and who have made observations of interest relevant to the present research

1. <u>Verbal-Performance Discrepancies</u>. We know of no work in precisely the same area for South African Indians. Ramphal (1961, Project II) has, however, administered the New South African Group Test (NSAGT) yielding Verbal and Non-Verbal IQ's to a carefully selected and

representative group of Durban Indians in standard VI. The mean "discrepancy" proved to be in the opposite direction to that noted for Indians on the Wechsler tests, although the magnitude of the discrepancy (2 points) was felt to be of little importance, and was significant because of the large numbers employed. Ramphal felt that this might reflect weakness in English, but this would not explain the all round weakness of Indian subjects relative to norms established for South African Whites. Other factors were investigated in order to account for this, and this brings us to the next section.

2. Level of Intelligence. Studies conducted with Durban Indians have shown them to perform in inferior fashion on South African standardised tests. Logue (1954) found that the South African Group Test (SAGT) mean of 1242 carefully selected children was 87.4 - 12.6 points below average. The SAGT, largely a Verbal test, has now been replaced by the NSAGT, and Ramphal, using this test, found the mean of his group to be 79.57, some 20 points below average. In discussing both his own and Logue's results, Ramphal refers to the work of Pratt Yule and Albino, from which the inference is that the SAGT overestimates intelligence by some eight points, on the average. He feels, in the light of this, that Logue's group mean is probably inflated, and suggests that the average Indian child can be expected to obtain a score some 20 points below the European average.

What reasons have been suggested for the apparent inferiority of Indian children? Logue attributed it to weakness in English, but Ramphal's work has suggested that other factors are involved since Non-Verbal scores are also depressed. With reference to Durban Indian children he investigated the effects of both bilingualism (objectively measured in terms of opportunities for speaking the vernacular) and educational deprivation (Projects II and III respectively) as determinants of level of functioning, and found that while the former was insignificant as a determinant of this, educational deprivation, occasioned as a result of lack of availability of school placement for Indian youngsters, was a very significant concomitant of depression of both intelligence and scholastic achievement scores. Discussing the results of his third project elsewhere, Ramphal writes as follows:

> "It seems that there is an actual stunting in the mental development of such children, a stunting that probably sets in even before school entry, ... during the idle years of waiting for school places in an intellectually barren environment ... Furthermore, what seems to happen is not a mere delay of so many years of schooling that can be made up later, but an actual dwarfing of mental potential that appears to be permanent." (1966, p.17).

Ramphal does stress that educational deprivation, while of great importance, is only one factor operating to depress scores of Indians relative to those of Europeans. Other factors include "socio-economic conditions, cultural deprivation, linguistic handicaps, nutritional factors... " (1961, p.472).

Personality factors may also affect test scores of Indian youngsters. Lloyd (1958), for example, speaks of a highly competitive attitude among his testees, with a concomitant of tension. Perhaps not unrelated to this observed tension is "general inhibition" which Kuper (1962, p.111) feels is characteristic of orthodox Indian children, relative to South African Whites. Space does not permit a discussion of possible reasons for this, but the writings and information of several who have worked among, and know the Indian people, suggests that factors related to child rearing practices may account for this observation. We mention, here, several of such factors:

a. Inconsistency of discipline and handling (Kuper,1960; Edelstein,[1] (undated)
b. The fact that fear (both of the known and the unknown) plays a part in child rearing techniques (Edelstein; Kuper,1960,1962).
c. The fact that overt expression of aggression is frowned upon (Kuper, 1960, 1962; Edelstein, Padayachee [2])
d. The fact that the Hindu way of life does not stress individuality. (Kuper,1960).
e. The fact that the period of irresponsible childhood, and irresponsible childhood play is restricted, activities being channelled, from an early age, into the realm of the "essentially useful" (Kuper, 1960).

It is difficult to reconcile lower test results of South Africa Indians with more superior results obtained on Wechsler tests by groups in India. Differences in groups tested, and in tests applied (by virtue of modification) may have affected differential levels of results, and these will be discussed later when results of testing our own sample are made available for comparative purposes.

3. Sex Differences. With regard to sex differences on a Wechsler scale, we have only the report of Kundu (1967) whose groups were probably inadequately matched and who used a modified W-B scale. His results however, merit comparison with results of other research with Indians in which sex differences have been mentioned.

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1 The writer is grateful to Mrs. Joy Edelstein for permission to consult her unpublished research.

2 Mrs.Violet Padayachee, at the time a social worker at the Durban Clinic, spent time discussing features of Indian child rearing with the writer, who wishes here to express her gratitude for this and for the guidance given in selection of the experimental sample used in this research.

Kamat (1951), who standardised the Binet Simon Scale for Kannada and Marathi speakers in the Bombay presidency, tabulated mean Binet Mental Ages corresponding to chronological ages for the sexes separately. He found these to be similar at age 2, after which boys drew ahead and remained in the lead until age 13, to draw ahead again at older age levels. Kamat grouped tests into clusters representing predominant abilities (in what, on his own admission, was a "naive" manner) and compared the sexes on these clusters. Of the eight clusters, boys and girls had the same numbers of tests to their credit only on "Performance". Most marked inferiority of girls appeared on "Language and Verbal Ability", "Comprehension", and "Immediate Memory". Kamat feels that the inferiority of girls, particularly in Verbal Tasks, might be due to the fact that girls spend more time in the home with female companions who tend to be largely illiterate,whereas boys spend more time with fathers, who tend to be more literate.

It is interesting that these results differ from those of Kundu, who found Verbal ability as measured by the W-B scale to be a aspect in which sex groups did not differ, Performance ability to be the aspect in which they did so. Age of subjects, and social class (Kundu's subjects were late adolescents from presumably privileged social classes as they were university students), level of education, and differences in tests applied may have been responsible for these discrepancies.

As regards level of intelligence of sex groups, both Logue (195 and Ramphal (1961, Project II) have noted superiority of boys on South African standardised group tests. Ramphal actually found the mean scores of boys and girls to be essentially the same, but girls were found to be of higher socio-economic status. When the effect of this variable was statistically controlled, the difference in favour of boys on Verbal, Non-Verbal and Full Scales of the NSAGT was significant. Ramphal feels that it is probably the rather conservative outlook of the Indian people with regard to the role of women which is responsible for this sex difference.

SUMMARY AND CONCLUSION

Positive discrepancy scores on modified Wechsler tests have been observed by several investigators to characterise performance of Indian groups in their homeland. Inferiority relative to U.S. norms has been noted particularly on Performance scales of such tests with Verbal inferiority being lacking or of minor importance by comparison. As far as comparisons are possible (due to differences in groups tested and tests applied) a different trend has been noted for South African Indian children, who display marked inferiority relative to the norms

on both Verbal and Non-Verbal sections of the NSAGT, the inferiority on the Verbal scale being even more marked. Differences in groups tested and in tests applied must have accounted for these differences, a point which we shall discuss when our own results are available for comparative purposes.

Investigators who have reported on sex differences in level of intelligence among Indian children have agreed that males tend to make higher mean scores, although Kundu's research has suggested that this is largely due to male superiority on the W-B Performance scale. This is not in agreement with Kamat's finding regarding sex differences on a modified Binet Simon scale and suggests rather strongly that differential sex differences should be viewed only within the frame of reference of a specified test.

OTHER GROUPS DEFINED IN TERMS OF CULTUAL BACKGROUND

Studies with other groups defined in terms of cultural background are of less importance to the understanding of results of the present research than are studies with Indians, and since the field is wide and space is limited, we have chosen to review results of selected investigations with other cultural groups only briefly. Our aim, in this review, is to select studies which suggest that cultural background of subjects may have an influence upon pattern of Verbal-Performance discrepancies on the WISC (and adult tests).

American Negroes constitute a group fairly widely studied with the Wechsler tests. WISC studies by Young and Pitts (1951) with congenital syphilitics, by Young and Bright (1954) with rural southern Negroes, and by Teahan and Drews (1962) with normals agree in their findings that southern Negro children tend to obtain positive discrepancies on the WISC. A paper by Hughes and Lessler (1965) also suggests this pattern, although the significance of the difference was not determined. For northern Negro children, the discrepancy may be less apparent (Teahan and Drews,1962). Teahan and Drews make the important observation that since southerners are culturally deprived, and since they make their most inferior scores on the Performance scale, this scale must be just as sensitive to the effects of cultural deprivation as the Verbal scale, although it relies less on language.

Negroes have been rather extensively studied with adult Wechsler scales but a rather unfortunate feature of most of the investigations in this realm is that it is subjects abnormal in some respect (who,as a result of abnormality have probably come to the attention of psychologists) whose performance is reported upon. In several of these studies the tendency for southerners to be Verbal dominant is not as evident as on the WISC, Franklin (1945), using juvenile offenders in a Maryland institution, and Young and Collins (1954) using syphilitic

from Georgia, failing to observe this. It is possible that just as other variables may blur the influence of pathology (Watson,1946), pathology may blur the influence of other factors.

Machover (1943) appears to have been the first to observe weakness on the W-B Performance scale for culturally deprived southern Negroes (who in this instance were criminals). The observed weakness, particularly in "perceptual organisation and perceptuo-motor integration" suggested that "... the maturation of these functions is to a large extent dependent upon training implicit either in formal schooling or at a higher level of cultural complexity than the southern Negroes enjoyed" (p.84). Others who have observed similar weaknesses are De Stephens (1953) with <u>northern</u> criminals, Davidson et al (1950) with neurotics in Detroit, and Davis (1957) with a "patient" group at the Florida State Hospital. Davidson et al have suggested a new and plausible hypothesis for findings : they feel that the time factor in Performance subtests may have penalised their group. The Negro, may, they feel, lack the "middle-class anxiety to get things done", since Negro initiative is not always rewarded.

Tyler (1956) has reviewed a number of these studies and has based her conclusion regarding Performance scale weakness on the well-known theory of Hebb (1949). She feels that this weakness probably stems from early perceptual deprivation and its effects upon intellectual development. Vernon (1965), however, says:

> "Perceptual deprivation ... hardly seems important in most cultural groups where nature provides plenty of sticks, stones, water and human contacts. I would rather emphasise conceptual deprivation during the school years when parents fail to answer questions, encourage curiosity, and provide books, TV and other types of experience." (pp 728-729).

Whatever the reason for this deficiency it does, as Teahan and Drews point out, indicate that a rather popular supposition that Performance or non-language tests are less "culture-bound" is, as far as the WISC and southern Negroes are concerned, rather a fallacy.

<u>American Indians</u>. Few relevant studies with this heterogeneous group have been reported. However, studies by Turner and Penfold (1952) using the WISC and children in the Caradoc Reserve in Ontario, and Howell et al (1958) using the WAIS and Navaho Indians as subjects, have suggested that American Indians may be Performance dominant. Turner and Penfold attribute poor performance, particularly on the WISC Verbal scale, to environmental factors which include lack of confidence to compete with Whites, lack of a "tradition" in education, low socio-economic status, poor school attendance, and language difficulties.

Puerto Ricans have been studied by Talerico and Brown (1963) and also appear to be a Performance dominant group. An interesting finding of this study was that negative discrepancies tended to decrease with age. The earlier, larger discrepancy was attributed in part to bilingualism and lack of familiarity with English, and it was suggested that the decline in the discrepancy with adolescence might be due to the individual's increasing opportunity to speak English outside the school itself and to expose himself to an environment wider than his own restricted one.

GROUPS DIFFERING FROM THE STANDARDISATION SAMPLE IN TERMS OF SUBCULTURAL FACTORS

Results of studying the performance of Jewish children of traditional parentage (Levinson) and of isolated, outpost children in Newfoundland (Sullivan) are interesting, for both groups may be considered to represent "subcultures" within the wider American culture Hypotheses advanced by investigators suggest that the demands of the subcultural group have influenced the "pattern" of abilities developed.

Jewish children have been studied extensively by Levinson, and his research has indicated that Jewish children of traditional parentage and educated in traditional Yeshiva schools constitute a Verbal dominant group. This dominance appears to be virtually non-existent at pre-school level, to make its appearance sometime during elementary schooling, and to persist through university level when the WAIS is the test used (Levinson, 1959 a). Levinson suggests that since, in the traditional Yeshiva school "very great emphasis is placed on verbal ability to the relative neglect of performance arts" (p.177), Children exposed to such a pattern of cultural pressure might be expected to develop ability patterns conforming to the "norm".

Jewish elementary school boys tested by Levinson (1960a) were found to have significantly higher Verbal IQ's and significantly lower Performance IQ's than either Irish catholic or Italian catholic boys carefully matched with them on age, grade placement and Full Scale IQ. Levinson felt that the extra hours involved in attending double program (English and Hebrew) and completing double homework assignments leave the Jewish student little time for the pursuit of extra-curricular activities less related to formal schooling, and that this could have influenced pattern of results. As a result of longitudinal studies (1960b and 1961) Levinson challenges the concept of stability of intelligence for a group which is subjected to cultural pressure to achieve. He found that for both boys and girls, tested as preschoolers and again after attendance at school, there had been a significant rise in Verbal IQ. He feels that cultural pressure, exemplified in features of the school curriculum, could have been responsible for this.

Wendt and Burwell (1964), using Jewish and non-Jewish children in Ottawa, have largely substantiated Levinson's results in that Jewish day school children (and only these) obtained significant positive discrepances on the WISC. Results also indicated that differentation of abilities only took place after some degree of formal learning had been received, substantiating Levinson's hypothesis that cultural learning as disseminated by education may influence a pattern of test scores.

An isolated outpost group of children in Newfoundland studied by Sullivan (1957) provides an interesting contrast with Jewish groups. Here, the main activities were reported to be lumbering, fishing and farming. Sullivan's group of average 15 and 16 year olds (tested on the W-B) proved to be a Performance dominant group, a feature not found to characterise performance of city groups (from Halifax and St. John's) matched on age and educational level with the outpost group. Sullivan suggested that verbal skills, being of little practical importance to the outpost group were learned for school purposes only, since it was probable that little discussion of related issues took place within the community.

Results of these two groups of studies are interesting in that they suggest, to use Levinson's words, that "each subculture encourages and perpetuates those abilities which are important for the growth and development of the group; and ... the process ... must therefore be evidenced in terms of intelligence test scores."

Other instances of "subcultural" groups within a larger culture may be groups defined by urban or rural residence and by socio-economic status. We shall briefly review results of such groups on the WISC.

GROUPS DEFINED BY URBAN AND RURAL RESIDENCE

Seashore et al (1950) tabulated mean scores on the WISC for urban and rural children comprising the WISC standardisation sample separately On the Full Scale the difference in favour of urban children was 5-6 points, and differences were found to be slightly less on the Performanc than on the Verbal scale of the WISC (4 points as against 6 points). Seashore (1951) after a full analysis of discrepancy scores, came to the conclusion that the urban-rural factor is of little importance as a determinant of these. Although the proportion of urban children with V > P was significantly greater than the corresponding proportion of rural children, the mean difference was only about 2 points. Seashore wrote:

> "For all practical purposes, ... we should not expect a rural child to be more 'performance-minded' than 'verbal-minded'." (1951, p.66).

Whether or not a difference in the direction noted above will manifest itself would appear to be related to factors pertinent to the wider cultural environment. Young and Bright's (1954) study with rural southern Negro children illustrates this point, for this culturally deprived group proved to be significantly Verbal dominant - a pattern found rather consistently to apply to southern Negroes irrespective of urban or rural residence.

GROUPS DEFINED BY MEASURES OF SOCIO-ECONOMIC STATUS

Actual level of WISC intelligence does appear to be related to socio-economic status, but perhaps insignificantly. Thus Seashore et al (1950) found, for the different "parental occupations" groups of the standardisation sample, that the expected hierarchy of means was obtained, but they also commented upon large intergroup overlap. Several independent studies, using objectively classified groups, have also found socio-economic status to have an effect upon level of intelligence. Several cross sectional and longitudinal studies (Estes, 1953,1955; Marks and Klahn,1961), have suggested that the effect of socio-economic status on measured intelligence may decline with age. Estes suggested that the "levelling" effect of school experience might be one factor responsible for this. This decline in differences with age is by no means fully substantiated, however (Laird,1957; Cropley, 1964). It would appear to depend upon experiences to which children of different socio-economic levels are subjected with increasing age.

Of more relevance to this particular study is the question of whether socio-economic status is important in the determination of discrepancy scores. In this connection, Seashore et al (1950) indicated that differences between the 9 "parental occupations" groups of the standardisation sample were higher on the Verbal than on the Performance scale. Seashore (1951) analysed discrepancy scores for these 9 groups and found that in all but Group I (professional and managerial parents) proportions of children with positive and negative discrepancies were approximately equal, although there was a tendency for discrepancies to be in the expected direction (i.e. the "higher" groups tended to include more children with positive discrepancies). For Group I, the proportion with positive discrepancies exceeded chance expectation.

With regard to results of independent research, little can be said to substantiate this pattern. A finding in line with that of Seashore et al is that differences between high and low status children tend to be greater on the Verbal than on the Performance scale (Estes,1953, 1955; Laird, 1957; Marks and Klahn,1961; Cropley,1964). However, while high status children may obtain positive discrepancy scores,

there is little evidence that low status children tend to obtain negative discrepancies. Both Estes (1953) and Laird (1957) found their low status children to obtain higher Verbal means. However, one study which has reported Performance dominance of working class boys (but not girls) is that of Ravenette and Kahn (1961) who found a lag in Verbal ability after the age of 12. This sample consisted of disturbed children referred to a Child Guidance Clinic, however, and as such probably dealt with an atypical group. As the authors suggest, more information is required with regard to the effect of socio-economic status on patterning of intelligence. One would agree with them that

> "Until such information is available there is clearly a need to bear in mind cultural and class differences when drawing conclusions or interpretations from the protocols of cognitive functions." (Ravenette and Kahn, 1961, pp. 211-212)

It is of interest to include brief reference to the effect of status on scores of Indian children. This has not, to the writer's knowledge, been widely investigated, but two studies may be relevant. Herrick (1921), in an early study, compared Brahmin and Panchama children on their performance on the Goddard Formboard, and found superiority of the former group. The Brahmins, Herrick points out, enjoy high status and claim to be of unmixed blood. Panchamas, in contrast, are from "the very large social group in which are found the very lowest castes." (p.253)

Ramphal (1961) has also commented upon socio-economic status as a variable affecting scores of South African youngsters. In his second project, for which he used a heterogeneous group, a positive relationshi between intelligence and socio-economic status was found, although the significance of this was not investigated. In his third project in whic children were fairly homogeneous with respect to status (being drawn fro one of the poorer areas in Durban), the relationship was insignificant when effects of grade placement for age were statistically controlled. Ramphal feels that for Indian children from fairly homogeneous backgrounds, scholastic opportunity is a more important determinant of ability than is socio-economic status per se, and refers, in this connection, to school experience as a possible "leveller" of abilities (p.424). This is not at variance with the hypothesis of Estes (1953, 1955), and suggests that experiences at school may be just as weighty as experiences at home in influencing level of functioning.

There is one more variable, the effects of which on intelligence we wish to review briefly. This is bilingualism. For convenience, we deal with this subject under the heading of subcultural background, although it is realised that "bilinguals" vary from one research project to another, and can hardly be considered as a homogeneous "group".

GROUPS DEFINED AS BILINGUAL

Reviews of studies on the effects of bilingualism on intelligence have been provided, inter alia, by Arsenian (1945), Darcy (1953,1963) and Peal and Lambert (1962). While a number of factors have influenced results - the "languages in contact" (Weinreich,1953), the extent of proficiency in each language, the time and context of learning languages and the test used for assessing intelligence - these reviews have to some extent suggested a "pattern" characteristic of bilingual children. It appears that if there is to be any handicap to the bilingual child, this will manifest itself more frequently on Verbal tests and scales than on Performance or Non-Verbal equivalents.

In several studies already cited, bilingualism has been assumed but not objectively assessed. Turner and Penfold's study of North American Indians (1952),and Talerico and Brown's (1963) study of Puerto Ricans fall into this category. Both these studies have reported Performance dominance of groups in accordance with the pattern.

Altus (1958) made a study of Spanish-English bilinguals of Mexican descent in California, matched with a control group of monolinguals of non-Mexican descent on age, grade placement and WISC Performance IQ. WISC Verbal and Full Scales were found to favour monolinguals significantly. Verbal-Performance discrepancies were non-significant in the case of monolinguals, but were strikingly in favour of Performance IQ in the case of the bilinguals. Few conclusions can be drawn from this study,however, as most of the bilinguals were suspected retardates. Since Wechsler (1944,1958) gives the P> V pattern as one of the "signs" of retardates, and Baumeister (1964) attests to a similar pattern on the WISC, this result may be due to low intelligence rather than bilingualism per se.

Other cultural factors may obscure a pattern of Performance dominance on the WISC. Cooper (1958) reports, for example, on bilinguals in the territory of Guam on the Marianos Islands. For this group, mean Verbal IQ exceeded mean Performance IQ by 6 points. From the writer's description, this appears to have been a culturally deprived group. We have already seen, with reference to studies with southern Negroes, that cultural deprivation may affect the Performance scale to the same or to a greater extent than the Verbal scale. For this particular group, cultural deprivation may have been the main determinant of the pattern of results, its bilingualism being merely incidental.

Levinson's studies with Jewish children are also interesting in this context. In one study (1959b) Levinson was interested in discovering tests which would prove "fair" to bilingual preschoolers.

As far as the WISC was concerned, when both sexes were considered together it was found that only Vocabulary and Picture Arrangement favoured monolinguals. There were no significant scale differences. Further information on these children suggested that bilingualism was in no way a handicap to the boy, but that it did seem to penalise pre-school girls on all scales of the WISC.

In Levinson's (1960a) study of Jewish, Irish and Italian catholic children, by far the greater proportion of Jewish children were bilingual (76 per cent as opposed to 4.26 per cent of the Irish and 42.55 of the Italians), and yet the Jewish group obtained a significantly higher Verbal mean than either of the other groups. This again suggests that other cultural factors may override a pattern ascribed to bilingualism.

Ramphal (1961, Project II) discovered that for South African Indian children tested on the NSAGT, degree of bilingualism (objectively measured in terms of opportunities for speaking the vernacular) bore an insignificant relationship to intelligence. Of greater importance as a determinant of results was proficiency in English, a variable itself not related to extent of opportunity for speaking the vernacular. In Ramphal's third project, both intelligence and proficiency in English were found to bear a strong relation to scholastic opportunity, which again indicates the importance of considering effects of other culturally determined background factors before ascribing a pattern to the effects of bilingualism.

These studies appear to indicate that bilingualism per se as a determinant of pattern of performance or even of level of performance, should not be viewed out of context of the entire cultural or sub-cultural background of the subjects studied. Within each differing group there may be factors more weighty in determining nature of performance than is this variable.

GENERAL CONCLUSION

Studies reviewed in this section, in our opinion, provide sufficient evidence that a pattern of performance for a group of subjects may to a large extent be influenced by cultural factors, since different cultural groups may reinforce certain classes of abilities at the expense of others, as stressed by Levinson. This is in keeping with more general findings on cultural differences in intelligence as reviewed, inter alia, by Ferguson (1954) and Vernon (1965,1969). Ferguson sees the evidence as pointing to the fact that "individuals reared in different cultures will develop different patterns of ability". The WISC scales appear sensitive to the effects of cultural and subcultural environment, and it would seem that reasons for a WISC discrepancy score of a culturally

deviant group should be considered in the light of these factors before seeking determinants of the pattern in other spheres.

2. LEVEL OF INTELLECTUAL ACHIEVEMENT

INTELLECTUAL RETARDATES OR DEFECTIVES

For this extreme group, Wechsler (1944) reported that Performance IQ generally exceeds Verbal IQ on the W-B. Seashore (1951) has analysed discrepancy scores of the 55 feebleminded children in the WISC standardisation sample (children with IQ's below 70 from which children with suspected organic involvement were excluded) and found that similar proportions of the group obtained positive and negative discrepancies. He expressed little optimism regarding the usefulness of the P> V "sign" as a concomitant of retardation for children's groups. However, subsequent studies with the WISC have suggested that at least for non-brain-injured retardates, there is a tendency towards Performance dominance. Baumeister (1964), who reviews a number of these studies, writes as follows:

> " It does appear, in general, that cultural familial, undifferentiated retardates score higher on the Performance than on the Verbal scale. Brain-damaged subjects appear to perform more evenly across the two scales. More specific pattern analysis, founded on variability among subtests, appears futile." (1964, p.192)

Studies confirming the P>V pattern for non-brain-injured retardates are those of Sloan and Schneider (1951), Stacey and Levin (1951), Vanderhost et al (1953), Whatley and Plant (1957), Baroff (1959), Shinagawa (1963), and Alper (1967). That the pattern fails to apply to brain-injured retardates is suggested by Beck and Lam (1955), and Newman and Looe (1955). However, the P>V pattern is by no means agreed upon, even for non-organic retardates, as studies by Atchison (1955), and by Sandercock and Butler (1955) indicate. The former study is of interest, for subjects were Negroes and the opposite tendency (V>P) was observed. In the light of findings with Negroes, it would appear that cultural factors may obscure other patterns, as has been suggested, inter alia, by Machover (1943).

An interesting study is that reported by Witkin et al (1966) with mildly retarded boys, in which it was indicated that factor-derived scores reflected the "discrepancy" more adequately than did Verbal and Performance IQ's. For two groups tested (one on the WAIS, and one on the WISC), the P>V pattern appeared, but the discrepancy between "analytic IQ's" (a factor similar to Cohen's (1954) "Perceptual Organisation" (Goodenough and Karp, 1961) and "Verbal Comprehension" (Cohen, 1959), greatly enhanced the original difference, suggesting that factor-derived scores, representing purer statistical entities than Verbal and Performance scales, may pinpoint differential functioning of

groups more adequately.

GIFTED OR SUPERIOR CHILDREN

For representative groups (generally with WISC IQ in excess of 119) there is little evidence of Verbal dominance, although this is the trend observed. Shinagawa (1963) found this insignificant trend for 374 gifted Japanese children studied in child psychiatry over a 13 year period. Lucito and Gallagher (1960), too, found that for 50 exceptional children (Binet IQ's above 150), the discrepancy did not reach significance. The authors feel that it was possible that the WISC Verbal scale possessed insufficient "ceiling" for a group such as theirs,however. It was found that when subtests were ranked, those on which the group performed best were those suggestive of the "Verbal Comprehension" cluster of abilities (Cohen,1959).

COMPARISONS BETWEEN GIFTED AND RETARDED CHILDREN

Several investigators have made these comparisons, using different methods. Kolstoe (1954) compared WISC subtest scores of a bright, young group (third and fourth graders with estimated Binet IQ 116 or above) with those of a dull, older group (eighth and ninth graders with estimated Binet IQ 84 or below), matched with the former on mental age. More similarities than differences were found, and Kolstoe observed:

> "No evidence was found to support the claims of some writers that the bright are superior on such mental tasks as vocabulary, reasoning, and a general mental ability. Neither does the evidence from this study indicate superiority of the dull, older children in performance tasks or manual manipulation." (1954, p.117).

Gallagher and Lucito (1961) criticise the design of studies such as Kolstoe's, contending that matching groups on mental age automatically matches them on abilities such as memory, generalisation and reasoning before the experiment begins, so that it is not surprising that little evidence of differences in these abilities occurs. Gallagher and Lucito have compared test patterns in a different way - simply by ranking subtests and looking at relative strengths and weaknesses for groups of gifted, average and retarded children. Results with three gifted groups paralleled those of Lucito and Gallagher (1960) in that the greatest strengths were found on the "Verbal Comprehension" subtests while relative weaknesses appeared on subtests related to "Perceptual Organisation". With the three retarded groups the pattern was reversed- a result later to be substantiated by Witkin et al (1966). Average subjects, in contrast, presented a pattern with no outstanding strengths and weaknesses.

Thompson and Finley (1962a) found the same general pattern of

strengths and weaknesses (in terms of factors) for retarded and gifted groups as did Gallagher and Lucito. These authors, however, enumerated potential sources of error which may operate when a "ranking" procedure is used alone and the extent of magnitude of subtest means and their variability is not considered. They feel, regarding their own and related studies, that:

> " The implication..... is that while a broad generalisation may be made as to relative strengths of gifted as opposed to retarded children as groups, the application to individual children within either group would be highly questionable." (1952a ; p.381).

The above studies would suggest, then, that gifted children may make their higher scores on the Verbal section of the WISC, or, more specifically, on subtests which factor analysis has shown to delineate a Verbal Comprehension factor. Retarded children may make their higher scores on the Performance scale, or on tests related to the Perceptual Organisation factor. Defects pointed out by several investigators would, however, suggest that results of the above studies are far from conclusive.

SPECIFIC INTELLECTUAL STRENGTHS AND WEAKNESSES

We do not propose to review studies dealing with specific intellectual strengths and weaknesses in detail, as this subject bears little relevance to our own research. There is one field within this area of research which deserves mention, however, and this is the field of reading achievement. Ramphal (1961) cites reports of school inspectors who have commented on poor reading achievement of Indian children relative to Europeans, and for this reason mention of the above research is relevant.

"Unsuccessful readers" (U.R's), variously classified, do comprise a group rather widely studied by means of the WISC, and a number of investigators have focussed attention on subtest strengths and weaknesse However, recent reviewers of such studies contend that:

> "Pattern analysis of subtests as a way of distinguishing diagnostic categories such as ... "poor reader" has proved unsuccessful with the WISC." (Glasser and Zimmerman, 1968, p.6 , emphasis added).

It is interesting that none of the 17 studies[1] which we have been able to study report Verbal dominance. The significance of the difference has not always been determined, but in 13 of the 17 studies in which

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1 Graham (1952), Burks and Bruce (1955), Altus (1956), Sheldon and Garton (1959), Dockrell (1960), Hirst (1960), Robeck (1960,1962,1963), Kallos et al (1961), Neville (1961), Coleman and Rasof (1963), Paterra (1963), McLeod (1965), Belmont and Birch (1966), Reid and Schoer (1966), Corwin (1967).

separate figures are given for Verbal and Performance scales, the latter mean is the higher figure. While not overlooking defects of some of these studies as mentioned, inter alia, by McLeod (1965), and Belmont and Birch (1966), this is a trend worthy of note due to its frequent occurrence, and it does suggest that specific weaknesses in the scholastic sphere may influence the direction of a WISC discrepancy score.

There is another way in which this group of studies is interesting. Groups of variously classified male psychopaths, sociopaths and social offenders have frequently been found to obtain the P > V pattern on the WISC and the W-B. Prentice and Kelly (1963) who review a number of these studies contend that the P > V pattern as diagnostic of psychopathy should not be given credence before such factors as reading skill and more general scholastic skill are investigated and subjected to control. Such observations reinforce the general contention that when a discrepancy is noted, non pathological factors as possible concomitants of this ought to be investigated before recourse is made to pathological factors as possible explanatory concepts.

3. PERSONALITY FACTORS

The research of Shinagawa (1963) deserves mention here, although Japanese children served as subjects and the effect of cultural environment cannot be discounted. Records of children attending a Tokyo clinic over a 13 year period were divided into 13 groups on the basis of "personality traits" of the children. Within each group three categories were formed according to WISC discrepancy score, namely:

a non-dominant group - discrepancy scores from 0 to 5 in either direction.

a Verbal dominant group - positive discrepancy scores of 6 points or above.

a Performance dominant group - negative discrepancy scores of 6 points or above.

Percentages of children within each category were tabulated separately for the 13 personality groups, and, after testing for significance, the group was labelled non-dominant, Verbal dominant, or Performance dominant.

A control group consisted of 603 kindergarten children for whom WISC scores were available. For this group, percentages of children in V and P categories were similar, but marked differences in these figures characterised the majority of the experimental groups. Categorisation of these groups was as follows:

Verbal dominant groups: Overprotected children, only children,

withdrawn children, neurotic children, nervous children, unstable children, eneuretics, weak children, clumsy children.

Non-dominant: Youngest children and gifted children.

Performance dominant: Delinquents and feeble-minded children.

Shinagawa's study is the only one of its kind of which we know, and further research in this field may well indicate that "personality traits" should be identified and controlled before discrepancies of groups classified in other manners are considered. While results of this research are certainly interesting, it is felt that more adequate reporting of the criteria used to classify,particularly less well defined groups,would have been helpful. Reporting of degree of overlap between groups (if any) should also have been mentioned (for example, could there have been "oldest children" who were also "delinquent", "unstable", etc.?). The use of a control group obviously younger than the experimental groups (age range from 5 through 15) is questionable in this study, particularly in the light of Levinson's studies with Jewish children in which differentiation of abilities was found to arise with increasing age and to be absent in the preschool period. It would have been more informative to compare results of clinical groups with those of a group of "normal" Japanese children of the same age.

Since Wechsler's rationale for the WISC (1949, p.5), and for adult tests (Wechsler,1958), does stress that personality factors may play a part in determining performance, it is clear that the contribution of such factors requires study. Shinagawa's study, may, in our opinion, be considered a useful start in this direction. Although one may question some of his "personality types", and even his methodology, the study does indicate that personality factors may play a part in determining direction of discrepancy scores.

4. SEX

Since the main focus of interest in this study is in WISC discrepancies and possible reasons for these, this will be the aspect upon which we shall concentrate in this review, although other aspects of observed sex differences will be mentioned as these are of interest.

There was room for sex differences to appear in the WISC standardisation sample, for scaled score and IQ tables were drawn up by treating boys and girls as members of the same sample. Seashore et al (1950,p.106 have drawn up a table showing means and standard deviations of IQ's on the three WISC scales by age and sex and from this it is apparent that boys were slightly superior to girls, particularly at older age levels. On the Full Scale, boys were ahead by 2.5 to 4 points at seven age

levels, girls being ahead, but by smaller amounts, at the remaining four age levels. Of interest from our point of view is the fact that on the Verbal scale boys were ahead by more than three points at age 8, and ages 10 through 15. On the Performance scale boys were ahead by more than three points at ages 8 and 10, the girls being ahead by similar amounts at ages 5, 6, 7 and 9. The writers do not evaluate the significance of differences, but later investigators, including Brown and Bryan (1957) and Finley and Thompson (1959) have done so. The latter investigators are more specific: they found significant sex differences favouring boys on the Verbal scale at ages 12 and 15, and on the Performance scale at age 8 (all at the .05 level of confidence only). Seashore et al give three possible reasons for observed male superiority:

a. Boys actually do perform better than girls (assuming the test's "fairness" to both sexes).

b. The test items were somehow biased in favour of boys.

c. The sampling of sex groups may have been biased.

They feel that the safest assumption is that factors (b) and (c) were involved.

Rather interesting is the tendency for boys to perform better than girls on the Verbal scale, since a number of earlier studies using different tests have suggested that verbal superiority is the prerogative of females (Tyler's (1956) summary). An explanation might be that the Verbal scale of the WISC is NOT ENTIRELY "Verbal", as studies using factor analysis have indicated that Arithmetic and Digit Span, for example, fail to load a Verbal factor as often as they do so. Interesting too, is the tendency at least at the younger age levels (5,6 and 7) for girls to perform better than boys on the Performance scale, although this tendency is not significant.

A well controlled study using the W-B indicates that on this scale, too, males may make better scores than females on the Verbal scale, while females may perform more equally or in superior fashion on the Performance scale. This is the study of Brown and Bryan (1955), who used well-matched groups of males and females at each of five age levels. Males were found to make significantly superior scores to females on the Verbal scale at three age levels, whereas on the Performance scale means of females equalled or surpassed those of males at four age levels. In a subsequent paper, Brown and Bryan (1957), after a careful analysis of sex differences on several tests, indicate that test makers should interest themselves in inevitable but differential sex differences, rather than endeavouring (a) to establish the overall superiority of one of the sexes; and (b) to eliminate all material which is not "sexually neutral" from scales.

It is difficult to review independent studies of sex differences with the WISC, for the sex variable is often compounded with other

variables (e.g. age, level of intelligence, and cultural and subcultural factors).

Two relevant studies deal with sex differences among preschoolers. Levinson (1960b) found sex differences to be compounded with bilingualism for his group of applicants to Hebraic Yeshiva Schools. Subjects were 58 boys and 59 girls of mean age 66 months. When the entire group was considered, boys tended to perform in significantly superior fashion to girls on all WISC scales and subtests with the exception of Coding A, significant differences being found on Full and Verbal scales and on four Verbal subtests (Information, Comprehension, Arithmetic and Vocabulary). When monolingual boys and girls were compared, no significant differences arose, but when bilinguals were compared, differences favouring boys were again found on Full and Verbal scales and on the Verbal subtests Information, Comprehension, Arithmetic and Similarities. This sex difference appeared to be compounded with cultural factors arising in the bilingual situation and Levinson attributed differences to the emphasis placed upon scholastically orientated learning for the traditional boy, since such boys excelled significantly on subtests "based on materials (most) subject to learning" (p.106). Even in this atypical group, girls appeared to perform more equally with boys on the Performance section of the WISC, a result in agreement with that of Brown and Bryan (1955) for 5 year olds.

In Darley and Winitz's study (1961) of normal preschoolers, 75 children of each sex (mean age 63 months) were tested. The only significant differences (on the Performance scale, on Coding A and on Similarities) favoured girls. The tendency observed by Seashore et al (1950) for 5 year old girls in the standardisation sample to do better than boys on the Performance scale of the WISC was thus substantiated.

Two studies have investigated sex differences for educable mental retardates. Finley and Thompson (1959) used 200 boys and 153 girls of comparable mean age (just below 11) all with WISC IQ's from 50 to 80 and enrolled in special classes in Californian schools. No significant sex differences were reported although Verbal and Full scales tended to favour boys. Gainer (1965) analysed WISC profiles of 100 children of each sex with IQ's from 50 to 79 and age ranges between 6 and 10, enrolled in special educational programs in California. As in Finley and Thompson's study no significant scale differences were reported, although boys made slightly higher scores on all three. Subtests on which differences were found were Picture Completion and Object Assembly (favouring boys) and Coding (favouring girls) - all at the .05 level of confidence.

Gainer (1962) has also undertaken a study of children with normal intelligence, using 100 children of each sex, aged 6 to 14, and in Sacramento Public schools, as subjects. Again, no significant scale

differences were found, but the subtest Comprehension favoured boys (.05 level of confidence) and Coding favoured girls (.01 level of confidence).

The evidence from these studies,which have been specifically concerned with sex differences,does not point to the overall superiority of either sex on the WISC. There is the suggestion from Seashore et al's analysis that boys may manifest any superiority which they may have on the Verbal scale more markedly than on the Performance scale in which they perform more equally with girls. (Brown and Bryan's results and those of Levinson substantiate this). Seashore et al's suggestion that younger girls may in fact perform in slightly superior fashion to boys on the Performance scale is substantiated by the study of Darley and Winitz. For older children of normal and subnormal intelligence there appear to be few differences in scale scores, if subjects are well matched in other respects. There appear to be few cross-validated findings with regard to sex superiority on subtests, except, perhaps, that Coding tends to favour girls.

Several points of interest have arisen from this section:

1. Verbal superiority on the WISC does not appear to be the prerogative of girls, a fact which is in contradiction to the "stereotype" regarding sex differences in ability (Tyler,1956).
2. We cannot adequately compare these findings with findings of research using Indian groups, as none of the studies are in precisely the same area. The only study which can be used for comparative purposes is that of Kundu (1967), who used a modified W-B scale and a student population. He found, as we have noted, that male and female groups obtained their highest scores on the Verbal scale of this test, the discrepancy being greater in the case of females than in the case of males. Allowing for differences in tests and in populations represented, this would suggest that for "culturally deviant" groups, patterns of male and female superiority may be altered. This supposition stresses the importance of having very carefully matched groups of males and females within a sample, particularly of "culturally deviant" individuals, if one wishes to describe performance of the entire sample, for sex differences, as determined by culture, clearly cannot be overlooked.

SUMMARY OF CONCLUSIONS REGARDING VERBAL-PERFORMANCE DISCREPANCIES ON THE WISC

Our opinion is that the selected studies which we have reviewed in this section have indicated that several classes of non-pathological

factors need to be taken into consideration before a found discrepancy score of a group is attributed to underlying pathology. Since we, in our own research, shall be dealing with "normal" children, we have chosen to review studies relating the discrepancy score to "normal" variables rather than pathological variables.

One class of variables deserving consideration, and, in our opinion, paramount consideration, is that related to cultural background factors. It has been found that in groups where the emphasis is on intellectual or scholastic achievement, individuals of normal ability tend to develop "patterns" in accordance with this pressure or expectation (Indian and Jewish children, notably, and possibly children from "higher" socio-economic groups). However, for those deprived of cultural or scholastic opportunity, or for whom scholastic success is less important, the evidence is less clear cut. Sullivan's (1957) isolated groups showed Performance dominance, but this was not the case for deprived southern Negroes studied by Machover (1943), by Young and her collaborators, and by Davidson et al (1950), neither was this particularly evident for "lower" socio-economic groups. Teahan and Drews (1964) have suggested that the Performance scale of the WISC is just as liable to be suppressed by inferior opportunity for learning as is the Verbal scale. With this conclusion one can fully agree.

Intellectual level of subjects appears to be related to discrepancy scores, but perhaps insignificantly so, for as studies by Lucito and Gallagher (1960), and by Gallagher and Lucito (1961) have suggested, the "gifted" tend to be <u>generally</u> gifted, the retarded, generally retarded. Factor analysis may well delineate more fundamental spheres in which the gifted excel and in which the retarded lag behind (relatively speaking) but as regards actual discrepancy scores as defined by Seashore (1951), there is little evidence that the "superior" obtain significant positive discrepancies while the "inferior" obtain significant negative discrepancies.

An interesting field of research is that related to specific scholastic weaknesses, in which field we have considered only children with reading disabilities as an example, it being felt that this was, for reasons specified, of interest in the present research. Evidence, by its frequency of occurrence rather than by statistical significance, appears to point to the fact that "UR's", variously classified, tend to obtain Performance means in excess of Verbal means. Prentice and Kelly's review suggests that it is wise to consider level of achievement before pronouncing a "pattern" to be diagnostic of a pathological category such as the "psychopathic" or the "delinquent".

Research on personality factors as influencers of the direction of

discrepancy scores on the WISC has been initiated by Shinagawa (1963) and is considered not out of place since Wechsler (1949) has indicated that such factors may influence WISC scores. While there were what we considered flaws in this study, it is a step in a legitimate direction and indicates that these factors may be of importance in the determination of direction of discrepancy scores.

Studies specifically concerned with sex differences on the WISC have largely shown that there are numerous factors to be controlled before sex as a variable can exert an influence upon discrepancy scores. Amongst such factors are age of subjects, level of intellect, and cultural background. This group of studies has, however, the utility value of impressing upon potential investigators the need for controlling the sex variable by extremely careful matching of sex groups within an experimental sample if performance of an entire sample is to be reported upon.

Studies in the above fields have, in our opinion, indicated clearly that non-pathological factors such as cultural background, level of intellect, personality, and sex, need consideration as determinants of WISC discrepancy scores of groups before such discrepancies can be considered in the light of possible pathological factors. This orientation will be adhered to in our attempts to interpret results of our findings regarding results of the performance of a group of Indian children on the WISC.

B. FACTOR ANALYSES OF THE WISC (WITH REFERENCE TO RESULTS WITH ADULT SCALES WHEN APPROPRIATE)

Although Wechsler has indicated that division of subtests into Verbal and Performance categories is only one way of grouping them, it appears that the subscales as entities of equal value are here to stay. This is indicated by the amount of research on Verbal and Performance discrepancies, and by Wechsler's provision for separate Verbal and Performance IQ's together with his own interest in the diagnostic significance of a discrepancy score (particularly with the adult scales: Wechsler, 1944, 1958).

How valid is the assumption that subscales measure separate entities which can be compared for groups and for individuals? The technique of factor analysis can shed some light upon this, although there are differences in the interpretation of results of studies due to difference in methods of extracting factors and rotating axes, differences in interpretation of factors, and differences in the groups whose records were analysed.

While our main interest in this section will be in the statistical unity of Verbal and Performance scales, other information judged to be helpful in interpretation of our own factor analysis will be set down briefly. Also, since the WISC is a separate test from the adult scales, reference to results with adult scales will only be made when judged helpful in understanding results, and for comparative purposes.

A review of studies which are judged to be relevant follows.

1. STUDIES USING RESULTS OF A PORTION OF THE WISC STANDARDISATION SAMPLE

As few as two and as many as five factors have been found to underly subtest intercorrelations as reported by Wechsler (1949) for three representative groups in the WISC normative sample (100 boys and 100 girls at each of three age levels : 7½, 10½ and 13½).

The earliest relevant study was that of Gault (1954), who analysed intercorrelations of the 10½ and 13½ year groups using a centroid analysis and orthogonal rotation to a bifactor solution. She was essentially interested in comparing WISC factor structure with W-B factor structure as noted by Hammer (1950) who used an identical technique for a portion of the W-B standardisation sample (the 20 to 34 year group). Results proved to be similar to those of Hammer in that a genera eductive factor (accounting for one-third of the variance in Gault's groups and nearly forty per cent of this in Hammer's group), a spatial-perceptual factor (Block Design and Object Assembly), a verbal comprehension factor (Verbal subtests with the exception of Digit Span), and a memory factor (Arithmetic, Digit Span, Picture Arrangement and Coding), emerged in each case. Interesting was the fact that general factor variance increased with age (a result to be substantiated by several later studies) and the fact that of the Performance subtests, only Block Design and Object Assembly defined a spatial-perceptual factor.

Cohen's (1959) analysis is perhaps the best known and most often quoted analysis of the WISC for the three age levels of the standardisation sample. He used the centroid method and blind rotation to oblique simple structure. Five primary factors were extracted from each matrix, the first three of which were similar to those found from analysing the W-B given to three neuropsychiatric groups (Cohen,1952), and the WAIS (Cohen,1957). Factors isolated in the 1959 analysis were:

A. Verbal Comprehension I - loaded by Information and Similarities consistently but not exclusively for the three age levels. By age 13½ the composition of this factor appeared stabilised in that Information, Comprehension, Similarities and Vocabulary loaded it exclusively as they were found to do in the analysis of the WAIS

(Cohen,1957). These four subtests Cohen designates "essentially verbal".

B. Perceptual Organisation - loaded consistently by Block Design and Object Assembly at all age levels, and by other Performance subtests at different age levels. Coding was the only Performance subtest which failed to load at any age level.

C. Freedom from Distractibility - loaded consistently by Digit Span and in addition by Arithmetic ($13\frac{1}{2}$ year level), Picture Arrangement ($7\frac{1}{2}$ year level), Object Assembly ($10\frac{1}{2}$ year level), and Mazes ($10\frac{1}{2}$ and $13\frac{1}{2}$ year levels).

D. Verbal Comprehension II - loaded by Comprehension and Picture Completion throughout, by Vocabulary ($7\frac{1}{2}$ and $10\frac{1}{2}$ year levels), and Similarities ($13\frac{1}{2}$ year level). Cohen tentatively distinguished between this factor and Verbal Comprehension I in his suggestion that "Factor A seems to reflect that aspect of verbally retained knowledge impressed by formal education ... Factor D ... seems to reflect judgment ..." (p.286).

E. An uninterpreted "quasi-specific" Factor - loaded consistently only by Coding.

A second order analysis was performed on intercorrelations between factors, and a second order "G" factor interpreted as "present general intellectual ability" emerged. Cohen's finding was that for the childrens' groups this accounted for about 35 per cent of the total variance, whereas for adults (1957) it accounted for .52 of this. His conclusion supports results of Hammer's (1950) and Gault's (1954) analyses,that adults are more dependent upon general ability for functioning than are children. Cohen feels that an alternative hypothesis (Garrett,1946), that age brings about greater differentiation of functioning is, as far as the Wechsler tests are concerned, refuted by these results.

A further interesting finding of Cohen's was that when subtest variance was analysed in terms of that attributable to communality and to error, little remained which could be considered specific to subtests themselves. On the basis of this he challenged individual subtest rationales such as those advanced by Wechsler (1944) and Rapaport et al (1945), which attribute specific measurement functions to subtests, feeling (justifiably) that subtests are best viewed as measurers of more adequately defined statistical entities - the general and the primary factors.

Cohen's research emphasises that these factors are more reliable

statistical entities than subscales themselves. Noteworthy is the failure of Digit Span to load a Verbal factor, and the failure of Coding to load the Perceptual Organisation factor. These results agree with those of Gault (1954).

Maxwell (1959) has submitted the same three intercorrelation matrices (omitting Information and Mazes - tests not generally used at Maudsley Hospital) to analysis using Lawley's Maximum Likelihood method and rotating axes arbitrarily to orthogonal structure. He noted similarity of factor structure for the three age levels and interpreted his first factor as "verbal-intellectual" (vg), declining to label it simply "verbal" as all subtests loaded it. The second and final factor was labelled space-performance (sp) and was loaded throughout by Block Design and Object Assembly, a fact which attests to its similarity to Gault's spatial perceptual factor and Cohen's Perceptual Organisation. Maxwell's analysis has been criticised on two main accounts by Jackson (1960). She feels that as he failed to examine his residuals to see if further variance could be extracted, and as his rotation procedure was arbitrary, his factors are "not pure, but composite".

In spite of variations in technique, these three analyses agree in finding a factor related to the spatial-performance subtests Block Design and Object Assembly most clearly, but differ in findings regarding a Verbal Comprehension factor, Maxwell having failed to isolate this as a separate dimension, and Cohen having isolated <u>two</u> Verbal Comprehension factors. Gault's and Cohen's analyses agree in the isolation of a third non-general factor defined principally by Digit Span and Arithmetic, which does not appear in Maxwell's analysis. It is possible that had he examined residuals, as Jackson suggests, there might have been sufficient variance to extract a third factor. One must also remember that the test battery which he analysed was reduced, however, Information and Mazes having been omitted.

2. <u>FACTOR ANALYSES OF THE WISC USING RESULTS OF OTHER GROUPS</u>

A. <u>NORMALS</u>

<u>English Children</u>

Jackson (1960) analysed data obtained from applying the six Verbal subtests to 86 boys and 121 girls aged 10 to 11, by means of the centroid method, with rotation to orthogonal simple structure. She obtained as many factors as there were tests, the six resulting factors being identified with Thurstone's Primary Mental Abilities, and subtests often appeared complex in that they loaded more than one factor. Burt (1960) expressed himself dissatisfied with an

"uneconomical" technique by means of which as many factors as tests were isolated. Using a technique he had previously advocated in Factors of the Mind (1940) and placing subtest reliabilities rather than the highest coefficient in the row in the principal diagonal, he showed that Jackson's intercorrelation matrix could just as feasibl be analysed in terms of a general factor and three non-overlapping group factors representative of "purer" cognitive abilities. These factors he named : Numerical (Arithmetic and Digit Span), a Verbal factor corresponding to Thurstone's "Words" (Information and Vocabulary) and Comprehension (Comprehension and Similarities).

This is clearly an instance of different factorial methods yielding different results. Another such instance may be found in Jones' (1960) and Maxwell's (1960) analyses of data gathered by the former for London children aged 8, 9 and 10. Jones, using Burt's Simple Summation method, extracted from each matrix a general factor (the importance of which was found to increase with age, reinforcing results of Gault and of Cohen) and a bipolar factor which she felt "broadly suggests a division between verbal and non-verbal tests, or a contrast between manipulative and non-manipulative abilities", (p.128). One cannot quite see how she arrives at this conclusion, however, for again, the Verbal-Performance dichotomy was upset, Arithmetic and Digit Span being grouped with non-verbal tests. Maxwell (1960) used Jones' data for 9 and 10 year olds for comparison with data from a group of "neurotic" children gathered by himself,and re-analysed the data using Lawley's Maximum Likelihood method. Results for the normal children essentially duplicated those which he had obtained in his analysis of standardisation data (Maxwell,1959)

Studies reviewed in this subsection, while showing some similarity with other results, essentially emphasise that different methods will yield differing results.

American and Canadian Children

Cropley (1964) was partly concerned with one of the problems tackled by Cohen (1957, 1959) - whether abilities become more dependent upon a general factor with age - or whether age brings about increased differentiation of ability. Subjects were 100 Canadian children tested at age 10, and 70 of the originals re-tested at age 12. Both analyses were performed using Householder's Principal Axis method with units in the principal diagonal. Rotation was to orthogonal structure. The result of interest here was that by age 12, fewer factors emerged. Cropley, after comparing factor structures for the two age levels, hypothesised that an "extra" memory factor emerging at age 10 had by age 12 been "absorbed" into

a general factor with the result that the latter had increased its variance considerably. This increased general factor variance with age supports results of several studies reviewed earlier. Credence is added to the results of cross-sectional studies by this longitudinal analysis performed by Cropley.

Semler and Iscoe (1966) provide an interesting study in that they analysed, separately, intercorrelation matrices obtained from two groups (141 Whites and 134 Negroes) enrolled in kindergarten and public schools in Austin, Texas. Subjects were aged 5 through 9, and the Maximum Likelihood method was used, with rotation to orthogonal structure. Negro and White factor structures were found to differ significantly, the only real similarity being on Factor I, a Verbal Comprehension factor similar to that of Cohen.

These two studies are interesting in that the study of Cropley substantiates observations as to the increase of general factor variance with age noted by other investigators. That of Semler and Iscoe indicates that the performance of different groups may give rise to differing factorial structures, a point which may to some extent explain results of our own factor analysis.

B. ABNORMAL CHILDREN

It is interesting that for both neurotics and retarded subjects, when matched with control groups of normals, an "extra" factor has often characterised WISC performance.

"Neurotic" Children

Maxwell (1961) compared factor structure of disturbed children (generally classified as neurotic) tested at the Bethlehem Royal and Maudsley Hospitals with that which he had obtained for "normals" in the WISC standardisation sample (Maxwell 1959). Subjects consisted of 205 boys and 87 girls aged 8 to 13 years. Whereas Maxwell (1959) had found two factors to underly the performance of normals, using the identical method of analysis he found that the neurotic samples' performance could be explained in terms of three factors. The "extra" factor was defined by loadings from Digit Span, Arithmetic and Object Assembly, and it was felt to be similar to Cohen's (1959) "freedom from distractibility". Its presence was felt to be due to the greater variability of the performance of neurotics, which increased the size of the intercorrelations between measures.

A further analysis (reported 1960) was undertaken by Maxwell in order to check these results. As he felt that an American control group was inadequate, he used, in this instance, Jones' (1960) normal

London schoolchildren (aged 9 and 10) and selected, from those available in the files of the Maudsley Hospital, a neurotic group to match Jones' sample in age. Results of his re-analysis of Jones' data have already been reported. Submitting data obtained from the neurotic sample to identical analysis, he again found an "extra " factor to underly their performance. This, again, was similar to Cohen's "freedom from distractibility", and was again attributed to wider test variance of the neurotics.

Retarded Children

This is another group for which more than the expected number of factors has been found to underly WISC performance in several studies.

Baumeister and Bartlett (1962a) analysed WISC intercorrelation matrices (excepting Digit Span and Mazes) for a group of retardates (13 and 14 year olds with IQ's below 80) using Thurstone's multiple group method with orthogonal rotation to a hierarchical solution. The 13½ year group of the standardisation sample was used as a control group and data was analysed in the identical manner. For the normals, a general factor and two group factors were extracted. For the retardates, a third group factor emerged, with loadings from Arithmetic, Picture Completion and Coding. The writers tentatively designate this a "stimulus trace" factor, and suggest that lack of perseveration of the stimulus trace among the retarded may be characteristic of the differences between normals and retardates on the WISC.

As the above analysis did not include the subtest Digit Span, and as the writers considered that this subtest's loading on the third group factor would substantiate the fact that it represented a stimulus trace factor, a further analysis was carried out (1962b) using scores of retardates who had done this subtest. Digit Span was found to load the third group factor which again emerged, substantiating the writers' former conclusions.

This factor is by no means unanimously agreed upon as characterising the performance of retardates, however, Osborne and Tillman (1967) having failed to find it as an underlying dimension of the performance of their group. Sprague and Quay (1966), using WAIS scores of adult retardates, had however isolated such a dimension, and found this to be absent as a dimension underlying performance of the 25 to 39 year level of the WAIS Standardisation sample.

These results of the analyses of scores of individuals abnormal in some respect clearly need verification. They are of interest

however, in that they show, once again, that analyses of scores of different groups may lead to different underlying dimensions of a test battery.

3. STUDIES IN WHICH NON-WECHSLER VARIABLES HAVE BEEN INCLUDED IN THE BATTERIES ANALYSED

The procedure of incorporating reference tests of known factorial content within a battery to be analysed appears, as far as the Wechsler tests are concerned, to have enjoyed some popularity following the work of Davis (1956) who employed this technique with the W-B and was commended by Wechsler (1958) for having done so. Although inclusion of tests of known factorial content may aid in the interpretation of Wechsler subtests in terms of previously isolated and understood dimensions, interpretation of a battery of eleven subtests in terms of eleven factors (Davis' result) is antithetical to one of the basic aims of factor analysis, which as Fruchter (1954) expresses it, is to analyse a set of observations in terms of intercorrelations "... to determine whether the variations represented can be accounted for adequately by a number of basic categories smaller than that with which the investigation was started". (p.1).

Thus, although a number of factor analyses of the WISC have included reference tests[1], and although these analyses may be useful to those who wish to understand the battery in terms of well established factors, it is judged that they would provide little insight into our own results, and time and space will not be spent in reviewing these studies.

SUMMARY AND CONCLUSIONS REGARDING FACTOR ANALYSES OF THE WISC

1. From studies reviewed it appears that in spite of disagreements, at least two group or non-general factors may be supposed to underly WISC performance of most groups:

   a. A factor defined principally by Cohen's "essentially verbal" subtests (Information, Comprehension, Similarities, Vocabulary) and designated by him Verbal Comprehension I. Arithmetic and Digit Span (Wechsler's other two Verbal subtests) fail to load this factor as often as they do so, particularly if a third group factor is isolated. Maxwell's (1959) first factor (verbal-intellectual) is clearly not the same factor as Cohen's

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1. For example, Lotsoff et al (1958) have analysed WISC and Rorshach batteries, Goodenough and Karp (1961) have analysed WISC and some of Witkin's "field dependence" measures, and Osborne, together with several collaborators has analysed the WISC together with four reference tests. (See, for example, Osborne, 1964,1965,1966 ;Osborne and Lindsay, 1967; and Osborne et al, 1967).

Verbal Comprehension, being more "general" than specifically verbal. Nevertheless, the tests having the highest loadings on this factor are the three "essentially verbal" subtests which entered into his analysis (Information was omitted).

b. A factor defined principally by Block Design and Object Assembly, although other Performance subtests may load it to smaller extents and at different age levels, is also well attested to. Cohen (1959) found that Coding was the only Performance subtest which bore no relation to this factor.

There is evidence then, that Wechsler's division of subtests into Verbal and Performance scales is not completely upheld by the results of factor analysis. Subtests which may not rightfully belong in the scales in which they have been placed appear to be Arithmetic, Digit Span and Coding. It may be that when sufficient variance (or specified factorial techniques) allow this to emerge, these subtests are most meaningfully viewed as definers of a third group factor.

2. The presence of a third group or non-general factor is less well established and there is disagreement, when it emerges, as to what it represents. Maxwell (1959,1960) and Baumeister and Bartlett (1962a) failed to isolate this as an underlying dimension of the performance of normals, although they found it to underly the performance of children abnormal in various respects. When a third factor emerges it is frequently loaded to the highest extent by Arithmetic and Digit Span, and (less frequently and to smaller extent by Coding. It has been designated "freedom from distractibility" (Cohen, 1959; Maxwell, 1960,1961) "memory" (Gault, 1954 ; Goodenough and Karp, 1962) "numerical" (Jackson, 1960 ; Burt, 1960) and "stimulus trace" (Baumeister and Bartlett, 1962a,1962b).

3. One can make few comments regarding the presence or strength of a general factor underlying WISC performance as a number of investigators have "rotated this away" in preference for simple structure. When a general factor does appear (either as a first order factor or as a second order "G" obtained from intercorrelating primary factors) it appears to account for about one third of the total variance in children's groups, and the evidence is that it increases in variance with increasing age of subjects (Hammer, 1950, and Gault 1954 ; Cohen, 1957 and 1959 ; Jones, 1960 ; and Cropley, 1964)

4. An interesting, but not yet cross-validated finding is that of Cohen (1959), that WISC subtests possess little specificity when communal and error variance is accounted for. This, if substantiated, would

suggest that subtests are more appropriately viewed as measurers of an underlying entity, the factor, rather than as separate, well defined entities in themselves.

5. A conclusion so obvious that it barely requires stating is that different methods of analysis can give rise to different solutions. In spite of this, there is some measure of agreement among results as points 1, 2, and 3 above indicate. That analysis of results of different test populations, using identical methods, may lead to different results is also obvious.

C. ABBREVIATED FORMS OF THE WISC

POINTS FOR AND AGAINST BRIEF TESTING

> "For anything beyond (screening purposes) the author would not recommend short scales". (Wechsler, 1958, p.112)

It is only within this limit that the usefulness of brief forms of the WISC can be evaluated, for it is now generally recognised that if a full intellectual assessment is required, the short form is inadequate.

Mumpower (1964) states that heavy case loads and lack of available time are usually given as reasons for a search for a valid short form. He continues:

> "If a valid Wechsler IQ can be obtained with only 15 to 20 minutes' investment of testing time, the benefit to the psychologist will be great, freeing him to work with more cases or to do additional testing with the case in hand". (p.111).

Previously omitted portions of the test can, as Glasser and Zimmerman (1968) point out, be administered at the end of the session or later, should partial results warrant the gathering of further information.

A point against brief testing may concern the validity of the form. Guertin et al (1962) point out, for example, that while high correlations have been reported between some of these instruments and the Full Scale, "... it must be remembered that they are exaggerated since they represent correlations of the parts with the whole." (p.5). A correlation of .90 is generally felt to be acceptable, but Mumpower says that, while such a figure "looks impressive", only 81 per cent of the variance is shared by the two tests. Mumpower himself reports a study in which 22 per cent of a group evaluated prior to recommendations regarding educational placement would have been miscategorised had a short form been used, although the correlation between the short form and Full Scale was .95. While admitting that recommendations are usually not made on intelligence scores alone, Mumpower feels that since the ultimate aim of intelligence testing <u>is</u> to obtain an index of mental ability, his was

a "valid" validating procedure.

Glasser and Zimmerman (1968) are of the opinion that the most telling critiscism of brief testing is that the eliminative procedures result in loss of information regarding important areas of functioning. This would apply more specifically to the type of short form using only selected subtests than to the modified split-half short form recommended recently by Lee (1966). However, to the extent that any curtailment of time spent with the testee reduces the tester's opportunity of acquiring information about him, the above critiscism could be extended to apply also to the latter type of short form.

Silverstein has adequately summed up the position:

"The primary consideration in deciding to use a short form ... in place of the Full Scale is the price one is willing to pay in validity for a saving of time and effort". (1967a, p.38)

TYPES OF WISC SHORT FORMS IN USE

1. The Selective-partial WISC: Here the examiner decides which part of the scale is most applicable to the subject. Glasser and Zimmerman (1968) mention in this connection the use of the Verbal scale with the blind and orthopaedically handicapped, and the use of the Performance scale with the deaf, with foreign children, and with thos with speech defects. This type of "short form" will not concern us here.

2. Short Forms using Selected Subtests: Here six or fewer subtests may be used to calculate Full Scale IQ either by the proration method or by means of a specially developed regression equation. Short forms in this category comprise the majority of those suggested for the WISC.

3. Modified or Corrected Split-half Abbreviations: This type of form has been used more extensively with the WAIS than with the WISC. Here every second or third item of subtests which lend themselves to splitting may be administered, and the raw scores are multiplied by the appropriate constant before conversion to scaled scores. Tests which do not lend themselves to splitting are applied as wholes.

SHORT FORMS USING SELECTED SUBTESTS

METHODS OF TEST SELECTION

1. Combinations Suggested by Research with the W-B: The first investigators to publish research on WISC short forms (Carleton and Stace 1954) selected their 21 subtest combinations (ranging from 2 to 5 subtests) from those in use on the W-B and reviewed by Herring

(1952). It now seems agreed that since the W-B and WISC are separate tests, such an "arbitary approach" is open to doubt (Glasser and Zimmerman, 1968).

2. Combinations Selected on the Basis of the Performance of the Standardisation Sample:

McNemar (1950) appears to have been the first to insist that the standardisation data of the W-B be used as a reference point in test selection (rather than the performance of "deviant" groups) if the short form is to have any general applicability. Using intercorrelations between subtests published in the W-B manual, he devised a formula by means of which the correlations of every possible combination of 2, 3, 4 and 5 subtests with the Full Scale could be determined. This approach was used with the WAIS by Eileen Maxwell (1957) with success, and in 1959 Geuting[1] evaluated all 3 and 4 subtest combinations for the 7½, 10½ and 13½ year levels of the WISC standardisation sample. Later Howard [2] (undated extended this work by evaluating every 2, 3, 4 and 5 subtest combination for these age levels.

Another approach using standardisation data as a reference point has been that of Cohen (1959) and Maxwell (1959) who have performed factor analyses of the intercorrelations, and suggested short forms based on subtests which correlate to the highest extent with the factors isolated.

There have also been instances in which partial use of the standardisation data has been made in selecting subtests. For example, Nickols (1962) selected his subtests on the grounds of their high correlation with the Full Scale as well as on the ground of convenient use and the possibility of precision scoring.

3. Combinations Selected with Reference to Data Obtained from a Sample of the Type of Population for Which the Test is Required:

The approach used by McNemar (1950) and extended to the WISC by Geuting (1959) and Howard (undated), has been used by several investigators to determine the most valid combinations of different lengths for particular groups in which they are interested. Thus Schwartz and Levitt (1960) evaluated all combinations of 2 to 6 subtests for a group of mentally retarded school children, Enburg et al (1961) evaluated all 3 to 5 subtest combinations for an emotionally disturbed group, and Osborne and Allan (1962) investigated all 3 subtest combinations for a mentally retarded group.

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1 & 2. These studies are unpublished, and information regarding them has been obtained from the work of Glasser and Zimmerman (1968).

The Wherry-Dolittle test selection method is perhaps a more economical method than the above for selecting a combination for a particular group, and one which has been used with satisfactory results by Finley and Thompson (1958) and by Clements (1965) for atypical groups. Other criteria used include inspection of correlations between subtests and the Full Scale, and, as is to be expected, several investigators have used their own arbitrarily selected criteria, the details of which cannot be given here due to lack of space.

COMPARISON OF THE METHODS OF TEST SELECTION - THE NEED FOR CROSS-VALIDATION

Using the standardisation data as a reference point appears to be the most satisfactory method if groups of children requiring screening are similar to the standardisation population and of average intelligence. For deviant and presumably more homogeneous groups (more likely to be in need of screening, perhaps) it appears wise that particular combinations should be checked and their validity for the group in question ascertained. This was the approach of Howard (undated) who, after ascertaining the best combinations for the normative sample, checked these on two smaller atypical groups - mentally retarded children and "wayward girls". (Glasser and Zimmerman 1968, p.126).

When short forms of the WISC have been developed for a specific sample, the authors usually stress the limited applicability of their form. Some combinations (e.g. Vocabulary and Block Design) do seem to have wider applicability, but it is clear that such combinations must be carefully checked with a new population before being used for any form of decision making regarding individuals. Mumpower (1964) and Silverstein (1967b) both recommended that,in addition to inspection of validity coefficients, it should be ascertained what proportion of a group will be misclassified according to pre-determined categories such as those provided by Wechsler (1949,p.16).

Schwartz and Levitt (1960) are of the opinion that some choice regarding suitable combinations should be allowed the examiner. They say:

> "Considerations other than validity are often of consequence in choosing a short form. Administration time, handicaps in the child, or the examiner's preference for particular subtests may dictate the choice." (p.188).

Finding that the range of validity coefficients yielded by combination of a specific length was somewhat restricted in their research, they published, not the "best" short forms in each category, but a selection of 5 maximally different dyads, triads, quartets, quintets and hexads selected from the best two dozen in each category. Glasser and

Zimmerman (1968), by publishing selections from the less generally available works of Guting and Howard, have also made it possible for the examiner to exercise some choice in the selection of combinations for possible use with normals, and, after further resear possibly with atypical groups. Bridges (1959) has published "nomographs" as an aid to calculation of the validity of from 2 to 7 subtest combinations, as based on McNemar's formula. This published research enables an examiner to select a combination and check its validity as determined by standardisation statistics, before deciding whether or not it shows potential for further standardisation with an atypical group.

A SELECTIVE REVIEW OF SOME RESULTS OBTAINED WITH SHORT FORMS

1. Study of all Combinations: As is to be expected, the greater the number of subtests used, the higher the validity of the combinatio Table III (p.46) makes this relationship clear. This Table also indicates the following:
   a. For mentally retarded children (average IQ 70) the coefficients are generally lower than for normals (Schwartz and Levitt,1960; Osborne and Allen, 1962). If correlations below 90 are not acceptable, it appears that a quintet will be necessary.
   b. For groups of average intelligence, quartets and even some tria seem to suffice. For groups comparable to the standardisation sample, only some dyads (four in number) would suffice, and thi only at the 10½ year level.
   c. Interesting to note from the results of Howard and of Gueting is the fact that short forms of each length appear most valid a the middle age level (10½) and least valid at the youngest age level (7½).

   General conclusions from this group of studies then are that both intellectual level and age should be taken into consideration when deciding whether or not to use a short form, and in deciding upon the length of the combination to be used.

2. Examples of Studies of Preselected Subtest Combinations:

   Carleton and Stacey (1954) inaugurated research with WISC short forms. They used 21 short forms previously used with the W-I and evaluated these with 365 possible defectives aged 7 to 16, and with mean IQ 68. Resulting validity coefficients ranged from .64 to .80 for dyads, .73 to .84 for triads, from .82 to .88 for quartets and .88 for two quintets. Yallowitz and Armstrong (1955) encouraged by these results, chose three short forms using subtest with high reliability for the standardisation sample and evaluated

TABLE III

RANGES OF VALIDITY OF SHORT FORM COMBINATIONS OF VARYING LENGTH

TYPE OF FORM	INVESTIGATION	RANGE OF BEST VALIDITY COEFFICIENTS	NUMBER OF "BEST" COMBINATIONS
Hexads	(1) Schwartz and Levitt (1960) 177 retarded children, 68% Negro, 32% White. Mean IQ 70, Mean age 13;4	.945 to .932	best 25
Quintets	(1) Howard (undated); standardisation sample, ages 7½	.95 to .94	best 10
	10½	.97 to .95	best 10
	13½	.96 to .96	best 10
	(2) Schwartz and Levitt (1960)	.92 to .90	best 13
	(3) Enburg et al (1961); 147 suspected emotionally disturbed; average IQ, Mean age 11;3	.96 to .95	best 10
Quartets	(1) Howard (undated) 7½	.93 to .92	best 10
	10½	.96 to .95	best 10
	13½	.95 to .94	best 10
	(2) Geuting (1959); standardisation sample	results as for	Howard
	(3) Schwartz and Levitt (1960)	.89 to .88	best 12
	(4) Enburg et al (1961)	.94 to .94	best 10
Triads	(1) Howard (undated) 7½	.90 to .88	best 10
	10½	.94 to .93	best 10
	13½	.93 to .92	best 10
	(2) Geuting (1959)	results as for	Howard
	(3) Schwartz and Levitt (1960)	.84 to .82	best 12
	(4) Enburg et al (1961)	.93 to .91	best 10
	(5) Osborne and Allen (1962) 50 mentally retarded, Mean IQ 70, Mean age 10;1	.87 to .87	best 10
Dyads	(1) Howard (undated) 7½	.83 to .81	best 10
	10½	.91 to .88	best 10
	13½	.89 to .86	best 10
	(2) Schwartz and Levitt (1960)	.79 to .71	best 10

these with a heterogeneous group of 229 children, aged 5 to 15, referred to a child guidance clinic for a variety of problems. Average IQ was normal, but considerable scatter was in evidence. The validity coefficients obtained were disappointengly low : .51, .61 and .57, and the authors considered that short forms did not appear promising for a heterogeneous group such as their own.

This was followed by research by Finley and Thompson (1958), who developed a five subtest combination (Information, Picture Completion, Picture Arrangement, Block Design and Coding) by the application of the Wherry-Dolittle test selection method to scores of their group of 309 mental retardates (mean IQ 68, age range fro 8 to 13). The validity coefficient reported was .896 (standard error of estimate 3.12 IQ points). A regression equation was presented for the calculation of Full Scale IQ from scores on these five subtests.

The Finley-Thompson scale has been subjected to cross validation with other retarded groups. Thompson and Finley (1962b) checked its validity with a group of retardates of similar age and IQ and obtained a coefficient of .855. Judged by this criterion a on that of similarity between mean Full Scale and short form IQ's, this scale was conceived as valid for retardates by its authors. Kilman and Fisher (1960) performed a cross-validational study using 145 institutionalised retardates of mean IQ 58 and ranging in age from 7 to 16. Using a procedure identical with that of Finley and Thompson they obtained a validity coefficient of .865, but found mean short form IQ to exceed mean Full Scale IQ significantly. Using the same subtests and the straight proration method rather than the supplied regression equation, they found no differences between short form and Full Scale IQ's, and the coefficient was only slightly reduced to .845. Other criteria showed the regression method to be superior, in spite of over-prediction.

Sosulski (1961) (as cited by Glasser and Zimmerman,1968) validated this form with 80 retardates (age and intelligence figures not available) and obtained a coefficient of .90 - a result comparable with that of Finley and Thompson (1958). This form is accepted by its users as promising, in spite of the fact that it barely attains acceptable validity. It is interesting to note that this particular form has higher validity with certain no retarded groups. It yields a correlation of .95 with Full Scale for the 10½ age group of the standardisation sample, and one of .96 for Howard's "wayward girls" (Glasser and Zimmerman,1968, p.143), which again emphasises the fact that for retardates, short

forms are slightly less satisfactory than they are for normals.

Another combination which has been subjected to much cross-validation is the dyad consisting of Vocabulary and Block Design. According to Howard's figures, this is the best dyad for the 10½ and 13½ year groups of the standardisation sample, yielding validity coefficients of .91 and .89 respectively. It was initially studied with an independent sample by Simpson and Bridges (1959) using 120 suspected emotionally disturbed children aged 5 through 16 and of average intelligence, on which occasion a validity coefficient of .87 was obtained. Wight and Sandry (1962) obtained a validity coefficient of .91 for 83 children hospitalised for physical disabilities, and Mumpower (1964) obtained the figure of .95 for "exceptional children" (mean IQ 86, aged 7 through 16). Mumpower, however, submitted results to a more stringent test of validity and found that 22 per cent of the group was misclassified according to intellectual level. More recently, Silverstein (1967) evaluated the combination on the WISC and the WAIS. On the former the correlation proved to be .878, corresponding to an error of estimate of about 7.2 IQ points. Silverstein feels that the magnitude of this error is not prohibitive.

Numerous other combinations have been suggested in the literature, some with good results. Since there is no record of cross validation in the majority of cases, and since atypical samples have for the most part been used, it is not considered necessary or worthwhile to review these individual studies here. There is, however, one particular short form to which we wish to devote further attention, and this is the Vocabulary, Similarities, Block Design and Object Assembly quartet of Maxwell, which is evaluated in the present research.

A.E. MAXWELL'S SHORT FORM OF THE WISC

Reference has already been made in the section on factor analyses of the WISC to the study of Maxwell (1959) and his techniques and results have been commented upon. Maxwell (1959) found that the subtests Similarities and Vocabulary best defined a verbal-intellectual factor and that the subtests Block Design and Object Assembly best defined a spatial-perceptual factor for the three ages of the standardisation sample. It was as a result of this study that a "shortened WISC" [1] was recommended, and this is at present in use

1. Mr. M.Herbert introduced this abbreviated WISC to the Child Guidance Clinic in Durban. Mr.Herbert, at present at the University of Leicestershire, worked with Dr.Maxwell at Maudsley hospital. On the writer's request he kindly supplied her with enclosures from the "Maudsley Handbook" which appear in Appendix I and explain clearly how IQ's are derived from the four subtests.Mr.Herbert reports that an additional article concerned with the short form,has not,to his knowledge, been published by Dr.Maxwell.

at Maudsley Hospital, and at the time that the present research was commenced it was also in use in the non-European section of the Child Guidance Clinic in Durban.

The only report on the use of this form which the present writer has been able to locate is that of Turner et al (1967) with a psychiatric group of 26 boys seen at the Children's Department of Maudsley Hospital and re-evaluated after six months. No correlations between Full Scale and short form are reported, but the Verbal factor correlated with the Full Scale to the extent of .65 and the Performanc factor - Full Scale correlation coefficient was .83. The reliability of the Verbal factor score (test-retest) was .79 and that of the Performance factor score, .72.

The Similarities - Vocabulary - Block Design - Object Assembly quartet (S - V - BD - OA) does not appear among any of the specifically studied forms, neither is it among the best quartets reported by any investigator who has examined all possible quartets. We have already reported Howard's (undated) results with the V - BD dyad for ages 10½ and 13½ for the standardisation sample. For these groups the addition of Similarities increases validity coefficients to .94 and .92 respectively. Enburg et al (1961) give a figure of .92 for this triad used with emotionally disturbed children. The present writer has calculated the validity of the S - V - BD - OA quartet using intercorrelations published in the WISC manual (1949) and nomographs supplied by Bridges (1959). Figures for the 10½ and 13½ year levels are .945 and .925 respectively. This quartet then appears sufficientl valid for groups similar to the standardisation sample of the WISC. Its validity with other groups needs to be ascertained, and this will be done for an Indian group in our own research.

3. Short Forms using the Modified or Corrected "split-half" Method

This research was suggested by results of those who attempted to "split" individual subtests or scales of the Wechsler tests. Armstrong (1955) considered the possibility of abbreviating the WISC Vocabulary subtest in such a manner, and for a Child Guidance clinic population she found the correlation between one half of the scores an the total raw score to be .88 (increased to .94 by use of the Spearman Brown formula). This initial research suggested the feasibility of splitting this subtest, and subsequent research by Jastak and Jastak (1964) has largely confirmed Armstong's results.

More extensive splitting was, until fairly recently, confined to the WAIS. Wolfson and Bachelis (1960) "split" the Verbal scale of this test by using every third item on Information and Vocabulary,

every second item on Comprehension, Arithmetic and Similarities, and leaving Digit Span intact. The resulting raw scores were multiplied by the appropriate constant before conversion to scaled scores. These writers reported a correlation of .97 between scores derived from the split and actual scores. The method was extended by Satz and Mogel (1962) and Pauker (1963) to the entire WAIS scale with promising results. Correlations between Full and abbreviated scales were in the high nineties in both studies. In the Satz-Mogel study subtest validities ranged from .77 for Object Assembly to .97 for Vocabulary, and in Pauker's study subtest validities ranged from .83 to .97. Both these studies used atypical groups. Estes (1963) has provided evidence that this type of scale is just as useful for "normals".

Lee (1966) has developed a similar abbreviation of the WISC (every third item on Vocabulary, Information and Picture Completion, every second item on the remaining subtests except for Digit Span and Coding which do not lend themselves to splitting and which are left unchanged). Rescoring of profiles of 147 child patients with mean IQ 104 and age range from 6 to 15 in this fashion, and correlating the split form with Full Scale IQ, led to correlations between the split form and Full Scale of .97, .96, and .93 for Full, Verbal and Performance scales respectively. Subtest validity coefficients ranged from .76 for Picture Completion to .94 for Block Design, and while these coefficients were lower than for the earlier work with the adult scale, results of this preliminary research were considered promising.

The advantage of this type of scale is, of course, that with the administration time reduced by at least half, each area of functioning considered important by Wechsler is still tapped, providing a fuller picture of an individual's overall performance. Its defects have not been overlooked, however, in research with the WAIS. Zytowski and Hudson (1965) have criticised spuriously high coefficients - higher in most cases than reliabilities of the subtests themselves - on the grounds of contamination due to the presence of the shorter scale embedded in the longer test. Rescoring profiles of high school and college students and correcting for contamination, these investigators found coefficients to be reduced to "more reasonable levels" (.92, .88, and .88 as opposed to .97, .95, and .95 for Full,Verbal, and Performance scales respectively). Subtest coefficients, after correction, ranged from .54 for Picture Arrangement to .95 for Vocabulary. As a result of these lower subtest validities, "Profile interpretations of the split-half administration are cautioned against except for differences in the two IQ scores". (p.294).

COMPARISON OF THE "SELECTIVE SUBTEST" AND "SPLIT" ABBREVIATIONS

No such comparison has, within the period of literature reviewed, been performed with the WISC as far as the writer has been able to ascertain, but Watson's (1966) comparison of three types of WAIS forms is interesting. He compared the efficacy of the Doppelt short form (1956) (Arithmetic, Vocabulary, Block Design, Picture Arrangement - IQ's calculated from a regression equation), the Doppelt subtests used to yield an IQ by the straight proration method, and the Satz-Mogel method in predicting IQ's of 80 patients (40 organics and 40 schizophrenics). Doppelt-Full Scale, and prorated Doppelt tests-Full Scale correlations were similar (.947 and .948), but the Doppelt form was found to overpredict significantly. Correlations between the Satz-Mogel form and Full Scale were higher (.977) and intelligence was not overpredicted. These figures suggest that the split-half form is the better predictor of intelligence for a group such as this; however, no correction for contamination was reported.

It is clear that there is a need for further research of this nature, and with widely differing groups, before a judgment can be made as to the superiority of any type of short form. In such research, objections of those who have raised questions regarding one or other of the short forms should be borne in mind. What does emerge from these studies is the fact that certain short forms have proved useful for certain populations. This finding adds credence to this field of study as a legitimate one, and one which may encourage individual examiners to experiment further with short forms suitable for the type of population which interests them.

III. RESEARCH UNDERTAKEN FOR THE PRESENT INVESTIGATION

In this section results of the analyses of abbreviated WISC performance of the Durban Clinic group of Indian children will be reported prior to a more detailed account of the independent research with the WISC undertaken by the writer. The independent research grew out of the findings with the Clinic sample, since these proved interesting and suggested that further research was warranted.

A. ANALYSIS OF ABBREVIATED WISC ACHIEVEMENT OF A CHILD GUIDANCE CLINIC GROUP OF DURBAN INDIAN SCHOOLCHILDREN:

As was mentioned in the introduction to this thesis, the present project was stimulated by the director of the Durban Child Guidance Clinic who had noted that when Indian children with learning disabilities were tested with Maxwell's abbreviated WISC, Verbal IQ tended to exceed Performance IQ, especially in the case of girls tested. No statistical evaluation of results had been undertaken, and it was suggested that the writer should perform this analysis, and if results merited this, plan an investigation into the performance of a larger, carefully selected group of Indian children on the full WISC. The validity of Maxwell's form, it was suggested, could also be evaluated in this way.

The Clinic Sample:

It was found that 39 children referred to the Durban Clinic specifically for scholastic problems and as possible candidates for remedial education had received Maxwell's abbreviated WISC from 1964 to June 1967. Three of these children were eliminated from consideration on account of age beyond 16 years and records of 36 children (13 boys and 23 girls) remained for analysis. Boys' and girls' groups were found to differ in age, but to obtain similar mean IQ'S as Table IV indicates:

TABLE IV

AGE IN MONTHS AND FULL SCALE ABBREVIATED WISC SCORES OF THE CLINIC SAMPLE

Group	N	Variable	Range	Mean	S.D.	"t"	Degrees of freedom	Level of significanc
entire group	36	age in months	110-191	153.1	20.81			
boys	13	age in months	110-170	137.5	17.86)	3.856	34	<.01
girls	23	age in months	129-191	161.1	17.19)			
entire group	36	IQ	74-105	89.1	8.60			
boys	13	IQ	75-105	89.6	9.81)	.2503	34	-
girls	23	IQ	74-104	88.8	7.95)			

In respect of number, and in respect of age, groups are thus poorly matched. As would be expected from differences in age, there is also a difference in grade placement of the groups, the median for boys being standard III, and for girls, standard V. Lower age of boys may be due to the fact that in the Indian community more stress is placed on the boy obtaining an adequate education (Kuper,1960). Any sign of scholastic backwardness may then be noticed earlier, and attempts made to remedy this sooner in the case of boys. One can draw no conlusions from different numbers of boys and girls tested, as the abbreviated WISC is only one of the tests applied to such children at the Clinic. Both boys' and girls' groups are seen to achieve mean scores in the upper ranges of Wechsler's "dull normal" category of intelligence (80-89).

In Table V (below), boys' and girls' scores on the four subtests comprising Maxwell's short form, and on Verbal and Performance scales so derived, are set down, and the significance of differences is estimated. No significant differences are revealed, although there is a tendency for girls to perform better on Similarities and Vocabulary, and thus on the abbreviated Verbal scale. Boys tend to do better on Block Design and Object Assembly, and thus on the abbreviated Performance scale. It will be seen that both boys' and girls' groups make "average" scores on the shortened Verbal scale and "dull normal" scores on the shortened Performance scale.

TABLE V

RESULTS OF GROUPS ON FOUR WISC SUBTESTS[1] AND ON VERBAL AND PERFORMANCE IQ'S DERIVED FROM THESE

Group	N	Measure	Range	Mean	S.D.	"t"	Degrees of Freedom	Level of significance
boys	13	Similarities	5-14	9.5	2.76)	1.1434	34	-
girls	23	Similarities	6-14	10.5	2.21)			
boys	13	Vocabulary	2-11	6.54	2.69)	.7169	34	-
girls	23	Vocabulary	4-10	7.13	1.58)			
boys	13	Block Design	3-12	7.84	2.51)	.3812	34	-
girls	23	Block Design	3-13	7.50	2.63)			
boys	13	Object Assembly	1-13	6.6	3.85))	1.186	34	-
girls	23	Object Assembly	2-11	5.2	2.43)			
boys	13	Verbal IQ	73-114	89.6	13.78)	.9524	34	-
girls	23	Verbal IQ	78-106	93.6	8.31)			
boys	13	Performance IQ	55-114	84.2	16.43))	.7908	34	-
girls	23	Performance IQ	58-103	80.00	13.03))			

1. Subtests are in scaled score units in order to correct for age heterogeniety.

The entire group performs in average fashion only on Similarities (mean 10.1) after which there is a drop of over two scaled score points to Block Design (mean 7.64). The mean score on Vocabulary is over three scaled score points (or one standard deviation) below normal, and a very inferior score is made on Object Assembly.

It remains to be seen whether differences between Verbal and Performance IQ's within groups are significant. This analysis is set down in Table VI (below), the "t" test for matched groups or correlated observations (Edwards, 1960, p.136) having been used.

TABLE VI

DIFFERENCES BETWEEN VERBAL AND PERFORMANCE IQ'S WITHIN GROUPS

Group	N	Verbal mean	Performance mean	Difference	$S_{x_1 - x_2}$	"t"	Degrees of freedom	Level of significance
entire group	36	92.14	81.5	10.64	2.485	4.282	35	< .01
boys	13	89.60	84.2	5.4	5.529	.977	12	-
girls	23	93.60	80.0	13.60	2.154	6.314	22	< .01

The difference is seen to be significant in the case of the entire group, but when the sex groups are considered separately, only girls obtain a significant discrepancy score. Combining the two groups and speaking of the entire group as "Verbal dominant" would not seem valid due to the poorness of matching of the sex groups on number, age and standard placement.

It is also of interest to consider the distribution of discrepancy scores in the light of Seashore's (1951) criteria. This analysis is only made for the sake of interest as this small group is in no way representative of any definite Indian community, and an abbreviated WISC, the validity of which is at present unknown, has been used. We use Seashore's "larger" discrepancy scores for comparison without apology, for the very fact that we have used WISC norms (scaled scores and IQ's) means that we are comparing this group with the standardisation sample. Numbers in each group obtaining positive discrepancy scores of 13 points or above, discrepancies of under 13 points, and negative discrepancy scores of 13 points or above are accordingly set down in Table VII (page 55), together with expected frequencies of these scores as derived from Seashore's analysis. Actual and expected discrepancies have been compared by means of the Chi-square test [1] for each group.

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1. Edwards, (1960, pp. 150-151).

TABLE VII

ACTUAL AND EXPECTED NUMBERS OF CHILDREN OBTAINING V > P (13 POINTS OR MORE), V = P (A DISCREPANCY LESS THAN 13 POINTS), AND P > V (13 POINTS OR MORE), SCORES

	Boys (N = 13)		Girls (N = 23)		Entire group (N=36)	
	Actual	expected	actual	expected	actual	expected
V > P	4	2.16′	13	3.83′	17	6
V = P	6	8.66′	10	15.33′	16	24
P > V	3	2.16′	0	3.83′	3	6
X^2	2.699		27.626		14.118	
Degrees of freedom	2		2		2	
Level of significance	-		<.01		<.01	

This analysis shows that, as was the case when the "t" statistic was used, it is abnormality of the scores of <u>girls</u> which accounts for abnormality of scores of the entire group when sexes are combined.

SUMMARY AND CONCLUSIONS, WITH IMPLICATIONS FOR FURTHER RESEARCH

Abbreviated WISC profiles of 36 Indian children (13 boys and 23 girls) referred to the Durban Clinic as possible cases for remedial education were examined. Boys' and girls' groups were poorly matched in number, and on age and educational standard, but did not differ with respect to intelligence.

When the group was considered as a whole, Verbal IQ exceeded Performance IQ significantly and distribution of discrepancies was considered abnormal in the light of Seashore's (1951) finding with the standardisation sample. When boys' and girls' groups were considered separately, however, these peculiarities were found to apply only to the girls' group, and the doubtfulness of combining sex groups was discussed, as these were so poorly matched. No inter-group differences were found on subtests or scales employed.

Several points of interest have arisen from this preliminary analysis of data, perhaps because its results are so limited in their applicability. Apart from small numbers employed, an abbreviated WISC, the validity of which is unknown for Indian children, was used. Secondly, the group was atypical in that all children were experiencing

scholastic difficulty, and thirdly, sex groups were so poorly matched that it was not possible to combine them and describe the performance of the group as a whole.

Limited application of the WISC in the above respects may have been responsible for the observed trend of results. In order to counteract these effects it would appear necessary to apply the full WISC to a larger group of children, carefully selected to be representative of a specific population. In order to describe the performance of the entire group, and to examine differential sex differences, boys' and girls' groups should be carefully matched. Lest the "pattern" obtained in the preliminary analysis should be characteristic of Indian children with scholastic difficulties, it appeared advisable to select, for an experimental sample, representative proportions of children who were achieving at school relative to those who had failed to achieve the required standard. These factors were all borne in mind in selecting the required experimental group to be subjected to full WISC evaluation.

B. THE INDEPENDENT EXPERIMENT

1. AIMS

A general aim of this research was to select well matched groups of boys and girls, representative of a specific section of the Durban Indian Community and containing proportionate numbers of normals (non-failing subjects) and retards (subjects who had failed a class or standard) and to describe WISC performance of the group and subgroups on the WISC and on Maxwell's abbreviated version of this.

Specifically, the writer was interested in obtaining information which would shed light on the following questions arising from reviewing literature on the WISC and/or from analysis of profiles of the Durban Clinic Sample.

1. Do Verbal and Performance subtests of the WISC load well defined factors, justifying the division of the subtests into these scales?
2. Is there a tendency towards Verbal dominance for the group studied and for subgroups defined in terms of sex and the normal/retard variation? If so, can reasons be sought for this with reference to the relevant literature?
3. Is Maxwell's short form of the WISC entirely valid for the present group? If this is in doubt, an attempt is to be made to suggest other short forms of the WISC for further research with Indian children similar in background to those who comprised the present sample.

Since this research is of an exploratory nature, no hypotheses are formulated, the aim being simply to attempt to provide answers to the above questions which have interested both the writer and the staff of the Durban Child Guidance Clinic.

2. PROCEDURE

Factors governing selection of subjects

Since the research was to be in the nature of an exploratory study it was decided that subjects would be selected from a fairly homogeneous background in order to minimise the effect of uncontrolled factors which might influence results.

a. Since we were interested in the performance of South African Indians, it was decided that all subjects should have been born and educated entirely in South Africa.

b. Since Kuper (1960) states that the main division in Indian society is on religious lines, it was decided that all children should be from one religious group. Since the Hindus are the largest group in Durban (Kuper et al, 1958), this was the group selected.

c. After religion, the cultural-linguistic division among Indian people is of importance (Kuper,1960). It was hoped that it would be possible to control this factor by selecting subjects from the same group. This proved impossible, if other factors were to be controlled. Since bilinguals and monolinguals may perform in different fashion on intelligence tests and since preliminary enquiry suggested that it would be difficult to obtain a sample of "pure" monolinguals, it was decided to select only bilinguals (those who reported speaking one of the vernaculars at home) for this research.

d. As it was desirable to have well matched groups of boys and girls for this study, it was proposed to select children from schools in the same area, catering predominantly for the same linguistic group and presumably individuals of similar socio-economic status. Having controlled background to this extent it was hoped that boys and girls could be individually matched on age, standard, failure/non-failure at school and a measure of intellectual capacity. Raven's Progressive Matrices Test (1938 and 1956) was selected as this measure.

e. Preliminary enquiry revealed that approximately one-third of the pupils in the schools to be visited and in the standards to be studied were retards in the sense of having failed at least one school year. It was proposed, then, to select subjects so that one-third of the sample would be retards, while the remaining two-thirds would be normal or non-failing children.

Selection of subjects

Schools visited

After discussion with Mrs. V. Padayachee[1] it was decided to approach the Department of Indian Education for permission to select subjects from Manilal Valjee and Kathiawad Junior Schools, established by the Hindu Gujarati-speaking community for the education of boys and girls respectively. These schools fulfil conditions stated in (d) above, catering mainly for Gujarati-speaking children, but admitting children from other religious and linguistic groups when vacancies occur. Mrs. Padayachee felt that principals of these schools would co-operate with regard to the research, and that they would be able to provide adequate facilities for individual testing, an important consideration. Departmental permission was granted, and principals and staff of the two schools were extremely kind in giving every assistance to the tester.

The Hindu Gujarati-speaking group comprise a rather select minority group, rather more wealthy and in some respects more "traditionalistic" than the average Natal Indian (Kuper et al,1958; Kuper,1960). Thus, by selecting subjects predominantly from this group, we render our sample rather select, and in no way representative of the wider Indian community.

Method of selection

From 29th May to 2nd June,1967, all children in standards V, IV and III at the schools filled in a Questionnaire (see Appendix II) eliciting personal and background information, and completed the Raven's Matrices Test in group sessions under the supervision of the writer. The Coloured form of the Test was administered to children in standard III, while standard IV and V pupils completed the Standard form. Ample time was given each child and an effort was made to see that all instructions were understood. Table VIII (below) indicates the numbers of children so "screened" as possible cases for selection to the final sample.

TABLE VIII

NUMBERS OF CHILDREN INITIALLY SCREENED

Standard	Normal boys	Retarded boys	Total boys	Normal girls	Retarded girls	Total girls	Total children
V	58	31	89	30	18	48	137
IV	51	24	75	27	15	42	117
III	46	28	74	25	17	42	116
TOTAL	155	83	238	82	50	132	370

1. See footnote 2 p.13

Before analysis of age and Raven's results, children from each standard were divided into normal and retard groups as shown in Table VIII, retaining the sex division. This information was checked with teachers when there was any doubt as to incorrect reporting. Retards are seen to comprise approximately one-third of subjects (the actual retard-normal ratio being 36 : 64). After this division, means and standard deviations of age and Raven's scores were worked out for each of the 12 resulting groups, and each boys' group was compared with the corresponding girls' group on these measures in order to evaluate the feasibility of combining groups and selecting boys and girls according to the same criteria. Table IX (below and p.60) shows relevant figures for the groups. A two-tailed test for independent groups was used to examine significance of differences:

TABLE IX

AGE AND RAVEN'S SCORES OF CHILDREN IN STANDARDS V, IV AND III

1. AGE IN MONTHS

Std.	Group	N	Range	$\bar{X}$	S.D.	"t"	Degrees of freedom	Level of significance
V	normal boys	58	132-168	146.33	6.85)	1.699	86	n.s.
	normal girls	30	135-172	150.0	10.75)			
	all normals	88	132-172	147.60	8.57			
	retard boys	31	149-202	166.60	13.75)	.2570	47	n.s.
	retard girls	18	152-211	165.83	13.64)			
	all retards	49	149-211	166.30	13.43			
IV	normal boys	51	123-154	136.45	7.44)	1.764	76	n.s.
	normal girls	27	124-160	140.30	9.96)			
	all normals	78	123-160	137.78	8.69			
	retard boys	24	140-197	156.29	13.02)	.0119	37	n.s.
	retard girls	15	143-191	156.34	12.52)			
	all retards	39	140-197	156.31	12.66			
III	normal boys	46	109-150	125.20	9.63)	.786	69	n.s.
	normal girls	25	110-153	125.00	10.31)			
	all normals	71	109-153	125.10	9.83			
	retard boys	28	112-176	140.43	13.46)	1.752	43	n.s.
	retard girls	17	125-181	148.12	14.60)			
	all retards	45	112-181	143.67	14.25			

TABLE IX (Continued)

2. RAVEN'S SCORES (RAW SCORES)								
Std.	Group	N	Range	$\bar{X}$	S.D.	"t"	Degrees of freedom	Level of significance
V	normal boys	58	9-48	36.46	8.67)	1.844	86	n.s.
	normal girls	30	10-48	32.33	10.56)			
	all normals	88	9-48	35.06	9.46			
	retard boys	31	8-48	34.64	9.87)	2.388	47	$<.05$
	retard girls	18	9-44	26.39	10.68)			
	all retards	49	8-48	31.22	10.23			
IV	normal boys	51	4-46	29.51	10.92)	1.842	76	n.s.
	normal girls	27	12-49	34.26	10.73)			
	all normals	78	4-49	31.15	11.09			
	retard boys	24	6-47	25.49	10.11)	.356	37	n.s.
	retard girls	15	11-45	23.67	12.26)			
	all retards	39	6-47	24.49	10.81			
III	normal boys	46	6-35	22.28	6.09)	1.240	69	n.s.
	normal girls	25	6-33	20.95	7.53)			
	all normals	71	6-35	21.79	6.58			
	retard boys	28	11-33	22.65	6.50)	.904	43	n.s.
	retard girls	17	12-31	20.76	6.63)			
	all retards	45	11-33	21.93	6.52			

It may be seen from this Table that in only one instance is there a sex difference on these variables. This is for retarded children in standard V on the Raven's test and is significant at only the .05 level of confidence. It was decided, therefore, to combine scores of boys and girls in each group and to work out new means and standard deviations for the combined group. These also appear in Table IX. It was decided that, in the final selection of subjects, children whose age and Raven's scores fell within one standard deviation from the mean of the group in which they were placed would be considered as possible candidates for the sample, provided that they fulfilled other selection requirements, such as birth and education in South Africa, being of the Hindu religion, and being "bilingual". A further stipulation was that they should be free from speech defects, and to aid in selection teachers were asked to provide lists of children so handicapped. Such children were automatically excluded from consideration, it being felt that the presence of these might embarrass

children in the presence of a strange examiner and hinder establishment of rapport.

The reason for considering only children whose age and Raven's scores fell within one standard deviation from the mean of the group in which they were placed was that it was felt that such a procedure would aid in rendering children representative of that particular group in terms of age and intellectual capacity as measured by the Raven's test. No particularly "deviant" individuals were selected to the group. The Raven's test was selected as a rough guide to intellectual ability only. Research has shown that it is not as free from the effects of cultural learning as Raven (1938) originally supposed, but Burke (1958) who has reviewed the test at length says of it that:"Perhaps it is as nearly culture free as any other test is or can be." (p.218). Moreover, it possesses high "g" saturation (Burt, as cited by Raven, 1956). Our subsequent results with the WISC attest to the fact that this test may be a good screening device for Indian children, a point which we shall have occasion to mention later.

The final selection criteria for normals and retards in each standard (upper and lower limits as determined by one standard deviation below and above the means for each group) are set down in Table X (below) which shows the limits within which scores were to fall if children were judged appropriate for selection to the final sample.

TABLE X

SELECTION CRITERIA FOR NORMALS AND RETARDS IN THE THREE STANDARDS

Std.	Group	Age in months	Raw score on Raven's
V	normals	140-156	26-44
	retards	153-180	21-41
IV	normals	128-146	21-42
	retards	144-168	14-35
III	normals	116-134	16-28
	retards	129-157	16-28

When children who satisfied all selection criteria (in terms of both scores and in terms of background) were isolated, there were, as might be expected, many more boys than girls "available" for selection. Since it was considered imperative to have individually matched groups of boys and girls, the final choice of subjects was made by considering scores of girls available, and, from the larger "pool" of boys, selecting the individuals best matched with the girls in question

on both age and Raven's scores. These rather demanding criteria resulted in the fact that of the 370 children originally screened, only 72 comprised the final sample. Table XI (below and p.63) gives particulars of children finally selected, and shows the extent of matching on variables under consideration. It must be emphasised that we selected every possible "pair" of subjects available, it being our intention, later, to discard less perfectly matched pairs if we had exceeded the number required in terms of proportions required for the normal-retard distribution. As it happened, this was not necessary. In terms of our selection criteria we were able to select, from each standard, exactly one half of the number of retards relative to normals, which resulted in the 1 : 2 proportion, which we had desired, being maintained.

TABLE XI

INDIVIDUAL MATCHING OF BOYS AND GIRLS ON VARIABLES OF AGE IN MONTHS AND RAVEN'S RAW SCORES

STD. V

Normal boys				Normal girls			
Identity No.[1]	Age	Raven's	Vernacular	Identity No.	Age	Raven's	Vernacular
1	140	41	G[2]	37	141	43	G
2	143	30	H[3]	38	145	27	H
3	141	38	G	39	144	37	G
4	145	39	T[4]	40	144	40	Te[5]
5	147	31	G	41	147	31	G
6	149	39	T	42	146	40	T
7	147	42	G	43	147	44	G
8	141	38	G	44	140	42	G
9	150	32	T	45	152	35	G
10	152	41	G	46	152	37	G
Mean	145.5	37.1			145.8	37.6	
Retard boys				Retard girls			
11	156	38	G	47	153	37	G
12	168	27	G	48	172	27	G
13	171	35	G	49	170	33	G
14	168	24	G	50	172	27	T
15	163	26	T	51	160	23	G
Mean	165.20	30.00			165.4	29.4	

1. Identity number refers simply to the number given to the child in the final sample.

2. Gujarati speakers, 3.Hindi speakers, 4.Tamil speakers, 5.Telegu speakers.

TABLE XI (Continued)

INDIVIDUAL MATCHING OF BOYS AND GIRLS ON VARIABLES OF AGE IN MONTHS AND RAVEN'S RAW SCORES

STD. IV

Normal boys				Normal girls			
Identity[1] No.	Age	Raven's	Vernac-ular	Identity No.	Age	Raven's	Vernac-ular
16	134	37	G[2]	52	134	39	G
17	131	42	G	53	132	42	G
18	144	27	T[4]	54	143	28	G
19	134	40	G	55	133	41	T
20	137	37	G	56	141	36	G
21	132	35	G	57	129	34	G
22	135	31	G	58	130	30	G
23	137	30	T	59	141	30	G
Mean	135.5	34.88			135.38	35.00	
Retard boys				**Retard girls**			
24	145	30	G	60	149	30	G
25	153	14	G	61	150	15	G
26	158	32	G	62	159	35	G
27	152	17	G	63	153	17	G
Mean	152.00	23.25			152.75	24.25	

STD. III

Normal boys				Normal girls			
Identity[1] No.	Age	Raven's	Vernac-ular	Identity No.	Age	Raven's	Verrac-ular
28	122	122	G	64	120	26	G
29	125	27	G	65	127	27	G
30	129	21	G	66	130	19	G
31	116	17	G	67	118	17	H
32	129	24	G	68	127	26	G
33	116	25	G	69	116	24	T
Mean	122.83	23.67			123.00	23.17	
Retard boys				**Retard girls**			
34	142	21	G	70	143	23	G
35	151	25	G	71	150	22	G
36	136	27	H[3]	72	141	27	G
Mean	143.00	24.33			144.67	24.00	

1. Identity number refers simply to the number given to the child in the final sample.

2. Gujarati speakers, 3.Hindi speakers, 4.Tamil speakers,5.Telegu speakers.

It will be seen from Table XI that matching of children on age and Raven's scores is close, the largest discrepancy in age being 5 months, and the largest discrepancy in Raven's scores being 4 points in raw score. The average age discrepancy is 2.11 months, and average Raven's discrepancy, 1.47 points. Means of subgroups are also seen to be very close. We have sacrificed numbers appointed to our sample in the interests of close matching, on an individual basis, of sex groups. Later research with the sample selected appears to have justified this, since we obtained the overall desired result - almost perfect matching of boys' and girls' groups on the Full Scale WISC IQ.

For convenience, we summarise numbers of children in each of the subgroups selected for the experimental sample in Table XII (below).

TABLE XII

NUMBERS OF CHILDREN SELECTED FROM EACH STANDARD AND CATEGORY.

		Normals	Retards	Total
STD.V	boys	10	5	15
	girls	10	5	15
	Total	20	10	30
STD.IV	boys	8	4	12
	girls	8	4	12
	Total	16	8	24
STD.III	boys	6	3	9
	girls	6	3	9
	Total	12	6	18
GRAND TOTAL		48	24	72

It will be noted from Table XI that matching of individuals on linguality is not perfect. However, as Table XIII (below) shows, group matching is adequate.

TABLE XIII

NUMBERS OF CHILDREN SPEAKING THE DIFFERENT VERNACULAR LANGUAGES.

	Gujarati	Hindi	Tamil and Telegu	Total
boys	28	2	6	36
girls	29	2	5	36
Total	57 (79.16%)	4 (5.56%)	11 (15.28%)	72 (100%)

In Table XIII (p.64), Tamil and Telegu groups have been combined. Justification for this is provided by Meston (1963) who comments on the similar origins of the groups.

In summary, groups of boys and girls appear well matched with respect to age, linguality, retardation/non retardation, and intellectual capacity as measured by the Raven's test. Other relevant variables have to some extent been controlled by selecting children from schools in the same area and catering for the same type of population. It is, to some extent, regrettable that selection procedures have reduced the size of the sample, but we are confident that this is a carefully selected group representative of children in standards III, IV and V at the schools visited.[1] It is, however, representative of only one section of the Indian community and because of the heterogeneous nature of the larger community, results of testing the present sample will be limited in their applicability.

Individual testing

This was commenced on 20th June,1967, with a break from 30th June to 25th July for the July vacation, and was completed in late September. Due to the foreseen break of nearly a month for the vacation, it was decided that the boy and girl "matched" with one another should be tested within a few days of one another in order not to disturb age matching. Accordingly, visits to the schools were alternated so that two boys could be tested on one day, and the two girls matched with them, the following day. Testing was confined to the two morning sessions only in order to avoid the possibility of fatigue in the afternoon session.

Preparation of the writer for testing

Mrs. L.E. Cumming trained the writer in the administration and marking of the WISC. The training consisted of observation of the administration of the test to Indian and European children, private administration by the writer using European children available to her, and administration to both Indian and European children under Mrs. Cumming's supervision. Only when the trainer was satisfied with the writer's administration and marking was testing commenced in the schools.

Conditions of testing

Principals and staff kindly granted permission for a child to leave the class when required for testing. Both principals had

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1. This does need some qualification, as is provided later in the thesis.

provided the writer with a room where privacy could be maintained and conditions were as free from extraneous noise as could be managed. As is to be expected in a school, however, this noise was not entirely eliminated. At Manilal Valjee, we were close to a busy road, and at Kathiawad, the chanting of infants could occasionally be heard. Disturbance was, however, minimal, and was judged to be of a kind to which boys and girls were accustomed, for it "upset" the testees not at all.

Establishment of rapport with testees, and elicitation of further background information

As a result of the kindness and of the welcome given to the writer at both schools, obtaining the trust of a testee was, perhaps, simplified. The writer had also taken the precaution, during the group testing sessions, of getting to know children, and of explaining that further selected individuals would later be asked to do tests and puzzles on their own. It appeared that children enjoyed the novelty of the "puzzles" (Raven's Matrices) and did not feel that the examiner constituted a threat to them. In consequence, there was often an air of expectation when the examiner visited a class to fetch a pupil. Reports of teachers confirmed this, several members of staff commenting on an air of pleasurable speculation as to who was to be "chosen" next.

Before commencing to test a child, a "conversation" period lasting usually from 10 to 20 minutes was employed, the aim of this being to set the child fully at ease. It was also used for the elicitation of further details regarding the child's background, an informal questionnaire having been drawn up for the purpose (Appendix IIb). This was never followed to the letter, however, the main aim being to engage the child in conversation and to interpose questions so that they would appear quite natural in the course of this. Each child was also given the opportunity to decline to do the test, and an attempt was made to gauge his or her reaction to the situation. No child declined. Several expressed "nervousness" but were easily reassured when it was made clear that test results would in no way affect school results.

Testing was commenced only when the examiner felt sure that the child was at ease and maximally co-operative. At the close of testing each child was asked for his/her comments, and to state his/her individual preference with regard to subtests. He/she was also asked to what extent he/she had had contact with "puzzles" of this nature before.

Results of the administration of the informal questionnaire,

together with results of the previously administered background questionnaire appear in the following Table (XIV), for the group and for the sexes separately. They confirm our opinion that the sex groups are well matched on a number of important variables.

TABLE XIV

DESCRIPTION OF THE GROUP IN TERMS OF SOME BACKGROUND VARIABLES

Variable	Entire Group	Boys	Girls	X^2 [1]	Level of significance
1. Type of residence					
Flat (urban)	55	25	30	.46	-
House (urban)	11	8	3	2.27	-
Cottage (peri-urban)	5	2	3	.20	-
Farm	1	1	0	.02	-
2. Attendance at vernacular school					
Attended	59	28	31	.153	-
Not attended	13	8	5	.692	-
3. Nursery school attendance					
Attended	41	17	24	1.20	-
Not attended	31	19	12	1.58	-
4. Duties of child at home and/or at parental place of work					
Regular (weekdays as well as weekends)	45	15	30	5.00	$<.05$
Irregular (weekends only)	20	15	5	5.00	$<.05$
None	7	6	1	3.58	-
5. Contact with manipulative toys or puzzles					
Some contact, even if when child was younger	22	13	9	.728	-
No such contacts recollected after questioning	50	23	27	.32	-
6. Linguality					
Gujarati	57	28	29	.02	-
Tamil or Telegu	11	6	5	.182	-
Hindi	4	2	2	-	-

1. A chi-square test (Edwards, 1960, p.151) was carried out in order to determine whether or not numbers of boys and girls in the different categories differed significantly.

This analysis was only performed after the groups had been selected, and the fact that sex groups are for the most part well matched on the variables selected for tabulation is pleasing. This has probably been achieved as a result of the homogeneous backgrounds from which the groups of boys and girls were selected. The following information may be noted from the Table:

i. The group is predominantly of urban residence. There is no sex difference with regard to this factor.

ii. The group appears to be "education orientated", over four-fifths of the subjects attending or having attended vernacular schools. Over half the subjects have also attended nursery school. There are no sex differences in the extent to which "extra" educational facilities have been made use of.

iii. Over five-sixths of the subjects are expected to perform duties in the home or at the parental place of employment. This is the one sphere in which a sex difference is noted, girls being required to help more regularly than are boys. We shall discuss possible implications of this difference at a later stage, when sex differences in the performance of the present group are under consideration.

iv. As far as contact with manipulative toys or puzzles is concerned, this variable was investigated at the suggestion of Mrs. Cumming, who felt that lack of experience with "puzzles" similar to those found in the WISC Performance scale might be one factor with a possible relationship to the fact that Indian children appeared Verbal dominant on Maxwell's abbreviated form of the WISC. This was investigated as carefully as possible for each child. The Background Questionnaire included questions with reference to toys played with, as did the informal questionnaire, and at the end of each individual testing session the child was asked specifically whether he/she had ever had any contact with any "puzzles" in any way similar to those which he/she had just performed. All three sources of information were used in the final judgment as to whether contact with toys or puzzles likely to build up manipulative or perceptual skills had been made. Table XIV suggests that such contact has only occurred for less than one-third of the group, and no significant sex differences here are apparent. Paucity of contact with "puzzles" might simply reflect the fact that, relative to the average European, the Indian child probably has rather a restricted play life (Kuper, 1960, p.156). It may be for this reason that a number of children who filled

in the Background Questionnaire, provided the answer: "I do not play".

v. Nearly four-fifths of the present subjects are seen to be from Gujarati speaking homes, and no sex differences are found on the linguality factor, indicating that, in this respect, boys' and girls' groups are well matched, although it was not always possible to match children individually on this variable.

vi. One item which is conspicuous in its absence from Table XIV is any attempt at categorisation of the group and sex groups in terms of socio-economic status. This was not for want of endeavour on the part of the writer, and several attempts were made in this direction, taking into account the occupation of the breadwinner as given in the Background Questionnaire and as discussed more fully with the child during completion of the informal questionnaire. Such attempts were abandoned by the writer as being too unreliable.[1] It was felt that since groups were well matched with regard to schools attended, area of residence and linguality, this probably rendered sex groups comparable with regard to socio-economic status.

Kuper (1960), discussing socio-economic status among Indians, reports that from the Indian point of view there are two main classes: the "Banya" (merchants and businessmen) consisting largely of Gujaratis, and the "non-Banya" (workers). Since the majority of the present group were Gujaratis, it is probable that the group was of higher status than a more representative sampling of Durban Indians would have been. There is little reason to suppose that boys' and girls' groups varied greatly in respect of this variable.

In conclusion, there is reason to feel that sex groups were rather well matched on an individual basis on age and Raven's scores, and, on a group basis, on a number of background variables besides.

The WISC testing

Since the present investigation was to include a validation of Maxwell's abbreviated WISC, the 10 subtests on which he had based

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1. It would have been possible to apply a standardised questionnaire such as that developed by Ramphal (1961) were it not felt that some questions could not ethically be put to children without parental knowledge and consent. Ramphal had this; we did not obtain it, as principals when asked regarding this question felt that their own and departmental sanction justified the research without the necessity of obtaining parental approval.

his factor analysis were administered. Information was accordingly omitted, and Digit Span given in its place. Justification for this comes from the fact that Information has been considered by many to be inappropriate outside the United States, as many of the questions have an American bias. Liddicoat and Roberts (1962) in an article reporting on the preliminary standardisation of the W-B for South African conditions, found that this was the subtest most in need of revision. The five Performance tests normally given (thus excluding Mazes) were administered, since these were the Performance tests used by Maxwell.

Wording in the WISC manual was followed exactly except for the followi deviations suggested by the National Foundation for Educational Research in England and Wales.[1]

Comprehension: Item 5 : Substitute "railway line" for "track"
Item 13: Substitute "members of parliament" for "senators"

Vocabulary: Item 21: Substitute "dollar" for "shilling"

Other necessary deviations occurred on the Arithmetic subtest where problems in American currency were converted into the currency of rands and cents.

Marking of tests

The marking of the first six WISC profiles took place under the supervision of Mrs. Cumming, profiles thereafter being scored by the writer on the same day as that on which the test had been administered. When testing was complete, profiles of 20 children (10 boys and 10 girls) were selected using a table of random numbers, and these were rescored by Mrs. Cumming. Product moment correlation coefficients between scorers' allocated marks were .995 for the Verbal scale, .999 for the Performance scale, and .999 for the Full scale. As these were high, but not absolutely perfect, each profile was rescored by the writer, with special attention being devoted to points on which the scorers had differed. The writer is confident that this procedure eliminated errors as far as is possible on a test which is not entirel objective as far as scoring is concerned.

3. RESULTS

Appendix III gives details of the scores of the 72 subjects on the following:

1. Subtests of the WISC (raw and scaled scores)

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1. An undated communication from the above body is available at the Durban Clinic.
Alterations were discussed with Mrs.Cumming before use was made

2. WISC IQ's (Verbal, Performance and Full scale)

3. Short form WISC IQ's (Verbal, Performance and Full scale)

4. Age in months at the time of the WISC testing.

Analysis of results

Major computations were performed on an IBM 1620 computer using PDQ Fortran. Mr. C.O. Murray wrote the programs and assisted the writer in running these.

Reporting of results

SECTION A: Measures of centrality and dispersion of the variables

In this section these will be reported for the group and for subgroups, as these are the data on which all subsequent analyses will be based.

SECTION B: Correlational and Factor Analysis

Split half reliabilities of WISC measures, and intercorrelations between all intelligence measures will be reported, as will results of submitting the WISC intercorrelation matrix to a factor analysis.

SECTION C: Analysis of intergroup differences

Sex differences and normal/retard differences will be evaluated and discussed.

SECTION D: Verbal and Performance scale results and Verbal-Performance discrepancies

Levels of differential scale performances will be discussed, and discrepancies will be evaluated. Possible reasons for these will be sought.

SECTION E: Short forms of the WISC

Maxwell's short form will be evaluated, and suggestions regarding the use of alternative short forms with Indian children will be made.

SECTION A: MEASURES OF CENTRALITY AND DISPERSION OF THE VARIABLES

The performance of the entire group and of subgroups is summarised in Table XV (p. 73). In this section attention will be limited to the results of the entire group, however, for the results of subgroups can more adequately be considered after differences in performance have been evaluated.

For convenience, in this section, we report results first. After this, brief discussion of results will take place.

Full Scale IQ of the group (91.6) places it within Wechsler's average category of intelligence, and although it falls 8.4 points below the absolute average of 100, it is nevertheless rather higher than would be expected from "average" Durban Indians, whom Ramphal (1961), on the basis of his own and Logue's (1954) results, felt could be expected to score some 20 points below the norm.

Verbal and Performance IQ's. The Verbal mean (95.4) is only 4.6 points below average, while the Performance mean (88.9) places the group within Wechsler's dull normal category of intelligence. The Verbal-Performance discrepancy of + 6.47 points still needs to be evaluated for significance, but it is interesting to note at this stage that it is in the same direction as has generally been found for groups in India tested on modified Wechsler scales, and opposite in direction to the discrepancy found by Ramphal for Durban Indians tested on the NSAGT.

WISC subtest scores are found to range from slightly above the average of 10 for Digit Span and Coding, to low scores nearly one standard deviation below average for Vocabulary, Picture Arrangement and Object Assembly.

WISC short form IQ's. An entire section is to be devoted to Maxwell's short form of the WISC, so that space will not be devoted to this subject here. In passing one notices, however, that the short form Full Scale IQ appears to predict WISC Full Scale IQ for the group fairly accurately. The prediction is not as close with the Performance scale, and still less close with the Verbal scale.

Measures of variability. WISC standardisation procedures "set" standard deviations of the WISC scales at 15, and those of subtests at 3. Inspection of standard deviations for the present group shows some curtailment of variation within both scales and tests.

TABLE XV. MEASURES OF CENTRALITY AND DISPERSION OF WISC SCORES OF THE GROUP AND SUBGROUPS

Group	Entire group (N=72)				Boys (N=36)				Girls (N=36)				Normals (N=48)				Retards (N=24)			
Variable	Range	Mean	Median	S.D.	Range	Mean	Median	S.D.	Range	Mean	Median	S.D.	Range	Mean	Median	S.D.	Range	Mean	Median	S.D.
WISC																				
C	4-15	8.014	8.09	2.392	4-12	7.639	8.08	1.797	4-15	8.389	8.12	2.782	5-15	8.813	8.84	2.297	4-10	6.417	6.37	1.579
A	4-16	9.681	9.86	2.308	4-16	9.639	9.69	2.311	5-15	9.722	9.75	2.305	7-16	10.583	10.37	1.913	4-13	7.875	8.06	1.943
S	3-14	9.389	9.93	2.531	3-14	8.972	9.57	2.804	4-13	9.806	10.07	2.145	5-14	10.417	10.56	1.988	3-10	7.333	8.00	2.230
V	4-13	7.639	7.41	1.813	4-11	7.389	7.27	1.514	4-13	7.889	7.75	2.038	6-13	8.271	8.22	1.692	4-9	6.375	6.67	1.317
D	5-20	11.597	11.76	2.909	5-20	11.778	12.14	3.092	7-20	11.417	11.25	2.702	8-20	12.25	12.22	2.602	5-20	10.292	10.13	3.048
PC	4-15	8.653	8.54	2.422	5-12	8.861	8.71	2.394	4-15	8.444	8.40	2.432	5-15	9.021	8.85	2.479	4-11	7.917	8.25	2.120
PA	3-15	7.444	6.86	2.687	3-15	8.361	8.25	2.907	3-12	6.528	6.18	2.075	4-15	7.708	7.57	2.466	3-14	6.917	6.14	3.013
BD	2-13	8.583	8.85	2.184	2-13	9.167	9.31	2.141	4-12	8.000	8.20	2.068	5-12	9.167	9.54	1.863	2-13	7.417	7.60	2.308
OA	1-13	7.028	7.15	2.421	2-13	7.333	7.60	2.492	1-11	6.722	6.33	2.305	2-13	7.396	7.51	2.069	1-13	6.292	5.85	2.865
Co	3-18	10.347	10.60	2.626	3-17	9.417	9.89	2.712	8-18	11.278	11.25	2.168	5-18	10.938	10.94	2.649	3-12	9.167	9.38	2.134
VIQ	69-119	95.375	96.00	11.425	70-116	94.194	95.00	11.000	69-119	96.556	98.67	11.622	85-119	100.417	99.40	8.805	69-108	85.292	86.75	9.167
PIQ	58-114	88.903	89.63	10.382	68-114	90.444	90.00	10.838	58-103	87.361	89.67	9.661	72-114	91.917	92.33	9.178	58-104	82.875	83.33	10.018
FS IQ	60-113	91.583	91.36	10.580	67-113	91.694	91.25	10.580	60-107	91.472	92.75	10.579	80-113	96.104	96.25	7.998	60-101	82.542	83.50	9.233
SF. VIQ	64-114	91.764	91.82	10.712	64-108	89.889	89.48	10.635	66-114	93.639	92.40	10.457	77-114	96.292	96.92	8.478	64-92	82.708	86.31	8.801
SF. PIQ	58-111	87.861	88.88	10.747	66-111	90.194	92.00	10.506	58-106	85.528	87.88	10.476	72-106	90.500	92.00	8.653	58-111	82.583	81.38	12.450
SF. FS IQ	69-107	91.667	91.86	7.290	73-103	91.917	92.25	6.942	69-107	91.417	92.20	7.614	82-107	94.562	93.40	5.608	69-97	85.875	86.75	6.796
**	119-174	144.99	144.91	13.566	119-174	144.8	145	13.48	119-173	145.2	145	13.78	119-154	138.39	139.50	9.517	138-174	158.17	157.00	10.72

** Age in months

Abbreviations used and to be used in other tables: We have used conventional abbreviations for WISC subtests and scales. "SF" before WISC IQ's denotes that these were derived using Maxwell's short form.

Particularly noticeable at this point is the fact that short form Full Scale IQ scores appear particularly homogeneous. This is one of the adverse results of application of Maxwell's short form, as will be explained in Section E.

Discussion

1. The mean Full Scale IQ of the group was found to fall short of the absolute average of 100. Reasons for this may lie both in the test used and in factors governing the selection of the group.

a. The WISC was standardised for American Whites, and it is therefore possible that without restandardisation, cultural bias of some of the items will penalise culturally deviant groups to some extent. Space does not permit detailed discussion of personal observations during testing, but, to some extent, comparison of our results with those of Malin (1964) may be helpful. It is, of course, to be remembered that the WISC was restandardised for his Indian group before application, so that the comparison is not entirely justified. To facilitate comparison, "profiles" representing our own and Malin's results may be consulted in Appendix IV.

Malin found that:

i. The Vocabulary subtest required complete re-organisation. Even after this, Vocabulary was the Verbal subtest which yielded the lowest mean for his group, as it was for ours. It may be that Vocabulary was an unsuitable test for the present group, because of weakness in English which Logue (1954, 1956) has hypothesised may adversely affect Indian intelligence test results.

ii. The Picture Arrangement subtest had to be completely abandoned, as too culturally biased. In the present research this is one of the subtests on which the group performed in notably inferior fashion, and from observation of subjects, and after studying of the contents of this test we feel able to suggest a reason for this. The "defect" of this test for Indian children does not appear to lie in the fact that typically European figures are used. It appears, rather, to lie in the fact that the philosophy underlying successful completion of some of the items is foreign to Indian thought regarding male superiority (Kuper, 1960). In several items (1, 5, 6 and 7) a male "transgresses" against superior female wisdom and is shamed or made an object of ridicule for doing so! Disobedient sons and "henpecked" husbands who ought to know better should perhaps

be eliminated if it is ever arranged to standardise this subtest for Indians.

iii. Object Assembly was the subtest in which the group made its most inferior scores, as was the case with the present group. It is possible that the idea of "putting pieces together to make a whole" is rather foreign to the experience of the Indian child and as such may be a poor measure of general ability for Indian children.

The suggestion from this brief analysis is that the present group may have performed in inferior manner upon subtests which constitute inferior measures of ability for them, due to cultural bias of items. However, before this can be accepted, these three subtests specifically mentioned will need further evaluation.

b. Our own selection procedure may have been responsible for level of results. The present group consisted of normals and retards in a proportion similar to that actually obtaining in the standards studied. From children available, a fairly homogeneous group of normals was selected, which meant that the very bright and the very dull (in terms of Raven's scores) were excluded. Retards were selected according to separate criteria, so the "dull" were represented, but there was no compensatory selection from among the ranks of the "bright", which might have balanced the group. No apology is made for this, since it is probably from amongst the ranks of the dull and the average, rather than the bright, that children requiring remedial education will be drawn. The fact that the sample was biased in this way may, however, have affected absolute level of results.

We have considered reasons for the "falling short" of the present group, but at the same time reasons for its achievement at a higher level than would be expected from Ramphal's results need consideration. Again it is felt that differences in tests applied, and differences in groups tested may have accounted for this discrepancy.

a. Tests used. Tamphal used the NSAGT which is a group test, and because of this at least its three Verbal subtests require ability to read before questions can be answered.[1] Also, in the NSAGT, one explains items carefully by means of practice examples, thereafter leaving the child on his own to complete as many items as he can within the time limit. In contrast, the WISC, being individually administered, relies on reading ability very little - only the last three items of the Arithmetic subtest may be read

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1. Reading ability of Indians is poor relative to that of Europeans

by the candidate himself. The examiner presents the remainder of the items orally. Furthermore, each individual item of speeded subtests is separately timed, so that the testee is never left with knowledge of unfinished items, a fact which might undermine confidence. Quite apart from the fact that in an individual session the tester is freed to establish rapport with a testee never possible in a group session, some of the above factors might have led to the fact that the present group scored rather better than Ramphal's group.

b. Differences in groups tested. Ramphal was careful to select a representative sample of Durban Indians, with the result that his group was more heterogeneous with regard to socio-economic status than was the present group which in contrast, appears rather "select" with respect to this variable. This could have influenced direction of results since Ramphal (Project II) found a correlation between socio-economic status and intelligence. Perhaps of more importance in determination of different levels of performance of the groups was the fact that due to our selection procedure, none of the normals was seriously overaged for standard placement. Since Ramphal has convincingly shown (Project III) that educational deprivation may have a marked effect upon level of functioning, the influence of this upon differential levels of results might well be important.

2. Factors mentioned in (1.) above may, in addition to having affected Full Scale IQ, have affected differential levels of Verbal and Performance results for the present group. Discussion of these in this context will be deferred until Section D, however.

3. As with Verbal and Performance scale results, discussion of short form WISC results will be deferred, in this case until Section E.

4. It was noted that variability within subtests and scales was somewhat curtailed. Guilford (1965, pp.464-465) explains how such curtailment of variance can adversely affect the size of correlations between measures and it is thus to be expected that correlational analysis will yield lower coefficients than those reported by Wechsler (1949). Curtailment of variation is very probably due to homogeniety of background of the present group.

SECTION B: CORRELATIONAL ANALYSIS AND FACTOR ANALYSIS OF THE WISC

a. Split half reliability coefficients of WISC measures

These are reported here because they will later be of interest in interpreting results of factor analysis, and because they may alo serve as an index as to the internal consistency of the WISC and its subscales and subtests.

Each WISC profile was re-examined and scores on odd and even items of each subtest (except Digit Span and Coding, which do not lend themselves to such splitting) were determined. Product-moment correlation coefficients were worked out for each subtest, and for Verbal, Performance and Full Scales, excluding Digit Span and Coding. The reliability of Digit Span was estimated by correlating Digits forwards with Digits backwards (as done by Wechsler,1949). As this is not strictly comparable with the method used with other subtests and probably underestimates reliability (Anastasi,1967), Digit Span was excluded when reliabilities of scales were determined. Reliability of Coding was not estimated in this research.

Table XVI (below) presents uncorrected reliability coefficients and the same coefficients corrected by means of the Spearman-Brown formula (Guilford,1965, p.458). Wechsler's corrected reliability coefficients for the nearest age level of the standardisation sample (13½ year olds) are also presented for comparative purposes.

TABLE XVI

SPLIT HALF RELIABILITIES OF WISC SUBTESTS AND SCALES

Measure	Reliability (uncorrected)	Reliability (corrected)	Reliability (Wechsler)	Measure	Reliability (uncorrected)	Reliability (corrected)	Reliability (Wechsler)
C	.371	.541	.71	PC	.339	.506	.68
A	.439	.610	.77	PA	.319	.484	.72
S	.513	.678	.79	BD	.615	.762	.88
V	.592	.744	.90	OA	.302	.464	.71
D	.306	.469	.50				
V.S. (omitting D)	.694	.819	.96	P.S. (omitting Co)	.603	.752	.90
F.S. (omitting D and Co)	.808	.894	.94				

Although our reliabilities are rather lower than for Wechsler's group, his figures indicate that of the two scales, the Verbal scale is the rather more reliable, and that of Verbal subtests, Vocabulary possesses the highest reliability. This is replicated in the present results. Of Performance subtests, Block Design possesses the highest reliability in both researches. There are also certain discrepancies in results, for in Wechsler's sample, satisfactory results (coefficients in the seventies) were obtained on Picture Arrangement and Object Assembly, whereas the reliability of these subtests was considerably depressed for the present group. It was noted in Section A that these two subtests, with Vocabulary, were those on which the group performed in most inferior fashion, and it was felt that they might be inferior measures of ability for the group. The Vocabulary subtest, in this analysis, possesses relatively high reliability whereas Picture Arrangement and Object Assembly are inferior tests in this regard. It may be, however, that use of the split half technique, which assumes that items are arranged in increasing order of difficulty, is an inappropriate method to use in assessing subtest reliability when one is not sure that this is the case.[1] This factor, and reduced variability within subtests could well have lowered correlation coefficients relative to those obtained by Wechsler.

b. Intercorrelations between variables

All IQ measures have been intercorrelated (product-moment technique) and results appear in Table XVII (p.79). Restricted variance has again probably influenced size of coefficients, for these are lower than those presented by Wechsler (1949, pp.11 & 12) for similar age levels. A definite tendency in line with Wechsler's results is that subtests tend to correlate better with "like" subtests and with "like" scales than with "unlike" scales (i.e. Verbal subtests correlate to a better extent with Verbal IQ than with Performance IQ whereas the opposite applies to Performance subtests). Also, Verbal subtests tend to correlate to a better extent with the Full Scale than do Performance subtests, with the result that the Verbal scale correlates to a better extent with the Full Scale (.904) than does the Performance scale (.850). The correlation between Verbal and Performance scales (.546) is similar to that obtained for Wechsler's 13½ year group (.56). Anastasi (1967) is of the opinion that such a coefficient is high enough to suggest that the scales have something in common, but low enough to suggest that differing abilities are to some extent being sampled. Factor analysis, to be reported in the next

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1. Error may have been involved particularly in the case of Object Assembly, which possesses only four items.

TABLE XVII

INTERCORRELATIONS BETWEEN THE VARIABLES

Variable	C	A	S	V	D	PC	PA	BD	OA	Co	VIQ	PIQ	FSIQ	SF.VIQ	SF.PIQ	SF.FSIQ
C		.483	.573	.628	.345	.204	.173	.280	.143	.332	.782	.371	.683	.665	.254	.567
A	.483		.435	.490	.454	.149	.048	.475	.285	.337	.745	.410	.680	.509	.445	.588
S	.573	.435		.594	.497	.235	.171	.245	.261	.408	.815	.440	.735	.926	.301	.716
V	.628	.490	.594		.270	.259	.244	.239	.328	.458	.743	.503	.714	.852	.344	.731
D	.345	.454	.497	.270		.063	.220	.354	.232	.266	.717	.375	.637	.444	.344	.465
PC	.204	.149	.235	.259	.063		.194	.143	.411	.144	.229	.618	.457	.278	.326	.351
PA	.173	.048	.171	.244	.220	.194		.145	.248	.208	.225	.623	.454	.225	.221	.273
BD	.280	.475	.245	.239	.354	.143	.145		.409	.108	.424	.559	.558	.274	.822	.673
OA	.143	.285	.261	.328	.232	.411	.248	.409		.097	.320	.696	.554	.322	.852	.705
Co	.332	.337	.408	.458	.266	.144	.208	.108	.097		.468	.533	.561	.478	.108	.352
VIQ	.782	.745	.815	.743	.717	.229	.225	.424	.320	.468		.546	.904	.873	.444	.792
PIQ	.371	.410	.440	.503	.375	.618	.623	.559	.696	.533	.546		.850	.522	.736	.758
FSIQ	.683	.680	.735	.714	.637	.457	.454	.558	.554	.561	.904	.850		.812	.657	.883
SF.VIQ	.665	.509	.926	.852	.444	.278	.225	.274	.322	.478	.873	.522	.812		.363	.807
SF.PIQ	.254	.445	.301	.344	.344	.326	.221	.822	.852	.108	.444	.736	.657	.363		.824
SF.FSIQ	.567	.588	.716	.731	.465	.351	.273	.673	.705	.352	.792	.758	.883	.807	.824	

section, should make this point clearer.

Of interest, in passing, are full WISC - shortened WISC correlations. These are .873, .736 and .883 for Verbal, Performance and Full Scales respectively, a finding which will be discussed in Section E.

c. Factor analysis of the WISC

The intercorrelations between the 10 WISC subtests as reported in Table XVII (p.79) were analysed, using the Principal Axis method (Harman, 1967). Squared multiple correlations were used as communality estimates and the reduced correlation matrix submitted to a Principal Axis analysis. Kaiser's rule for stopping the extraction of factors was used (Harman, 1967). Eigenvalues for the first two factors were found to be 3.246 and .629, indicating that the second factor was probably not significant.[1]

Since two factors were extracted, the second was retained as it was felt that although it lacked statistical significance it might possess psychological significance and interest value. It was deemed inappropriate, however, to rotate factors since in reality only one factor of significance had emerged. Accordingly, unrotated factor loadings are set down in Table XVIII (p.81). Communality, uniqueness, specificity and error variance are also reported in this Table.

Interpretation of factors

When it is considered that only one significant factor emerged, it is clear that Factor I is a general factor of ability, as loadings in excess of .30 occur from all subtests. This factor accounts for approximately 32.5 percent of the total test variance, a result similar to that found by Cohen (1959) for children's groups. Interesting is the fact that all Verbal subtests load this factor to a higher extent than does any Performance subtest, and that its highest test loadings are Cohen's three "essentially verbal" subtests given in this research (namely, Similarities, Vocabulary and Comprehension), suggesting that this factor might have a slight verbal bias. It might be that "verbal intellectual", the term used by Maxwell (1959) for his first factor, could be a better designation for it. Had there been sufficient variance for more significant factors to emerge, it is

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1. The significance of the second factor was further checked using Humphrey's criterion (Fruchter, 1954, pp.79-80) that the product of the two highest loadings in the factor column should exceed twice the standard error of a correlation coefficient of zero for the type of correlation and size of sample used. The standard error for our data is .1170, and the two highes loadings yield a product of .1625. Clearly, in terms of this criterion, the second factor is insignificant.

TABLE XVIII

FACTOR ANALYSIS OF THE 10 WISC SUBTESTS

Subtest	Factor I	Factor II	h^2	u^2	rjj	s^2	e^2
C	.692	-.248	.541	.459	.541	.000	.459
A	.674	-.005	.455	.545	.610	.155	.390
S	.731	-.184	.568	.432	.678	.110	.322
V	.752	-.164	.592	.408	.744	.152	.256
D	.563	.011	.317	.683	.469	.152	.531
PC	.341	.284	.197	.803	.506	.309	.494
PA	.304	.153	.116	.884	.484	.368	.516
BD	.484	.323	.339	.661	.762	.423	.238
OA	.459	.503	.464	.536	.464	.000	.536
Co	.491	-.213	.286	.714	-	-	-
Variance %	32.457	6.295	38.750				

h^2 is the communality of the test
u^2 is its uniqueness $(1-h^2)$
rjj is the reliability of the test
s^2 is the specificity of the test $(u^2 - e^2)$ or $(rjj-h^2)$
e^2 is the error variance of the test $(1-rjj)$

possible that a factor similar to Cohen's Verbal Comprehension might have been isolated. In the present analysis, however, general ability and verbal ability seem somewhat compounded. General ability for the present Indian group, would appear to rely more heavily upon Verbal than on Performance skills, and this is compatible with a suggestion of Kundu (1967) that for Indian youngsters the Verbal subtests appear to rely more upon general ability, Performance subtests more on specific abilities. We see, too, in confirmation of this suggestion, that the Performance subtests (except for Object Assembly, with high error variance) possess greater specific variance than do Verbal subtests.[1]

The weak and insignificant Factor II accounts for only 6.3 percent of the total variance. When signs only of loadings are taken account of, this appears to be a bipolar factor contrasting Verbal subtests (with the exception of Digit Span) and Coding with Cohen's Perceptual Organisation and Maxwell's space-performance subtests. Studying relative rather than absolute magnitudes, we find that Object Assembly and Block Design load this factor to the greatest extent, suggesting that it is related to the above factors of Cohen and Maxwell. Smaller positive loadings are contributed by Picture

1. Specificity of Coding cannot be estimated here.

Arrangement and Picture Completion, a finding not incompatible with Cohen's designation of the Perceptual Organisation factor as representing "interpretation and/or intergration of visually perceived materials against a time limit." (1959, p.287) .

The two subtests with near zero loadings on Factor II are Arithmetic and Digit Span. These are the two subtests which most frequently define a factor variously classified as "freedom from distractibility" (Cohen, 1959; Maxwell, 1960, 1961), "memory" (Gault,1954), "numerical" (Burt,1960), and "attention-concentration" (Goodenough and Karp,1961), but by no means isolated in every analysis of the WISC. It appears that in the present analysis where there is insufficient variance for such a factor to emerge, these subtests, bearing little affinity to a Perceptual Organisation factor, contribute the majority of their reliable variance to the general factor.

The"essentially verbal" subtests and Coding have negative loadings on Factor II and again contribute the majority of their reliable variance to measurement of Factor I. Failure of Coding to load with other Performance subtests has been noted in other analyses, Cohen (1959) having found it to define its "own" factor, and several investigators, for example Gault (1954), Baumeister and Bartlett (1962a, 1962b), and Goodenough and Karp (1961) having found it to define the same factor as Arithmetic and Digit Span. Of Performance subtests, then, Coding is perhaps the least appropriately grouped under this heading. This was mentioned in our review of factor analyses of the WISC and confirms, for the present group as well, that Wechsler's division of subtests into scales is not entirely supported by the results of factor analysis.

Discussion

In discussing these results, one of the main points of interest is that only one significant factor emerged as an underlying dimension of performance of the present Indian group, whereas from two to five factors have more adequately described performance of American and British groups. In attempting to account for this one must consider differences in techniques and in samples used.

1. Was the method of factor extraction responsible for curtailment of number of factors extracted? Is the Principal Axis method an inferior technique which fails to extract maximum variance from the intercorrelations available? Harman (1967)suggests that this is not the case. Speaking specifically of the Principal Axis method he states that because of the considerable calculations

required, this was impracticable before the advent of electronic computers. It is perhaps for this reason rather than because of excellence of technique that the centroid method has been used by the majority of those who have analysed the WISC. Harman's statements (p.100, p.106) fail to suggest that the Principal Components method allows for fewer than the expected number of factors. "Method" as a factor which may have curtailed results can then be ruled out.

2. With method excluded, it is probable that factors within the sample itself were responsible for the finding that only one significant factor emerged. We know that there was restricted variation within subtests and that this can lead to lowering of correlation between measures (Guilford,1965,p.144). Lowered intercorrelations may have, in part, been responsible for the fact that fewer than the expected number of factors emerged. The possibility cannot be entirely discounted that had we selected subjects from a more heterogeneous group of Indian children who would, presumably, have been more heterogenous with regard to WISC functioning, higher intercorrelations might have resulted, and more factors might have been extracted.

On the other hand, the possibility must be entertained that the present result may signify a simpler structure of intellect for Indian children, for there have been cases, with "deviant" cultural groups, in which this interpretation has been given to a finding of only one significant factor underlying a test battery which, when applied to an European group, yields more factors. Vernon (1950) cites the case of a 13-test battery, applied to African recruits, yielding two interpretable factors of which probably only the first was significant (Murray,1956). Murray's own research led to a similar result - only one factor was consistently found to underlie performance of various groups of Africans subjected to non-verbal test batteries. Murray feels, on the basis of his own results and those cited by Vernon (inter alia) that a simpler structure of intellect underlies African performance. Interesting in this connection is Logue's (1956) analysis of his Non-Verbal Group Test adminstered to Indian children in standards II through VI. He found that approximately 42 per cent of the variance was attributable to a general factor. Residuals were non-significant. Thus the finding of only one significant factor underlying the performance of culturally deviant groups is not peculiar to this study. It may mean that a simpler structure of intellect underlies the performance of such groups relative to Europeans, and in the present group it might represent lack of environmental or cultural opportunity to

broaden and develop the intellect.

In SECTION A it was proposed that the three subtests on which the present group performed in inferior fashion might be rather poor measures of intelligence for Indian children. Results of correlational and factor analysis suggest that this is not the case with the Vocabulary subtest, which possesses relatively high reliability (Table XVI, p.77), correlates well with Full Scale IQ (being surpassed only by Similarities Table XVII, p.79), and provides the highest loading on the general factor (Table XVIII, p.81). Picture Arrangement, another poorly performed subtest which there is reason to believe is culturally biased, has one of the lowest reliabilities in the battery, correlates to the lowest extent with Full Scale IQ and appears, from Table XVIII (p.81) to be the poorest measure of general ability among subtests. It is also the subtest which contributes least to total communal variance extracted from the battery, all of which observations suggest that it is in fact rather a poor component of the WISC battery for the present group. With regard to Object Assembly, a subtest on which the present group and that of Malin (1964) performed in most inferior fashion, we have already noted a very inferior reliability coefficient, although since the subtest contains only four items, the split half method of ascertaining reliability may be unsuitable for a group for which these items might not be arranged in strict order of difficulty. It may also be noted (Table XVII,p.79) that Object Assembly provides the third lowest correlation with Full Scale IQ. It is possible that in spite of weaknesses, this subtest has some redeeming features, for all its reliable variance is taken up in measurement of the factors isolated (Table XVIII, p.81), and communal variance is seen to be the highest among Performance subtests. It yields the highest loading on the weakly developed and insignificant Factor II, and as such may form the nucleus of a factor of intellect not yet developed fully for Indian children in the upper junior school levels. Assessment of the "goodness" of Object Assembly as a component of the WISC for the present group is therefore difficult, for apart from low reliability and correspondingly high error variance (which might be an artifact of method), this test would appear to display certain adequate functions of measurement.

Summary

In SECTION B, split half reliabilities of WISC measures, intercorrelations between variables and factor analysis of the WISC subtests have been reported upon. As was expected, curtailment of

variation within measures led to lower reliability coefficients and intercorrelations than those reported by Wechsler. There were, however, certain similarities in patterning of results and these were commented upon.

Of the two factors emerging from the factor analysis, and tentatively interpreted, only the first was significant. It was felt that this was not due to the method of analysis used, but to factors related to the group studied. It was possible that lowered intercorrelations had resulted in less "analysable" variance, but, at the same time, since the "one factor only" result has characterised several analyses using culturally deviant groups, it was felt that the possibility could not be discounted that Indian children might possess a simpler structure of intellect relative to European groups.

The first factor isolated was felt to represent general ability, although, since it had a slight verbal bias, "verbal intellectual" might have designated it more appropriately. The insignificant Factor II appeared to be a weak replica of Cohen's (1959) Perceptual Organisation or Maxwell's (1959) "space performance". By virtue of different signs, it appeared to suggest a broad dichotomy between "essentially verbal" subtests and Coding, on the one hand, and Performance subtests on the other hand. This suggested that, as has been found in other analyses, Wechsler's division of subtests into Verbal and Performance scales is not entirely upheld on statistical grounds, a point which is relevant to Verbal-Performance discrepancies and which will merit discussion in Section D.

SECTION C. ANALYSIS OF INTERGROUP DIFFERENCES

Interest, in this section, is focussed upon the contribution of the two factors of interest - sex and the normal/retard division - to the total variance of WISC measures. Analysis of variance is used here in preference to analysis by means of the"t" test, in order to check for interaction effects which might complicate interpretation of results.

Tests for homogeneity of variance (the F_{max} statistic recommended by Winer,1962) were undertaken in order to check legitimacy of using this technique. This has been applied to the variances of the four non-overlapping groups (namely normal boys, retard boys, normal girls and retard girls) on each measure analysed, and results are set down in Table XIX (below).

TABLE XIX

F_{MAX} RATIOS FOR MEASURES EMPLOYED IN ANALYSIS OF VARIANCE

Measure	F_{max} Ratio	Measure	F_{max} Ratio
C	3.145	OA	2.411
A	1.210	Co	3.613
S	2.293	VIQ	1.275
V	2.001	PIQ	2.352
D	1.995	FSIQ	2.114
PC	2.180	SF.VIQ	1.934
PA	5.395	SF.PIQ	2.433
BD	3.184	SF.FSIQ	1.686

Since this was a two-factor analysis, and the number in the largest groups was 24, degrees of freedom used were 4 and 23 (n-1). Reference to a Table for the distribution of the F_{max} statistic (Winer,1962, p.653 - interpolation used) indicates that with these degrees of freedom the F_{max} ratio should not exceed 4 points if the hypothesis of homogeneity of variance is to be accepted. Only in the case of Picture Arrangement, which previous analyses have shown to be a rather weak subtest, is it necessary to reject the hypothesis of homogeneity of variance, and less confidence is placed in results of analysis of variance as far as this subtest is concerned.

Results of the analysis of variance are set down in Table XX (p.87). The method of analysis used was the method of least squares, the reason for this being the fact that the numbers in each cell

TABLE XX

TWO WAY ANALYSIS OF VARIANCE OF WISC MEASURES

Measure	Total sum of squares	Within groups			Factor I - Sex				Factor II - Normal/retard distribution				Interaction			
		Sum of squares	d.f.	Mean square	Sum of squares	d.f.	Mean square	F.	Sum of squares	d.f.	Mean square	F.	Sum of squares	d.f.	Mean square	F.
C	404.990	295.460	68	4.345	10.124	1	10.124	2.330	91.840	1	91.840	21.137*	7.562	1	7.562	1.740
A	383.660	265.919	"	3.910	.124	"	.124	.031	117.361	"	117.361	30.011*	.249	"	.249	.063
S	461.117	295.501	"	4.345	12.500	"	12.500	2.876	152.111	"	152.111	35.003*	.999	"	.999	.230
V	236.614	169.542	"	2.493	4.499	"	4.499	1.804	57.507	"	57.707	23.064*	5.062	"	5.062	2.030
D	609.332	522.255	"	7.680	2.347	"	2.347	.305	61.361	"	61.361	7.989*	23.361	"	23.361	3.041
PC	422.325	399.126	"	5.869	3.124	"	3.124	.532	19.507	"	19.507	3.323	.562	"	.562	.095
PA	519.780	448.251	"	6.591	60.499	"	60.499	9.177*	10.027	"	10.027	1.521	1.000	"	1.000	.151
BD	343.503	269.001	"	3.955	24.499	"	24.499	6.193+	49.000	"	49.000	12.386*	1.000	"	1.000	.252
OA	421.947	389.876	"	5.733	6.722	"	6.722	1.172	19.506	"	19.506	3.402	5.840	"	5.840	1.018
Co	496.326	379.460	"	5.580	62.347	"	62.347	11.172*	50.173	"	50.173	8.991*	4.340	"	4.340	.777
VIQ	9399.626	5638.375	"	82.917	100.346	"	100.346	1.210	3660.257	"	3660.257	44.143*	.027	"	.027	.000
PIQ	7761.125	6251.125	"	91.928	171.126	"	171.126	1.861	1308.033	"	1308.033	14.228*	30.249	"	30.249	.329
FSIQ	8060.125	5111.500	"	75.169	.888	"	.888	.011	2943.069	"	2943.069	39.152*	4.340	"	4.340	.057
SF.VIQ	8261.501	5043.625	"	74.170	253.123	"	253.123	3.412	2952.115	"	2952.115	39.801*	12.249	"	12.249	.165
SF.PIQ	8317.251	6906.000	"	101.558	391.999	"	391.999	3.859	1002.790	"	1002.790	9.873*	15.999	"	15.999	.157
SF.FSIQ	3826.750	2591.750	"	38.113	4.499	"	4.499	.118	1207.571	"	1207.571	31.683*	22.562	"	22.562	.591

* significant at the .01 level of confidence

\+ significant at the .05 level of confidence

were not equal, but proportionate - the proportion with regard to the normal/retard distribution being that actually found in the population from which the sample was drawn. In each case the error term used was the within groups mean square as suggested by Edwards (1955).

It will be seen that no significant interaction effects occurred. Significant main effects due to factors of interest may therefore be considered.

a. Sex differences

These are best reviewed with reference to results set down in Table XV (p.73) and the reader is referred back to this Table. Here it may be seen that boys' and girls' groups are matched to within one point on Full Scale WISC IQ, the desired but by no means guaranteed result of careful individual matchings on age and Raven's raw score, and of controlling a number of background variables besides. That this result has been attained enables one to consider sex differences on subtests and scales of the WISC. It also, incidentally, attests to the "validity" of Raven's test as a "screening" device for Indian children of similar background to the present group.

We now consider sex differences on the WISC (Table XX,p.87) in conjunction with information made available in Table XV (p.73). Significant sex differences are found only on three Performance subtests - Picture Arrangement and Block Design favouring boys (.01 and .05 levels of confidence respectively) and Coding favouring girls (.01 level of confidence). No significant sex differences are noted on the scales, although girls obtain a slightly higher Verbal mean (full and abbreviated versions) than do boys, as well as slightly higher means on all Verbal subtests with the exception of Digit Span. Boys obtain slightly higher Performance means than do girls, as well as slightly higher scores on all Performance subtests with the exception of Coding. Digit Span and Coding are thus subtests on which sex groups tend to perform atypically, and it is of interest that these are both alternative subtests in Wechsler's battery, and that factor analyses (our own, and a number of those reviewed) suggest that these are the subtests least appropriately placed in their respective subscales. Reasons have already been given for the decision to use these two subtests, but the possibility must be entertained that if Information (an "essentially verbal" subtest in Cohen's ,1959, analysis) and Mazes (a test which loaded Perceptual Organisation in Cohen's analysis) had been given in

place of Digit Span and Coding, results might have been slightly different. Had boys and girls performed more typically on these subtests it is possible that sex differences on Verbal and Performance scales may have reached significance.

As regards comparison of these results with those of other investigators who have reported on sex differences on the Wechsler tests, it was noted in our review of literature that males often tended to make slightly better Verbal scores than girls who in turn tended to perform slightly better on the Performance scale. This seemed to be a reversal of the "stereotype" pertaining to sex differences (Tyler,1956). In this study it is the girls who make the slightly higher Verbal mean score - a result more in the direction of the conventional stereotype. Regarding subtest differences, little can be said, for results vary. The finding of female superiority on Coding replicates several other findings, however.

b. Normal/retard differences

Table XV (p.73) indicates that normals make higher mean scores than do retards on all WISC measures, and the analysis of variance (Table XX, p.87) indicates that the difference is significant at beyond the .01 level of confidence on all IQ measures. If selection of normals and retards on the basis of non-failure/failure of a school standard is valid, and if sheer inability to cope with the demands of schooling is related to intelligence, then one would expect these differences to occur. The fact that they do so provides some evidence for the emipirical validity of the WISC.

It will be noted that although Verbal and Performance scales differentiate significantly between groups, the Verbal scale is the better differentiator here (Tables XV, p.73 and XX, p.87). This is to be expected in the light of research reviewed by Littel (1960), in which Verbal IQ tends to possess higher correlations with standardised measures of achievement than does Performance IQ.

All Verbal subtests differentiate significantly between groups. Three Performance subtests (Picture Completion, Picture Arrangement and Object Assembly) fail to do so, however. It would be expected that these subtests might be least dépendent upon the type of general ability which allows an Indian child to acquit himself in satisfactory fashion with regard to both scholastic tasks and intelligence tests, and reference to Table XVIII (p.81) indicates that this is in fact the case. These three subtests have the lowest

loadings on Factor I, which was interpreted as general ability. We have already had occasion to question the "appropriateness" of Picture Arrangement and Object Assembly subtests for Indian children, and from this analysis it appears that Picture Completion, too, must be regarded as possibly being an inferior component of the WISC in this respect.

Of interest is the fact that the Verbal mean of normals is in no way inferior to the norm, being actually slightly above average. Since there is no reason to believe that this group has suffered retardation as a result of educational deprivation, the WISC Verbal scale may estimate the intelligence of non-deprived Indian children in completely average fashion. It is on the Performance scale that inferiority is apparent, the mean of 91.9 falling 8.1 points below average. In consequence, mean Full Scale IQ falls below average, but only by 3.9 points - a decrement small in comparison with the decrement of about 20 points suggested by Ramphal for more representative groups. It indicates the level at which the non-deprived Indian child may be expected to perform, and emphasises one of Ramphal's conclusions - that differences between performances of Indian and European groups can largely be sought in differing background environments.

In contrast to normals who are placed in the average range of intelligence on all WISC scales, retards are placed within the dull normal range on all these measures. Again, in contrast to normals who appear to possess a relative strength in the Verbal realm, retards appear to have no particular strengths or weaknesses, their Verbal and Performance means being rather similar. However, this requires further evaluation, as will take place in Section D.

Summary

In SECTION C, intergroup differences were analysed by means of the technique of analysis of variance. No significant interaction effects were found, and main effects of the two factors studied (sex, and the normal/retard distribution) could therefore be commented upon.

Sex differences were found only on three WISC Performance subtests - Picture Arrangement and Block Design favouring boys, and Coding favouring girls. The latter result has frequently been found in analyses of sex differences on Wechsler tests, but less can be said regarding the consistency of the other two findings. Although there were no significant sex differences on the scales there was a tendency for boys to do better than girls on the Performance scale

and for girls to do better on the Verbal scale - a result in the opposite direction to that which has been found, in the majority of cases, with European groups. It was thought to be possible that choice of subtests used in the present research may have prevented sex differences on the scales from assuming significance.

Normal/retard differences were found, as would be expected, on all WISC scales and on all measures with the exception of Picture Arrangement, Picture Completion and Object Assembly. These three Performance subtests were found to be the most inferior measures of Factor I, interpreted as general ability, which emerged from factor analysis of WISC subtests.

SECTION D VERBAL AND PERFORMANCE SCALE RESULTS, AND VERBAL-PERFORMANCE DISCREPANCIES

In spite of the fact that division of subtests into Verbal and Performance scales (Wechsler,1949) is not entirely supported by the results of factor analysis, Verbal and Performance scales carried equal weight in determining Full Scale IQ for the present group. Since we have used Wechsler's norms in deriving these measures, it is entirely appropriate to evaluate significance of differences between the two scales for the group and for subgroups. In Table XXI (below) differences between measures are evaluated using a "t" test for correlated observations (Edwards,1960,p.136).

TABLE XXI

EVALUATION OF DIFFERENCES BETWEEN VERBAL AND PERFORMANCE IQ'S WITHIN GROUPS

Group	Means of measures being compared		Difference	Standard error of difference	"t"	Degrees of freedom	Level of significance
	VIQ	PIQ					
Entire group	95.375	88.903	+6.472	1.2293	5.2650	71	< .01
boys	94.194	90.444	+3.750	1.8093	2.0726	35	< .05
girls	96.556	87.361	+9.195	1.5360	5.9863	35	< .01
normals	100.417	91.917	+8.500	1.4932	5.6932	47	< .01
retards	85.292	82.875	+2.417	1.9347	1.2493	23	-

Although Verbal IQ is seen to be the higher measure for all groups, significant differences occur for the entire group, for girls and for normals (.01 level of confidence) and for boys (.05 level of confidence). The discrepancy in the case of retards fails to reach significance.

We shall concern ourselves, first, with differential scale results of the entire group and before analysing these further, these should be viewed in the light of standard errors of measurement of the scales, which are 4.86 points for the Verbal scale and 5.17 points for the Performance scale.[1] It thus appears that a discrepancy of 10 points could be accounted for within one standard error of measurement, and that one as large as 30 points could be accounted for within the margin of three standard errors of measurement. Thus in the case of every individual studied, the obtained discrepancy could have been accounted for in terms of error alone (since discrepancies range from -24 to +27). What is interesting however, is the Verbal dominance of the group. Is the mean discrepancy large enough to warrant that

1. Calculated with the aid of a formula supplied by Guilford (1965,p.444)

the group be considered Verbal dominant? In Table XXII (below) we have compared our results with those reported by Seashore (1951) for 12 year olds in the WISC standardisation sample. The reason for the choice of this age level is because it would be rather unrealistic to compare present results with those obtained by the entire standardisation sample (N=2,200). Since means and standard deviations of the sample were found to differ little with age, we have chosen the age group nearest to the mean age of the present sample for comparative purposes, although results would have been similar whichever age group had been chosen.

TABLE XXII

COMPARISON OF DISCREPANCIES OF THE PRESENT GROUP WITH THOSE OF WECHSLER'S 12-YEAR-OLDS

Group	N	Discrepancy scores						
		Range	Mean	S.D.	Difference	$S_{x_1-x_2}$	"t"	Degrees of freedom
Present group	72	-24 to +27	+6.47	10.45				
Wechsler's 12-year-olds	200	not given*	-0.8	12.00	+7.27	1.261	5.773	270

* As scores were normally distributed one assumes that their range was from -36.8 to +35.2 for 99.9 per cent of the group

The Table indicates that the mean discrepancy score of the group is significantly higher than that of the nearest age level of the standardisation sample. In terms of this analysis, too, the group may be considered Verbal dominant. Subgroups within the present sample cannot be compared with the standardisation sample in this way, for no breakdown of boys' and girls' discrepancy scores by age is reported by Seashore.

One may also enquire whether distribution of larger discrepancy scores of the group and of subgroups is abnormal with reference to Seashore's (1951) analysis for the standardisation sample. As mentioned previously, Seashore found discrepancy scores to be distributed around a mean of zero with a standard deviation of approximately 12.5 for each age level. Since the distribution of these scores was ostensibly normal, approximately two-thirds of a group comparable to the standardisation sample would be expected to obtain discrepancy scores of less than 13 points. In the remaining one-third of the group, discrepancy scores may be expected to be larger, with larger positive and larger negative discrepancy scores being found with approximately equal frequency. We further compare performance of the present group with standardisation statistics in this realm

in Table XXIII (below), where the frequency in the V > P group represents the number of children with Verbal in excess of Performance IQ by 13 points or more; the frequency in the V = P group represents the number of children with discrepancies, in either direction, of less than 13 points, and the frequency in the P > V group represents the number of children with Performance greater than Verbal IQ by 13 points or more. These frequencies are compared with "expected" frequencies in the light of Seashore's analysis by means of the Chi square test (Edwards, 1960, p.151) undertaken to determine whether they differ significantly.

TABLE XXIII

ACTUAL AND EXPECTED FREQUENCIES IN V > P, V = P AND P > V CATEGORIES

Category	Group									
	Entire group		Boys		Girls		Normals		Retards	
	Actual	Expected	Actual	Expected	Actual	Expected	Actual	Expected	Actual	Expected
V > P	18	12	7	6	11	6	16	8	2	4
V = P	50	48	26	24	24	24	30	32	20	16
P > V	4	12	3	6	1	6	2	8	2	4
N	72	72	36	36	36	36	48	48	24	24
X^2	9.416		1.834		9.334		12.725		3.000	
d.f.	2		2		2		2		2	
level of significance	< .01		-		< .01		< .01		-	

It will be seen that in the above Table we have, for the sake of interest, broken down discrepancy scores into those obtained by subgroups. Comparison of subgroup results with Seashore's statistics is not entirely justified since Seashore has not performed a separate analysis for the sex groups or for different levels of achievement. It is performed solely for the sake of interest in that one knows that one has an abnormal distribution of such scores, but wishes to be more precise in defining the sources of such abnormality.

It may be seen from Table XXIII (above) that in the case of the entire group, distribution of larger discrepancy scores is abnormal, and that this is the result of a disproportionate number of discrepancies in the V > P relative to the P > V category. The same conclusion holds for the girls' group and for normals. For boys and for retards, the distribution of larger discrepancy scores does

not differ significantly from expectation. This analysis, together with the analysis of significance of discrepancy scores for subgroups separately (reported in Table XXI,p.92) suggests that girls are "more" Verbal dominant than boys, and that normals are "more" Verbal dominant than retards. In Table XXIV (below) we have analysed this question. Here discrepancy scores of boys and girls, and of normals and retards are compared, and differences are evaluated for significance.

TABLE XXIV

DISCREPANCY SCORES OF SUBGROUPS AND SIGNIFICANCE OF DIFFERENCES BETWEEN THESE

	Group	N	Range	Mean	S.D.	"t"	Degrees of freedom	Level of significance
1.	Boys	36	-24 to +27	3.75	10.97	2.2628	35*	<.05
	Girls	36	-18 to +26	9.195	9.374			
2.	Normals	48	-19 to +27	8.50	10.48	2.4756	70	<.05
	Retards	24	-24 to +14	2.42	9.47			

* The "t" test for matched pairs was used here

It may be seen from the above Table that girls may be considered "more" Verbal dominant than boys, and that normals may be considered "more" Verbal dominant than retards. Differences, in each case, are significant at the .05 level of confidence.

Discussion

In this section we analysed one of the main features of interest in undertaking the present research - namely whether for Indian children one could expect WISC Verbal IQ to be higher than WISC Performance IQ. A brief analysis of results of the Durban Clinic sample tested on Maxwell's short form of the WISC had suggested that this might be the case, but since boys' and girls' groups were poorly matched, it was difficult to assess whether the performance of the group was biased because girls had outnumbered boys. For this reason it was felt that an experimental sample should comprise equal numbers of individually matched boys and girls. It was also felt to be necessary to test the children on the full WISC in order to ascertain whether what appeared to be a positive discrepancy on the short form would be replicated when the full WISC was applied.

Having selected an experimental sample according to requirements, and having applied the full WISC to this sample, one is now in a

position to comment upon Verbal and Performance scale results, and Verbal-Performance discrepancies of a group of Indian children. This section has also purposely been delayed in order to enable one to draw upon results detailed in previous sections in discussing present results.

1. THE PERFORMANCE OF THE ENTIRE GROUP

a. It was found (Table XXI, p.92) that the mean Verbal IQ of the group was 95.4, which places it within Wechsler's average category and falls only 4.6 points below the norm. Mean Performance IQ (88.9) is within the dull normal category and falls 11.1 points below the norm. The mean Verbal-Performance discrepancy (+6.47) is significant at the .01 level of confidence and is also significantly higher than the discrepancy obtained by Wechsler's 12-year-olds, and distribution of larger discrepancy scores is also found to be abnormal. In terms of results of the analysis summarised here, it would appear that the term "Verbal dominant" can be applied to the group.

b. In substantiation of this result we look also at results of factor analysis (SECTION B) in which it was found that the WISC Verbal subtests were more closely allied to general factor variance than were Performance subtests which appeared, in contrast, to possess higher specific or unique variance. This was in accordance with the results and suggestions of Kundu (1967) for Indian adolescents. These latter subtests, with the exception of Coding, appeared to be defining a weak and insignificant factor tentatively designated as "Perceptual Organisation" - a poorly developed dimension of intellect for the present group. It seems plausible that Indian children of the type studied here lag behind Europeans more markedly on a dimension of intellect which is poorly developed and which bears less affinity to general ability than does Verbal ability, on which they perform relatively well.

c. Comparing differential scale results of the present group with those of other groups, one notes that the present discrepancy is in the same direction as that noted for Indian children in their homeland. This suggests that cultural background of the Indian child may be a factor involved in determining this pattern of results. At the same time the direction of the discrepancy is opposite in direction to that noted by Ramphal (1961) who used a South African standardised group test on a representative group of South African Indian children. This suggests that differences in tests used may have been largely responsible for differences in patterning of results. In discussing our own

results we shall therefore consider both cultural background factors and tests applied as possible factors contributing to the pattern obtained.

CULTURAL BACKGROUND FACTORS

That developing individuals tend to acquire patterns of ability in accordance with cultural demands and pressures is the thesis of Ferguson (1954), and that such differentiation can be manifest on a scale such as the WISC is demonstrated, inter alia, by the work of Levinson with Jewish children. Since the present group obtained a mean discrepancy in the same direction as that noted for Indians in their homeland, it appears entirely legitimate to consider this in terms of cultural background factors.

Unfortunately, investigators in India have not been specific in detailing reasons for their suppositions that Verbal dominance of Indian youngsters can be attributed to environmental factors. One can only conjecture therefore, that certain factors within the Indian way of life, at least for those aspiring towards education, may place stress on acquisition of verbal-type abilities to the relative neglect of performance-type skills. What are these factors? Here again, one can only surmise, with respect to the situation obtaining in South Africa, as reported by those who know the Indian people. After a survey of literature in this field, the writer suggests that one factor of importance in determining the observed pattern of abilities is the stress placed by the community on acquisition of essentially useful skills, from the point of view of attaining responsible adulthood. Kuper, speaking of the Indian child of traditional parentage, says:

> "From the time that a child can understand, he is conditioned to responsible social participation... The tasks that he is given are essentially useful, and his efforts are critically appraised" (1960, p.156).

What may be the effects of the stress upon the "essentially useful", to the relative neglect of that which assumes lesser importance? We suggest the following:

i. The emphasis placed on education among South African Indians (Kuper,1960; Hey, 1961) may constitute one aspect of this stress upon the "essentially useful". It is possible that among the Gujaratis, with their independent background as passenger Indians and their tradition as independent businessmen and traders, verbal-type abilities are highly prized. At least at junior school levels, education tends to be largely verbally orientated (a fact lamented, inter alia, by McFarlane Smith,1964, and by McFie - as cited by Vernon,1969). If there is emphasis on obtaining a "good" education, and that education happens to be

largely verbal in its orientation, then it is highly probable that in accordance with cultural demands verbal ability may be developed to a greater extent than spatial and/or manipulative skills.

South African Indian people who, while placing emphasis on conformity to the norm, still value their own traditions, will want their children to share in the latter by participating in education provided by vernacular schools. Principals of the two schools visited informed the writer that for Gujaratis, vernacular schooling is obligatory, and we find that four-fifths of the present group have received such instruction over and above attendance at formal schools. Thus, for the present group, the emphasis on education is furthered. Levinson, in several of his researches with traditional Jewish boys, has commented on the effects of a "double" program on the development of ability. He feels that the extra hours involved in increased schooling and increased homework leave the youngster less time to indulge in extra-curricular activities less related to formal learning, and envisages this as one reason for the accelerated development of verbal-type abilities to the relative neglect of performance-type skills. The same may possibly be said for the majority of children comprising the present group, and may in part account for the relatively better development of the former type of ability.

Of course, if a community places stress on verbal-type ability, but has no means of guaranteeing that formal education will commence at appropriate age levels, there will be doubt as to whether these abilities will be the better developed skills. The fact that Ramphal's sample (1961, Project II) included a representative sampling of the educationally deprived may have to some extent accounted for the fact that verbal ability as measured by the NSAGT was relatively depressed. In contrast, at least the normals[1] included in the present study were not seriously overaged for standard placement. This is probably due to selectivity of the sample - the fact that it comprised mainly Gujaratis attending Gujarati schools (both of which accommodate this linguistic group before admitting children from other groups) - and the fact that the selection procedure eliminated seriously overaged subjects. As the majority of the present group were not deprived, differences between our own results and those of Ramphal may very probably be sought in these factors.

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1. With retards it is difficult to determine the extent of educational deprivation, but it is possible that this has to some extent taken place, for only four retards (two boys and two girls) had failed two school classes. The remainder had failed one class only.

ii. Possible curtailment of freedom to explore and manipulate the environment. If essentially useful tasks have been stressed from an early age it is possible that there has been curtailment of freedom or lack of encouragement to explore the environment and to achieve what Vernon (1969,p.44) calls "a progression of psycho-motor skills" necessary to understanding of this. It has been mentioned that Tyler (1956) has used the hypothesis of perceptual deprivation to account for lowered Performance scores of southern Negroes and also that Vernon (1965) feels that this cannot assume importance in a society where "nature provides plenty of sticks, stones, water ..." (p.72). Even assuming the availability of these commodities in a largely urban, flat-dwelling community need not however imply that children had been free to exploit them in gaining understanding of the world of objects. Vernon (1969), in a later work, implies that the extent to which natural phenomena are so used may depend on parental sanction, encouragement and feedback. It is possible that a number of parents have failed to provide this due to the view that such experience is not essentially useful.

Probably allied to the stress on the useful is the fact that Indian children appear to have a restricted play life. Kuper writes:

> "For the average South African Indian child there is no period of irresponsibile play, no world of toys, no fairy make believe", and "In recently formed pre-school 'play groups' ... it was initially difficult to get the children to behave freely; ... they treated the toys with the care bestowed on important household possessions ..." (1960,p.156)

In the present research we have attempted to study only extent of contact with manipulative toys and puzzles, and find that 50 of the 72 subjects had probably not had such contact prior to testing. It would seem, then, that the play life of these children has not been geared towards compensation for a paucity of contact with natural phenomena. It is reasonable to suggest, then, that perceptual-motor skills may be retarded (relative to verbal skills) as a result of cultural emphasis upon this aspect of development.

iii. Perhaps not unrelated to the stress on the useful and early expectations of responsible behaviour is the fact that Indian children, relative to South African Whites, appear anxious and tense (Lloyd,1958) and generally inhibited (Kuper,1962). Could this have affected WISC scores? The effects of anxiety have been studied in several ways and results merit brief consideration.

a. Shinagawa (1963), whose method has already been outlined, found a group of "nervous" Japanese children to be Verbal dominant.

b. Several investigators have correlated WISC scores with scores on the Children's Manifest Anxiety Scale developed by Castenenda et al (1956) along the lines of the Taylor Manifest Anxiety Scale. The latter has been correlated with Wechsler's adult scale scores and Guertin et al (1962), in reviewing such studies, comment upon lack of consistency of results. The same may essentially be said for CMAS-WISC correlations, for, while negative correlations between measures have been reported, these often fail to reach significance (Haffner et al, 1956; Rowley and Stone,1963). There is little evidence that Performance scale achievement suffers to a greater extent than Verbal scale achievement, although this is the trend indicated.

c. Exner (1966) studied effects of "situational anxiety" on WISC achievement, this anxiety being manipulated by deliberate failure to establish pre-test rapport with an experimental group of testees. There is evidence from this study that such anxiety has an overall depressing effect upon scores, that subtests administered early in the battery may be most affected, and that the Arithmetic and Digit Span subtests which require attention and concentration may be affected regardless of order of presentation, but little evidence to suggest a more marked depression of Performance IQ relative to Verbal IQ.

It is difficult to make suggestions from results of these studies as to whether tension or anxiety, had it occurred in the present group,[1] might have affected pattern of results obtained. It is noted that the present discrepancy is in the same direction as that obtained by Shinagawa's group, for whom we assume, in the absence of information, that "nervousness" was a "stable" trait rather than one manifest at the time of testing only. Had the present group consisted of children on the average rather more "nervous" than children in the normative sample, it is possible that this might have had some effect upon results. Situational or manifest anxiety may have occasioned an overall lowering of results, but is unlikely on its own to have occasioned a significantly greater decrement in Performance output. In conclusion, it cannot be discounted that tension or anxiety may have affected performance of the present group, but very much more information would have to be available before a personality factor of this nature could be suggested, with any confidence, to have had a marked influence on the direction of the discrepancy obtained.

Apart from possible cultural pressure towards acquisition of

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1. We have no objective information to enable us to suggest that this was the case. It is simply assumed to be a possibility in the light of findings with Indian children.

useful skills and abilities, we shall briefly consider possible influences of other subcultural factors reviewed in the literature.

Urban residence. Some eleven-twelfths of the present group can be classified as of urban residence. Seashore (1951), after analysing discrepancy scores of the normative sample noted that while a higher proportion of urban children obtained positive discrepancies, the 2 point difference in means was not of great importance although "in the direction of the stereotype". (p.66). Predominantly urban residence may have been a factor contributing to the direction of the discrepancy here obtained, but in the light of Seashore's findings it is unlikely to have had any great significance. We do, however, feel it to be worthy of note that five-sixths of the urban children were also flat dwellers with, one assumes, decreased opportunities for exploration. This, it is felt, may have had some bearing on direction of results rather than urban residence *per se*.

Socio-economic status has not been determined for the present group, and what is said here can only be in the nature of conjecture. Our subjects probably enjoyed higher status than Ramphal's more representative group (1961, Project II), since "...Gujaratis ... have the highest incomes" (Meer,1969, p.86) and nearly four-fifths of the present group were Gujaratis. This may have contributed to the fact that our own group performed better than Ramphal's with respect to overall intelligence and possibly Verbal intelligence. However Ramphal (Project III) found that socio-economic status, within a fairly homogeneous group of rather deprived Indian children, assumed only minor importance as a determinant of level of achievement relative to scholastic opportunity. At least the normals within our own group do not appear to be scholastically deprived, and this, more than socio-economic status *per se*, may have accounted to some extent for differences between our own group and Ramphal's group. This difference was probably manifest in overall level of intelligence, and, since Verbal IQ bears a stronger relationship to scholastic achievement and opportunity than does Performance IQ, in differential levels of functioning in addition.

While it is believed that the present group was rather "select" when compared with a more representative group of Durban Indians, there is little reason to believe that it enjoyed high status in any "absolute" fashion, since Durban Indians are not a wealthy group. (Kuper et al, 1958; Kuper,1960; Meer,1969). Seashore (1951) found that it was only in the highest "parental occupations" group of the WISC normative sample that Verbal IQ exceeded Performance IQ significantly, and it would therefore not appear likely that socio-

economic status in any absolute fashion has been responsible for the direction of the discrepancy obtained by the present group.

Bilingualism. All the present subjects were chosen on the groups of reported bilingualism,[1] although no objective test of this was given. Could the contact with two languages have affected direction of results? This does not appear to be the case, for, as a review of literature shows, bilingualism is more likely to depress Verbal than Non-Verbal intelligence, and the present group does not appear to have depressed Verbal intelligence. That the bilingualism of the present group appears to have had little effect upon pattern of results is not surprising, for:

a. Levinson has found predominantly bilingual Jewish groups to be Verbal dominant (e.g. 1960a). A comparison has been made earlier in this section between value orientations of traditional Jewish and Indian groups, and it is possible that in both the stress upon education has been more instrumental in determining differential development of abilities than has bilingualism.

b. Ramphal (1961, Project II) found the relationship between bilingualism and intelligence to be insignificant for his Indian group.

We conclude that it does not appear likely that contact with two languages has influenced the direction of the discrepancy obtained by the present group. It might, of course, have influenced level of Verbal IQ, but it has not lowered Verbal IQ relative to Performance IQ.

FACTORS RELATED TO TESTS APPLIED

It is not possible to compare absolute level of WISC performance of the present group with that of groups studied in India since modifications and translations of the scales must have rendered them more appropriate (or "fairer") to the Indian groups who would thus be expected to perform at a higher level. What is interesting is the fact that even after modification the direction of the discrepancy is the same as in the present research. This would tend to suggest that important properties of measurement were maintained even after modification, and that Indian children and adolescents (or at least thos presumably undeprived of schelastic opportunity) do indeed constitute a Verbal dominant group when assessed by means of a Wechsler scale. Interesting, too, is the fact that the Verbal scale, on which youngsters make their higher scores, appears the

1. "Bilingualism" it is realised, is a term perhaps too restrictive for Indian children of this age, who also have some contact with Afrikaans

better and more appropriate scale for them. Kundu (1967) found a modified W-B Verbal scale to be more allied to general ability than the corresponding Performance scale, and results of factor analysis as applied to results of the present group substantiate this in this research also.

Similarly, it is not really possible to compare absolute level of IQ of the present group with that of the group tested by Ramphal (1961, Project II) since samples and tests again differ. What is of interest is the fact that the direction of the discrepancy differed in the two researches, Ramphal's group obtaining a slightly but significantly higher mean on the Non-Verbal than on the Verbal scale of the NSAGT, the present group obtaining a significantly higher mean on the Verbal than on the Performance scale of the WISC. Differences in tests used could to some extent have been responsible for this difference.

Comparison of Verbal scales reveals that the subtests of the NSAGT require reading ability before questions can be answered. This is required to different extents, the Verbal Reasoning subtest requiring reading and comprehension of instructions before the nature of the question to be answered can be ascertained, the Classification and Analogies subtests, while requiring this to a lesser degree (since one set of instructions, orally presented, designates the manner in which subsequent items are to be tackled) still require an adequate reading vocabulary if success is to be attained. Since Ramphal (1961) cites inspectoral reports which state that the average Indian South African child reads at a lower level than his European counterpart, it is possible that at least some of the deficiency of Ramphal's subjects on the Verbal scale of the NSAGT pinpoints a deficiency in reading rather than a deficiency in Verbal intelligence.

The Verbal scale of the WISC, in contrast, does not rely on ability to read, at least within the age level of the present group. Only items 14, 15 and 16 of the Arithmetic subtest require such ability and few of the present subjects reached this level - success through item 12 only is expected from the average 13½ year old (Glasser and Zimmerman,1968). The present group was not, then, handicapped by possible deficiencies in reading and it follows that output at a higher level than that of Ramphal's subjects could be expected.

We do not propose to compare and contrast Non-Verbal (Performance) scales of the two instruments in detail. One obvious difference is that the WISC Performance scale allows for overt manipulation of

"pieces which go together to make a meaningful whole" in at least three of its subtests. A "trial and error" approach may lead to correction of error[1] and obtaining of a correct solution. The Non-Verbal scale allows for no overt manipulation, but a compensatory factor is that the correct solution is provided among one of the alternates, and this may on occasion prove a guide to success (which would have been unmerited in "creative response" solutions) through approximation or through a lucky guess. We cannot say, within the bounds of our present knowledge, which type of scale would prove "easier" for a child presumably deprived of knowledge regarding the world of "things". The present group made a higher mean score on the WISC Performance scale than did Ramphal's group on the NSAGT Non-Verbal scale (88.9 as opposed to 82.32) but the present group performed at a very much higher overall level, probably due to differences between samples. Ramphal's group did not appear retarded on this scale relative to results on the Verbal scale, whereas the present group did - possibly because Verbal IQ was enhanced as a result of the fact that no reading ability was required.

We conclude that the scales of the NSAGT and the WISC are not strictly comparable and that directions of discrepancies between Verbal and Non-Verbal scales observed on the one instrument need not necessarily be observed on the other. A tentative conclusion is that if reading ability is not required, there appears to be no reason why a non-educationally deprived group of Indian children should under-achieve on a Verbal scale of intelligence. Relative underachievement on a Performance scale might suggest, as we have already mentioned, lack of familiarity with the world of objects, and concomitant lack of development of spatial and manipulative skills.

2. SEX COMPARISONS

Girls, with a mean discrepancy of +9.2 points were found to be significantly "more" verbal dominant than boys (mean discrepancy +3.75 points) at the .05 level of confidence (Table XXIV, p.95). This agrees with Kundu's (1967) results using Indian adolescents tested on the W-B, and suggests that there may be factors within the Indian culture which lead to this sex difference. In the light of what Kuper (1960) has to say regarding Indian rearing practises, it appears to be the boy who is more likely to develop the concept of an achiever in the educational realm, and since Verbal IQ appears more closely related to school achievement than does Performance IQ, this finding requires some discussion.

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1. Feedback can be assumed in the subtests Block Design, Object Assembly and Picture Arrangement.

Boys and girls in the present study were well matched on overall IQ, so that when groups are compared with regard to differential levels of functioning, an increment in one sphere will necessitate a decrement in the other sphere. Both boys' and girls' groups are seen to be Verbal dominant but this dominance is more marked in the case of girls. Why should this be so? We suggest that the following factors may be involved:

a. Kuper (1960, 1962) has stressed that demands made upon the young girl are more exacting than those which apply to the boy, since the girl's freedom is curtailed earlier and to a greater extent. She is required to assume the role of a "little lady" early; feminine charms are stressed, and quietness, gracefulness and a deferential manner are desired and reinforced by parental approval. She may, then, have less freedom than the boy to play, to explore, and to acquaint herself with her environment. If it is conceded that perceptual deprivation may, to some extent, have accounted for lowered Performance scores of the present group, we would suggest that because of factors in her upbringing, the girl's development may suffer more markedly as a result of this. Her very "lady-likeness" may preclude her from discovering the charms of "sticks, stones and water" should these be available. Whereas the boy might seek substitutes, the girl, confined as she is largely to the home, would be unlikely to have the same opportunity, even if her upbringing had not stamped out such desires completely.

b. Girls studied in the present investigation appear a "busier" group than boys in that regular chores are expected from them more frequently. Since proportions of girls and boys who have attended vernacular schools are similar, this would suggest that the girl has less free time to indulge in extra-curricular activities than does the boy. This might to some extent account for the fact that as far as boys are concerned there is a more even development of the two types of abilities sampled by the WISC, whereas, for girls matched with the boys on overall intelligence and age, the one type of ability appears to be developed very much at the expense of the other.

c. As it was felt that play activity might have been related to sex differences in discrepancy scores, an analysis was made of toys enjoyed by the sex groups separately. Table XIV, (p.67) indicates that slightly more boys than girls have enjoyed contact with manipulative toys and puzzles, but the difference is not significant and it is therefore unlikely that this was significantly related to differences in discrepancy scores. The analysis is probably too superficial and too restricted. It is possible that

more would have been accomplished had a detailed analysis of free time activity been undertaken.

In conclusion, it is feasible that sex differences in discrepancy scores for the present group might be related to differences in upbringing and to differences in sex roles within the community. Girls, it would appear, have more restrictions placed upon them, and their role as "little ladies", probably imposed from an early age, might have inhibited a desire to become fully acquainted with the world of objects and natural phenomena. They appear to be more confined to the home than are boys who are their age peers and their equals as far as overall intelligence is concerned and because of this their freedom to explore might have been somewhat curtailed. We suggest that if Indian children from traditional homes may be regarded as suffering from the effects of perceptual deprivation, this would seem to have had a more marked effect upon the development of the girl than on the development of the boy.

3. COMPARISONS ACCORDING TO LEVEL OF ACHIEVEMENT

i. Normals and retards

Both normals and retards are seen to have WISC Verbal means in excess of Performance means, but for normals the discrepancy reaches significance (.01 level of confidence) whereas for retards this is not the case. Table XXIV (p.95) reveals that normals, with their mean discrepancy of +8.50 points are significantly more Verbal dominant than are retards with a mean discrepancy of only +2.4 points. Normals or non-failing subjects score in entirely average fashion on the Verbal scale, their relative decrement appearing on the Performance scale. Retards, in contrast, would appear retarded in almost equal fashion on both scales. A tentative conclusion from this result is that for those who achieve in school, and who are, presumably, non-deprived, educationally speaking, Verbal ability as measured by the WISC is not lowered relative to European achievement. It is Performance ability which appears relatively impaired. For these who underachieve to so great an extent that actual failure results, there appears to be no relative increment in Verbal ability: this ability remains at the same level of underdevelopment as does Performance ability. While it is almost certain that normals studied in this investigation were not educationally deprived, the same cannot be said for retards. It is possible that at least some of the latter group entered school late and were unable to cope, and that scholastic retardation may have had its roots in

this. Such children may never have developed their full capacity on the verbal/intellectual skills which result in both success at school and success on a verbal-type scale.

ii. Average and below average children

The normal-retard dichotomy does not correspond exactly to a division of children into average (IQ of 90 and higher) and below average (89 or lower) groups, as Table XXV (below) indicates.

TABLE XXV

NUMBERS OF CHILDREN PLACED IN WECHSLER'S CATEGORIES OF INTELLIGENCE

Category	Entire Group			Boys			Girls		
	Normals	Retards	Total	Normals	Retards	Total	Normals	Retards	Total
Bright normal (IQ 110-119)	2	-	2	2	-	2	-	-	-
Average (IQ 90-109)	38	6	44	17	3	20	21	3	24
Total average and above	40	6	46	19	3	22	21	3	24
Dull normal (IQ 80-89)	8	11	19	5	6	11	3	5	8
Border line (IQ 70-79)	-	4	4	-	1	1	-	3	3
Defective (IQ 69 or below)	-	3	3	-	2	2	-	1	1
Total below average	8	18	26	5	9	14	3	9	12
N	48	24	72	24	12	36	24	12	36

From this Table it may be seen that eight children (five boys and three girls) have succeeded in satisfying the demands of schooling although below average in intelligence. Six of the children who have failed, in contrast, possess average intelligence. Because the distinction between those of average and sub-average intelligence does not completely ocrrespond to the distinction between normals and retards, we have dichotomised the group at the cutting point of 90 and examined discrepancy scores of children classed, for convenience, as of average and below average intelligence. This grouping was not carried further for the reason that small numbers in the categories suggested by Wechsler (1949) would not have supported such detailed analysis. Table XXVI (below) indicates mean discrepancy scores of children classified as average and below average intelligence, and gives results of a test of significance of differences between these means as ascertained by a "t" test for independent observations.

TABLE XXVI

DISCREPANCY SCORES OF AVERAGE AND BELOW AVERAGE CHILDREN

Group	N	Range	Mean	S.D.	"t"	Degrees of freedom	Level of significance
Average	46	-24 to 27	+8.47	11.71)	.9677	70	-
Below average	26	-14 to 20	+6.19	8.18)			

Table XXVI (p.107) indicates no significant differences between discrepancy scores of average and sub-average groups. For the present group, then, magnitude of discrepancy scores does not appear to depend on absolute level of intelligence as measured by the WISC Full Scale. Both average and below average groups obtain positive discrepancy scores, and while there is a very slight tendency in this direction it cannot be claimed that the "more intelligent" make their higher scores on the Verbal scale of the WISC while the "less intelligent" make more evenly distributed scores. Lest it be felt that division at the cutting point of 90 was too arbitrarily determined and did not give a true reflection of results, we have also correlated magnitude of discrepancy scores (retaining signs so that the continuum was from high negative to high positive scores) with level of Full Scale achievement for the entire group. The resulting coefficient was .201, which yields a "t" ratio of 1.7163 (Guilford,1965, p.163, formula 8.13) which with 70 degrees of freedom is insignificant. Actual level of intelligence then appears unrelated to magnitude of discrepancy scores for the present Indian group. What does appear to assume some importance, in contrast, is level of school achievement. Nothing is known regarding educational deprivation of retards, but at least for normals such deprivation would not appear to have occurred. It is possible that those who achieve in school and who have not been precluded from achieving by virtue of educational deprivation, develop Verbal ability in normal fashion, their Performance abilities being relatively neglected because the community to which they belong does not stress development of these to the same extent. For those who fail (for reasons which we do not have sufficient information to specify)[1], there may be less stress on Verbal-type ability and/or less opportunity to develop this,resulting in more even (but inferior) development of both types of abilities. Such an interpretation would again stress cultural factors as determinants of discrepancy patterns before intellectual level of subjects <u>per se</u> could be felt to be responsible.

iii. <u>Relation of discrepancy scores to specific strengths and weaknesses</u>

We discuss the obtained pattern only with regard to weakness in one sphere - that of reading. We do so only because there is evidence from inspectoral reports (cited by Ramphal,1961) which agree in emphasising that by European standards, the reading achievement of the Indian youngster is poor. Retarded or unsuccessful readers, when tested with the WISC have rather uniformly, as groups,obtained higher Performance than Verbal IQ's. The present group of Indian

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1. The question <u>of why Indian children fail</u> is one which needs further investigation. That it is a problem of sizeable proportions is seen with reference to the failure rate in Senior Certificate at the end of 1968. In this examination, 41 per cent of Indian candidates failed. (Natal Mercury, Friday, 10th January,1969). That failure, even at lower levels is not only the result of sub average intelligence is demonstrated in this research, where,with reference to Table XXV (p.107)it may be seen that one quarter of the present retards possessed intelligence within the average category.

subjects obtained a discrepancy in the opposite direction, and since we have applied no tests of reading we are unable to relate this to the above. If we consider that the present groups' mean reading achievement would probably be poor (generalising from the fact that subjects share a common "Indian" background with more representative groups on the basis of whose performance the above reports were undoubtedly made) we must assume that negative WISC discrepancy scores as characteristic of a group of unsuccessful readers can only emerge when other background factors are controlled. On the other hand it is possible that the present group, being rather "select" in a number of ways already mentioned, might suffer relatively less retardation than would a more representative group of Indian children in this sphere of learning.

This brief analysis does not, however, point to retardation in reading as in any way having been responsible for the direction of the mean discrepancy score obtained.

Summary and tentative conclusions

1. A positive discrepancy score was noted to characterise WISC performance of the present group of Indian children, and it was noted that this finding was concomitant with findings of investigators in India who applied modified Wechsler scales to children and adolescents. This suggested that factors within the Indian culture may have influenced the pattern of Wechsler discrepancy scores. It has been suggested that the stress placed by Indians upon an acquisition of "essentially useful" abilities may have been one factor with bearing on the above pattern. A corollary of this is that "school type" abilities (both at formal and at vernacular institutions) may have been stressed to the relative neglect of Performance arts, and may be better developed than these both because of cultural pressure and because of possible lack of time to indulge fully in extra curricular activities.

2. Girls, who may be supposed to develop into "little ladies" early, and to spend free time in the acquisition of abilities which will enable them to become, in their time, competent housewives, may have had less time for development of perceptual-spatial-manipulative abilities relative to boys who are their age peers and their intellectual equals. It may be for this reason that we find that the girls here studied appear more Verbal dominant than the boys. Boys, relatively speaking, appear more "rounded" as far as intellectual abilities are concerned. Girls appear to have developed Verbal ability to the relative decrement of Performance ability.

3. Normals, or non-failing subjects, appear to be a Verbal-dominant group. The same may not be said with regard to retards (defined in this study as those whose scholastic achievement has become so severe that actual failure of a school level has resulted). The cause of "retardation" of retards is not known, but there is some evidence that this is not only due to intellectual deficiency. Educational deprivation, stressed by Ramphal (1961) and found by him to have a marked effect on attainment of both intellectual skills and satisfactory educational output may have occasioned failure, in some pupils. Little can be said in this respect except that for normals, who, presumably, are non-deprived with regard to educational opportunity, Verbal ability appears to have developed in normal fashion. Non-failure and achievement of success year after year may have motivated normals to further study and towards greater successes in essentially "school type" tasks, with the result that Verbal abilities have been developed to the relative neglect of Performance arts. For retards, positive reinforcement may have been absent, and there may have been little incentive for this group to "forge ahead" with respect to Verbal ability, as the normals appear to have done. They perform at a fairly uniform and low level on both sections of the WISC.

The average/below average division appears, in this study, to have had little effect upon magnitude of discrepancy scores and there is little evidence that poor reading ability of the group (had this existed) had any effect upon results obtained.

4. Subcultural factors with pertinence to the present group (as a group within the larger Indian community) would not appear to have affected the direction of results to any marked degree. The fact that the group was predominantly urban may have had some bearing upon the fact that the direction of the discrepancy was positive, but it is not felt that relatively high social status (within the Indian community only) could have been a causal factor. The fact that all subjects reported bilingualism was also not felt to be a causal factor since a number of investigators and reviewers had suggested that if there is to be any handicap to the bilingual child relative to the monolingual, this can be expected on Verbal scales and Verbal tests rather than on Performance tests.

5. The direction of the present discrepancy on the WISC was compared with the direction of the discrepancy noted by Ramphal (1961) who found, for a more representative and larger group of Indian children than that used in the present research, that Verbal IQ's obtained on the NSAGT were slightly but significantly lower than correeponding Non-Verbal IQ's. While it is felt that differences

an samples tested (our own being, in all probability, rather more "select" than that of Ramphal) could have occasioned a higher level of overall performance for the present group, differences in direction of discrepancy scores are felt to be largely due to differences in tests applied. The greatest pertinent difference between tests lies in the fact that in order to perform on the Verbal scale of the NSAGT, a subject has to be able to read. This is not necessary on the Verbal scale of the WISC within the age level studied. Defects in reading may well have lowered Verbal intelligence of Ramphal's group, whereas they would not be expected to do so as far as the present group was concerned.[1] The WISC may then allow a child to express his capability in the realm of Verbal Comprehension more readily than does the NSAGT, where a reading deficit may mean that Verbal Comprehension is not being truly assessed since the child may not be able to read and understand what is required of him. He cannot attempt to answer questions which he cannot decipher!

In concluding this section, the present writer is of the opinion that the discrepancy score obtained by the present group reflects the cultural emphasis of the Indian community upon predominantly verbal, "school type" learning as a useful dimension of intellect, at least among a rather select group such as was studied in the present research. Lack of time, motivation, and facilities (within a predominantly urban flat-dwelling community) to acquire Performance abilities may have resulted in the finding that these are, relatively speaking, but poorly developed. When results are compared with those of Ramphal (1961, Project II) it is felt that although group differences may have had an effect upon direction of discrepancy scores, differences in tests applied are more pertinent to differences observed in this respect.

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1. We in no way wish to imply that the WISC is more "valid" than the NSAGT for the measurement of intelligence of South African Indian children. Poor reading ability, which will handicap a child on the NSAGT, will also, of necessity, handicap him to a large extent in his school subjects and will be shown up in examinations should he be unable to read questions. The NSAGT may therefore, where reading difficulty is suspected, be more predictive of scholastic success than is the WISC.

SECTION E. AN EXAMINATION OF MAXWELL'S SHORT FORM OF THE WISC AS APPLIED TO THE PRESENT GROUP, AND SUGGESTIONS REGARDING THE USE OF ALTERNATIVE ABBREVIATED FORMS WITH INDIAN CHILDREN.

A. FINDINGS WITH MAXWELL'S SHORT FORM

1. Correlations between short and Full scales are .873, .736 and .883 (Table XVII, p. 79), for Verbal, Performance and Full Scales respectively. The correlation between Full Scales falls just short of .90, considered by many to be a minimum requirement for validity of a short form. Since our review of literature has suggested that for "atypical" samples, validity coefficients may be lower than for normal groups (e.g. Schwartz and Levitt, 1960; Enburg et al, 1961; Osborne and Allen, 1962) it is possible that the above coefficient may be considered acceptable.

   One fact which merits attention at this stage is that separate Verbal and Performance scale validity coefficients are lower than that of the Full Scale. In our review of literature it may be seen that only investigators using modified split half abbreviations have been sufficiently ambitious to attempt to predict differential Verbal and Performance IQ's on the basis of a short form. On account of lowered coefficients for these scales we would suggest that to attempt differential prediction on the results of only two subtests in each scale is probably not warranted.

2. In no research which we have been able to see has the Similarities-Vocabulary-Block Design-Object Assembly quartet (S-V-BD-OA) been studied, neither has it been reported among the best quartets by those who have examined every possible four-subtest combination for the WISC standardisation sample (see Glasser and Zimmerman, 1968, p.134 ff.). Using the method advocated by Bridges (1959), and nomographs provided by him, we have estimated its validity, for 10½ and 13½ year groups of the standardisation sample to be .945 and .925. Thus, for the present group, validity of the combination is lowered, possibly because of restricted variation of scores. It is possible, also, that use of Maxwell's method to derive IQ's had an effect upon the coefficient. For this reason we planned to estimate the validity of the quartet using a regression equation especially derived with reference to the performance of the present group to see if this could be enhanced. This proved to be the case as later results will show, but the increase in validity was not large.

3. One requires knowledge not only of correlations between full and abbreviated scales but also of the extent to which the short form yields comparable mean IQ's to the full test scale before assessing validity of the short form. Pertinent information is set down in Table XXVII (p.114).

It will be seen from Table XXVII (p.114) that:

a. Mean Full Scale IQ's as measured by the WISC and as predicted by the short form do not differ significantly and are in fact within one point of each other for the entire group, for boys and for girls. For normals, there is a tendency towards underprediction, and for retards, a tendency, more marked, towards overprediction of intelligence by the short form. This suggests that for the more homogeneous groups classified according to achievement, less dependence can be placed upon results with the short form.

b. Mean Verbal IQ is underpredicted by the short form, significantly in the case of all groups.

c. Mean Performance IQ is very similar to mean short form Performance IQ for all groups, and none of the differences between means is significant. This suggests that the two Performance subtests used (Block Design and Object Assembly) have merit in being fairly representative of the "Performance" achievement of the group.

d. Verbal-Performance discrepancies obtained on the short form are, as far as their direction is concerned, similar to those obtained on the full WISC. The entire group, girls, and normals again appear Verbal dominant on the short form although magnitude of these discrepancies is reduced (compare Table XXI, p. 92). Retards, who did not appear Verbal dominant on the Full Scale are also clearly not significantly Verbal dominant on the short form. The boys' group, which on the full WISC achieved a significantly higher Verbal mean (.05 level of confidence), fails to do so on the short form. As far as these results are concerned we refer the reader back to our preliminary analysis of short form WISC profiles of the Clinic group. Here too, it was the girls in the group who appeared Verbal dominant, the boys failing to do so. It appears that as far as boys of this particular subculture are concerned, a discrepancy score obtained on the full WISC need not necessarily be replicated on Maxwell's abbreviated form. This observation, together with the fact that short form Verbal IQ clearly underestimates Verbal IQ for all groups studied, adds

TABLE XXVII

EVALUATION OF SIGNIFICANCE OF DIFFERENCES BETWEEN FULL SCALE AND ABBREVIATED WISC IQ'S

Group	VIQ and S.F.VIQ			PIQ and SF.PIQ			FSIQ and SF.FSIQ			SF.VIQ and S.F.PIQ		
	Difference	Standard error of difference	t	Difference	Standard error of difference	t	Difference	Standard error of difference	t	Difference	Standard error of difference	t
Entire Group	+3.611	.662	5.455*	+1.042	.905	1.151	- .084	.632	.132	+3.903	1.427	2.734*
Boys	+4.305	.818	5.263*	+ .250	1.459	.171	- .223	1.000	.222	- .305	1.956	1.156
Girls	+2.917	1.013	2.880*	+1.833	1.057	1.735	+ .055	.774	.072	+8.111	1.828	4.438*
Normals	+4.125	.860	4.796*	+ .417	1.086	.385	+1.542	.645	2.358+	+5.792	1.551	3.734*
Retards	+2.584	1.041	2.482+	+ .292	1.686	.173	-3.333	1.0797	3.087*	+ .125	2.859	.043

(In all difference columns the sign is positive if the mean of the first mentioned measure exceeds that of the second measure)

*The difference is significant at beyond the .01 level of confidence

+The difference is significant at beyond the .05 level of confidence

credence to our conclusion set down in (1) above: namely that attempting to predict differential Verbal and Performance IQ's from an abbreviated scale containing only four subtests is too ambitious a procedure to be warranted at present. It is one, clearly, which will be subject to error.

An apparent contradiction arises from careful study of this Table. Why, when short form Verbal and Performance means tend to be lower than Full WISC Verbal and Performance means, is there such good correspondence between Full Scale means on the full and short forms of the WISC ? This can be explained with reference to Maxwell's method of deriving short form IQ's. This is essentially a deviation method, for details of which we refer the reader to an enclosure from the Maudsley Handbook (Appendix I). To derive Verbal IQ for a subject one sums scaled scores on Similarities and Vocabulary, obtains the deviation of this figure from the expected average of 20, and divides this deviation by the standard deviation of the two tests as calculated for the nearest age group of the standardisation sample. The resulting figure is then multiplied by 15, the standard deviation of the Verbal scale. The sign of the deviation is retained throughout, and if positive the deviation is added to 100; if negative it is subtracted from this figure in order to derive Verbal IQ. The same procedure, using scaled scores on Block Design and Object Assembly, is used to derive Performance IQ. However, when calculating Full Scale IQ for an individual, one sums scaled scores on the four relevant subtests, then halves this figure and again finds its deviation from 20 before proceeding in the above manner. This has the effect of reducing variations from the mean, the effects of which may clearly be seen in Table XV (p.73), where it is apparent that the spread of variation of short form Full Scale IQ's is considerably reduced relative to both short form Verbal and Performance IQ's and to Full Scale IQ as derived from the 10 WISC subtests. This may account for the fact that Full Scale IQ's are well replicated for the entire group and it is possible that this is a statistical artifact of the method used in derivation of these measures.

4. One is also interested in the way in which a short form will replicate scores of individuals as well as the group, and individual discrepancies between Full and short form measures are set down in Table XXVIII (p.116).

It will be seen from this Table that the range of discrepancies is very much greater on Verbal and Performance scales of the instruments than on the Full Scales. This would again suggest that prediction only from short form Full Scale IQ is a safer

TABLE XXVIII

DISCREPANCIES BETWEEN SCORES ON FULL AND ABBREVIATED SCALES OF THE WISC.
(Numbers of children obtaining discrepancies of varying magnitudes)

Magnitude of discrepancy	VIQ's					PIQ's					FSIQ's				
	Entire group	Boys	Girls	Normals	Retards	Entire group	Boys	Girls	Normals	Retards	Entire group	Boys	Girls	Normals	Retards
+18 to 22	2	1	1	1	1	3	2	1	2	1	-	-	-	-	-
+13 to 17	1	-	1	1	-	4	2	2	3	1	-	-	-	-	-
+ 8 to 12	16	9	7	14	2	5	3	2	4	1	4	2	2	4	-
+ 3 to 7	18	12	6	11	7	19	7	12	13	6	18	10	8	16	2
+ 2 to -2	22	11	11	13	9	20	9	11	12	8	28	12	16	19	9
- 3 to -7	13	3	10	8	5	13	7	6	9	4	17	9	8	8	9
- 8 to -12	-	-	-	-	-	4	2	2	4	-	2	-	2	-	2
-13 to -17	-	-	-	-	-	4	4	-	1	3	3	3	-	1	2
N	72	36	36	48	24	72	36	36	48	24	72	36	36	48	24
Range	19 to -5	19 to -3	19 to -5	19 to -3	19 to -4	19 to -17	19 to -17	18 to -12	18 to -17	19 to -16	12 to -14	12 to -14	9 to -9	12 to -13	7 to -14

(A negative sign in the first column denotes the fact that the abbreviated WISC score is the larger measure)

process than prediction of differential Verbal and Performance IQ's on the basis of the short form.[1] We consider, on the results of this analysis and on the basis of lower coefficients of correlation between differential measures, that Verbal-Performance discrepancies on the short form may be very much less meaningful than they are on the full WISC. Differential properties of measurement may not be truly replicated.[2]

5. In considering whether or not the shortened Full Scale result is sufficiently valid to be put to practical use, an analysis has been made of the number of children who would have been mis-categorised on the basis of these short form results. For convenience, Wechsler's categories of intelligence (1949,p.16) have been used. This analysis is set down in Table XXIX (p.117), from which it may be seen that 60 of the children, or five-sixths of the group are placed in the same category of intelligence on both full and short forms of the WISC. Of the 12 (one-sixth) who

1. Standard errors of estimate of Verbal, Performance and Full Scales are 11.08, 10.57, and 9.06 IQ points respectively. These are all large,but the slightly smaller measure for the Full Scale lends credence to the above suggestion.

2. This may be one reason why boys tested in the present research obtained a significant V-P discrepancy on the full WISC,but not on the short for

are misclassified, 9 are boys. Four boys are downgraded, two from the bright normal category obtaining average intelligence on the short form, and two from the average category obtaining dull normal ratings. The remaining five boys are upgraded, three from the dull normal category appearing average, and more seriously, two from the defective category rating as dull normal on the short form. The three girls who are misclassified are all upgraded one category - two from the dull normal into the average category, and one from the borderline into the dull normal category. Thus the short form has the effect of reducing variation within the group; 68 children, or over nine-tenths of the group now fall into average and dull normal categories, with only four children obtaining IQ's below 89. Similarly, the two "bright normal" boys have been absorbed into the average group.

Misclassification of nearly 17 per cent of the sample on the grounds of short form Full Scale IQ is a defect which would have to be considered by potential users of the short form in evaluating whether or not it appears satisfactory for use.

TABLE XXIX

CATEGORISATION OF INDIVIDUALS ON FULL AND ABBREVIATED FORMS OF THE WISC (Full Scale IQ)

SHORT FORM		FULL WISC: Bright normal			Average			Dull normal			Borderline			Defective			Total
		B[1]	G	T	B	G	T	B	G	T	B	G	T	B	G	T	
Bright normal	B																-
	G																-
	T																-
Average	B	2			18			3									23
	G		-			24			2								26
	T			2			42			5							49
Dull Normal	B				2			8						2			12
	G					-			6			1			-		7
	T						2			14			1			2	19
Borderline	B										1						1
	G											2					2
	T												3				3
Defective	B																-
	G														1		1
	T															1	1
TOTAL		2	-	2	20	24	44	11	8	19	1	3	4	2	1	3	72

1. In this Table, B represents boys; G, girls; and T the total number of children.

Conclusions

The correlation between the full and short form of the WISC is just below .90. Its standard error of estimate is fairly high, and it misclassifies nearly 17 per cent of the present sample. Whether or not it would prove satisfactory for practical use with Indian children similar in background to the present group would have to be evaluated by potential users of the test, fully aware, in the terms of Silverstein (1967a) of the price they are willing to pay in validity for a decrement of testing time.

It is felt that present results show that attempts to derive differential Verbal and Performance IQ's from a short form based on only four subtests is out of place. Differential properties of measurement of the scales may not be truly replicated when the short form is used.

B. PRELIMINARY INVESTIGATION OF THE POSSIBILITY OF DERIVING ALTERNATIVE SHORT FORMS FOR THE PRESENT GROUP

Slightly disappointing results with Maxwell's short form of the WISC led the writer to consider the possibility of using other short forms with Indian children. This has not been a full analysis of recommended short forms, its purpose being simply to suggest combinations of subtests which possess satisfactory validity for the group in terms of the multiple correlation they yield with the Full Scale. Utility of such forms has not been evaluated in terms of other criteria (standard errors of estimate and over and underprediction), and this would have to be done with other sample populations before they can be fully recommended.

It was decided to confine investigation to quartets, and only one quintet has been evaluated. It would have been possible to evaluate every possible quartet, but this was decided against as it was felt that other criteria besides size of correlations with Full Scale should enter into the selection of a suitable short form with utility for a "deviant" or atypical sample. It also appeared impracticable to investigate the "best" quartets for the standardisation sample, inspection of Howard's work (Glasser and Zimmerman,1968) having revealed that the subtests Information and Picture Arrangement frequently entered into the composition of these. Information was not administered in this research, and we have already given reasons for feeling that Picture Arrangement is an unsuitable test for the present group.

Space does not permit the provision of a rationale for each

of the 17[1] combinations evaluated, but we have attempted to group combinations in such a way that reasons for selection of subtests to enter into these should be clear.

Although examination of Maxwell's short form did not suggest the feasibility of endeavouring to predict Verbal and Performance IQ's in addition to Full Scale IQ, and no such attempt has been made here, it was decided that combinations comprising two Verbal and two Performance subtests should for the most part be used in order to retain the "balance" within the WISC.

Method

The multiple regression analysis was performed by means of computer analysis. Input, for each running of the program consisted of intercorrelations between each of the selected subtests, correlations of each of these with the Full Scale, and means and standard deviations of each subtest employed and of the Full Scale. The program was then run automatically, the printed output in each case consisting of regression weights for each subtest, a constant to be added, and the multiple correlation between the combination and the Full Scale.

Results

These are reported in Table XXX (p.120). Each subtest has been referred to by a defining symbol as has been done in Tables throughout this work.

In discussing results, we shall group combinations as grouped spatially in Table XXX, indicating reasons for selecting subtests to enter into these.

Combinations 1 and 2 were chosen on the basis of findings of other research. The S-V-BD-OA combination is already familiar. It is to be noted that it possess slightly higher validity for the present sample when the regression method rather than Maxwell's method of deriving IQ's is used because it makes use of parameters established specifically for this sample. Would calculation of short form IQ based on these four subtests, using figures presented here[2], provide

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1. More than 17 combinations were actually evaluated, but those yielding validity coefficients below .86 were taken no further account of.

2. Method of calculating IQ from Table XXX
Scaled scores on the four subtests are obtained, and each of these is multiplied by the appropriate regression weight. For example, in the S-V-BD-OA quartet the scaled score on Similarities is multiplied by B_1 that on Vocabulary by B_2, and so on. Products are then summed, and the constant is added to this sum to derive predicted intelligence.

TABLE XXX

VALIDITIES OF SHORT FORMS OF THE WISC EVALUATED FOR THE PRESENT SAMPLE

	Combination	Regression Weights					Constant	Multipl correlation
		B_1	B_2	B_3	B_4	B_5		
1.	S-V-BD-OA	1.713	1.942	1.394	.962		41.941	.9069
2.	C-S-V-BD-OA	1.104	1.403	1.274	1.205	1.126	41.573	.9241
3.	S-V-BD-Co	1.549	1.766	1.792	.933		38.520	.9086
4.	S-V-OA-Co	1.632	1.554	1.500	1.009		43.779	.8954
5.	C-V-BD-OA	1.601	1.958	1.260	1.251		44.185	.8886
6.	C-S-BD-OA	1.532	1.676	1.162	1.321		44.320	.9114
7.	A-S-BD-OA	1.393	2.043	.901	1.153		43.091	.9032
8.	C-A-BD-OA	1.661	1.140	1.458	1.296		41.311	.8786
9.	A-V-PC-OA	1.782	2.328	.880	1.003		41.883	.8773
10.	C-V-PC-OA	1.822	1.820	.690	1.436		47.002	.8670
11.	C-A-PC-OA	1.912	1.628	.819	1.375		43.749	.8913
12.	A-S-PC-OA	1.745	1.925	.833	1.079		41.824	.9063
13.	V-D-PC-OA	2.751	1.630	.974	.889		36.986	.9154
14.	C-S-PC-OA	1.686	1.656	.651	1.466		46.584	.8964
15.	S-V-PC-OA	1.632	1.504	1.506	1.009		43.779	.8959
16.	C-A-S-V	.778	1.491	1.472	1.395		46.439	.8778
17.	C-S-V-D	1.375	1.359	1.938	.729		45.595	.8794

a more valid estimate than Maxwell's method for a new sample of Indian children similar in background to the present sample? Guilford (1965) has stressed that for small samples (N less than 100) the multiple correlation may have an inflated value which would be reduced when data were applied to a wider population. He suggests a method for "shrinking" R to a more probable population value, and when his formula (16.7, p.401) is applied here, the multiple R is reduced from .9069 to .9011. If the strict criterion of a validity coefficient of at least .90 is required for a short form, this short form still fulfils requirements whereas Maxwell's short form fails to do so. The actual difference between validity coefficients is probably not significant, however. Maxwell's method has the advantage of assigning equal weights to the four subtests in derivation of Full Scale IQ (as happens when all 10 WISC subtests enter into the derivation of this) whereas inspection of regression weights in Table XXX (p.120) reveals that this is not the case when IQ's are derived by the present method.

Combination 2 is the S-V-BD-OA quartet with the addition of Comprehension. This corresponds to the subtests (used in the present research) which Cohen (1959) found to be the best definers of a Verbal Comprehension and of a Perceptual Organisation factor and its potential usefulness is thereby supported. Addition of the extra subtest, of course, increases the correlation with the Full Scale, and when the multiple R is corrected for bias it is reduced only slightly from .9241 to .9181. Table XXX (p.120) indicates that the five subtests contribute to a similar extent to determination of Full Scale IQ, and there is reason to believe that this is therefore a rather promising combination with possible utility value for further standardisation with Indian children of similar background to the present sample.

Combinations 3 to 8 to some extent represent arbitrary choices of what we feel to be good subtests for the group in terms of relatively high correlations with the Full Scale (Table XVII, p.79), the equal balance between Verbal and Performance subtests still being maintained. Combination 3, for example consists of the two Verbal and two Performance subtests which, in their respective scales, correlate to the best extent with Full Scale IQ. The subtests Digit Span, Picture Completion and Picture Arrangement are inferior subtests (within their scales) in this respect, and it will be noted that they do not enter into any combination evaluated in this subdivision. As may be seen from the Table, promising results are obtained with combinations 3, 6 and 7. Combination 6 (C-S-BD-OA) is interesting. This is our quintet, minus Vocabulary and the correlation it yields with Full Scale IQ (.911) is satisfactory. We would advocate that if testers wish to confine themselves to quartets, this might be a good

combination to consider. Correction for bias reduces the multiple R to .9056.

Combinations 9 to 15 have been especially selected so as to consist of subtests on which no sex differences are apparent. Since Picture Completion and Object Assembly are the only Performance subtests satisfying this criterion, they enter into every combination. It may be seen that Combinations 13 and 12 are the most satisfactory within this section. We personally would not advocate combination 13, although it possesses good validity, on the grounds that Digit Span (an alternative subtest and a relatively poor one) is included. If testers wish to make use of subtests which minimise sex differences, other factors besides validity may have to be considered, but this would be the personal choice of the examiner.

Combinations 16 and 17. Here we have disregarded our stipulation that the combination to be evaluated should maintain the "balance" of the WISC, and have evaluated only two combinations consisting of Verbal subtests, since these possess the highest correlations with Full Scale IQ. Of Verbal subtests, Digit Span and Arithmetic are the most inferior in this respect, so one of the combinations excludes the one subtest, the second, the other. The validity of these two combinations is not high, relative to results with other scales, and suggests that if one wishes to predict Full Scale IQ adequately, both Verbal and Performance subtests should enter into a combination.

Conclusion

Validities of combinations examined here are lower than those of the best combinations for the WISC standardisation sample as obtained by Howard and cited by Glasser and Zimmerman (1968). However, due to the atypical nature of the present sample this is to be expected. The S-V-BD-OA quartet is a case in point. Using nomographs published by Bridges (1959) we have estimated its validity for 10½ and 13½ year groups of the standardisation sample to be .945 and .925, whereas for the present group (average age 12) its correlation with the Full Scale is only .907 (before correction).

Of short form combinations evaluated here in what is only a preliminary fashion, it is interesting that several quartets present a sufficiently high correlation with Full Scale IQ to suggest their usefulness for further investigation. The one quintet here evaluated seems to possess greater potential usefulness, at least for groups similar to the present one, and it is therefore recommended in preference to any of the quartets investigated. It is based on an adequate rationale with regard to subtest selection, and with wider

standardisation for a more representative population, may prove a useful screening device for Indian children for whom an estimate of WISC intelligence will suffice.

4. SUMMARY, GENERAL DISCUSSION, AND CONCLUSIONS

The present research was undertaken due to the interest of the writer in results of application of A.E. Maxwell's abbreviated form of the WISC to Durban Indian school children referred to the Non-European section of the Durban Child Guidance Clinic as possible cases for remedial education. Analysis of profiles of this group suggested Verbal dominance on the short form, this being particularly evident in the case of girls studied. The Clinic sample was atypical in that all subjects had scholastic difficulties, and boys' and girls' groups were poorly matched on age, scholastic standard and number. The question arose as to whether this Verbal dominance, particularly noticeable in the case of girls, could be an artifact of the abbreviated WISC and whether peculiarities within the limited sample tested had led to this observation.

A GENERAL AIM of the present research was to describe WISC performance of a selected group of Durban Indian school children. The experimental group consisted of 72 children drawn from two schools catering predominantly for Hindu Gujarati speakers. Boys and girls within the group were individually matched on age, intellectual capacity as measured by the Raven's Progressive Matrices Test, standard placement, and failure as opposed to non-failure at school. Besides this, a number of background variables were controlled in the interests of rendering the group representative of one section of the Indian community. There was evidence that boys' and girls' groups were well matched on a number of variables, and the group was so selected that normals (non-failing subjects) and retards (subjects who had failed at least one school standard) were represented in the proportion actually obtaining within the standards studied.

In summarising general results of the present group, the following points are of interest:

1. The group obtained a WISC IQ of 91.6 - within the average category and only 8.4 points below the absolute average of 100. Results were compared with those obtained by Ramphal (1961) using the NSAGT, and the higher result was felt to lie in differences in samples tested and differences in tests applied.

   Reasons for the "falling short" of the absolute average were sought in the fact that the WISC was not standardised for this group, and the fact that one-third of its number were retarded subjects. Normals, considered alone, achieved a WISC mean of 96.1 - only 3.9 points below average, whereas the mean of the retards was 82.5 - 17.5 points below average. The WISC can therefore be

considered to rate normal, non-failing Indian subjects, presumably non-deprived with regard to scholastic opportunity, in very near average fashion. Its empirical validity with Indian school children of the type studied here, appears rather promising.

2. Possibly due to homogeniety of background, variation of scores was somewhat curtailed.

3. Probably as a result of (2) above, intercorrelations between measures were lower than those cited by Wechsler (1949) for comparable age groups of the normative sample. Poorer construct validity is thus indicated for the present sample although this may be an artifact of the sample studied.

Subtests and scales, too, possessed lower reliabilities than expected, but since the split half method of estimating reliability was used, and items may not be arranged in strict order of difficulty for subjects tested., this may well have been an artifact of method.

4. As far as subgroup performance was concerned:

a. Boys' and girls' groups were well matched on WISC Full Scale IQ, a fact which allowed sex comparison on subscales and subtests of the instrument. While the Verbal scale tended to favour girls, and the Performance scale, boys, neither of these differences reached significance. It could not be discounted, however, that choice of subtests entering into the battery delivered had been instrumental in the fact that these differences were not significant. The only subtests on which significant sex differences occurred were Picture Arrangement and Block Design - favouring boys, and Coding, which favoured girls. One can draw few parallels with the literature here except to say that Coding has frequently been found to favour females.

b. Normal and retarded groups obtained significantly different IQ's on full and abbreviated scales of the WISC. All subtests with the exception of three Performance subtests (Picture Completion, Picture Arrangement and Object Assembly) similarly differentiated between the groups. It was of interest that normals made average ratings on all WISC scales, their Verbal mean of 100.4 being slightly above average. Retards made dull normal ratings on all scales.

A general conclusion from this section is that the WISC, even without modification, would seem a promising measure of intelligence for Indian children such as comprised the present sample. It

differentiates well between normals and retards objectively classified in terms of non-failure as against failure in school, and leads to matching of boys' and girls' groups already carefully matched in terms of other criteria, attesting to its concurrent validity for this group. Construct validity and reliability appear rather lower than for American samples but since restricted variation of scores can affect both these measures, this may be an artifact of the type of sample used, since this sample was essentially homogeneous with regard to background factors.

SPECIFIC AIMS of the research now require comment.

1. The question was posed as to whether Verbal and Performance scales of the WISC would load well defined factors and justify division of subtests into these scales for the present group.

Review of factor analyses had suggested that this was not necessarily the case, even for American and British groups. There was, however, some agreement that "essentially verbal subtests" (Information, Comprehension, Similarities, Vocabulary) were grouped together to define a factor which Cohen (1959) designated "Verbal Comprehension", and that Performance subtests with the exception of Coding formed the nucleus of a "Perceptual Organisation" factor (Cohen). The subtests Arithmetic, Digit Span and Coding seemed less appropriately placed in their respective scales. In Cohen's analysis the former two formed the nucleus of a "Freedom from Distractibility" factor while Coding loaded its own "quasi-specific" factor.

In our analysis, only one significant factor emerged, and since results did not justify rotation this was interpreted as a general factor with a verbal bias since its highest test loadings were Similarities, Vocabulary and Comprehension. The second insignificant factor was bipolar, differentiating between Verbal subtests and Coding, and remaining Performance tests. Its highest test loadings were Object Assembly and Block Design, which suggested that it might be a weak replica of Cohen's Perceptual Organisation, or Maxwell's (1959)space- performance factor, but it accounted for too small a proportion of the total variance to be given credence as a significant underlying dimension of WISC performance of the present group.

This result was interesting, for research by Kundu (1967) with Indian adolescents had suggested that Verbal subtests are better integrated with, and rely more upon, general ability than do Performance subtests, which in turn rely more upon specific abilities. This is largely substantiated by results of the present

research.

Discussion of the present results led to the conclusion that the possibility could not be discounted that the present group possessed a "simpler" structure of intellect relative to other groups whose WISC performance had been analysed to yield more than one significant factor. The performance dimension is less well integrated into general ability for the present group, and for these subjects it may constitute of poorer measure of general ability than does the Verbal dimension.

2. A second question posed was as to whether there would be a tendency towards Verbal dominance for the present group and for subgroups.

Using Wechsler's norms, this proves to be the case for the group and for subgroups with the exception of retards. That this is the result for the entire group tested on the full WISC discounts the possibility entertained when only abbreviated WISC results were available for the Durban Clinic sample - that this was simply an artifact of the abbreviated WISC. Also, since normal, achieving subjects obtain a significant positive discrepancy, this is not an artifact of the Durban Clinic group's composition, consisting as it did of underachievers. The fact that the entire group proved Verbal dominant was felt to be significant, and possible reasons for this were sought in the literature.

Teahan and Drews (1962) had convincingly pointed out that cultural factors need not result in the lowering of Verbal IQ relative to Performance IQ, and Ferguson (1954) had suggested that cultural pressure can determine a pattern of abilities - a fact adequately borne out by the researches of Levinson with Jewish children. It was felt that since the present group had obtained a pattern similar to that described by investigators who had applied modified Wechsler scales in India, the reason for this pattern could be sought in cultural background factors.

It has been suggested that one factor related by upbringing may be the stress placed by the Indian community upon acquisition of "essentially useful" skills and abilities, and since scholastic experience and achievement may be deemed useful (Hey,1961) it is feasible that achieving, non-deprived children develop patterns of abilities in accordance with cultural expectations. Lack of time, encouragement and possibly opportunity (since the majority of the group were urban flat-dwellers) to develop familiarity with the world of objects, and lack of compensatory play experience could have led to channelling of abilities so that the verbal type

of ability is developed at the expense of the more practical spatial-manipulative type of ability. It is our hypothesis that, if Indian children similar to those studied in the present research can be considered "culturally deprived", this deprivation manifests itself more in the field of Performance skills than in the field of more scholastically orientated Verbal type skills. With other groups, the situation may be somewhat different. Ramphal (1961) who studied children deprived of opportunity for education, found an all-round lowering of ability. In our own rather "select" group, at least two-thirds of subjects were not so deprived, and this may have influenced differential levels and patterns of results. Also not to be discounted in comparing our own and Ramphal's results are differences in tests used. The fact that the NSAGT, used by Ramphal, demands reading vocabulary and reading comprehension at least for success on its Verbal subtests, whereas the WISC does not require this, could have led to the fact that our own group was not penalised on the Verbal scale, whereas Ramphal's group was so penalised.

As far as subgroup results were concerned, we found that

a. Girls appear "more" Verbal dominant than boys; and

b. Normals appear "more" Verbal dominant than retards.

Possible reasons for (a) above are that girls are required to assume the role of adults earlier than boys, and that they are confined to the home and expected to perform regular "useful" chores sooner and to a greater extent than are boys. Opportunities for exploration and manipulation of the environment may therefore be curtailed to a greater extent in the young Indian girl; who might be expected to develop her perceptual-motor ability to a lesser extent than the boy who is her age peer and her intellectual equal.

With regard to (b) above, Ramphal's hypothesis regarding educational deprivation and its effects on intellectual functioning deserves mention. No normal in our study was seriously overaged for standard placement and possible effects of deprivation can therefore be ruled out with this subgroup. Normals, who have achieved sufficiently to experience promotion each year may have had their tendencies to apply themselves to scholastic achievement (in accordance with the cultural dictate) reinforced. With regard to retards, less can be said, for it is not known whether educational deprivation may have been a contributory cause to retardation in some instances. All that can be said regarding this group is that, unlike normals, they do not show any evidence of having "forged ahead" with regard to verbal ability. Their

Verbal and Performance means are very similar, indicating similar underdevelopment of the two types of abilities.

In discussion of results, other possible reasons for the observed discrepancy have been examined. These include actual level of WISC achievement, specific scholastic defects, socio-economic status, urban residence, bilingualism, and possible personality factors. There appears little reason to ascribe the observed discrepancy to any of these factors, however (although as contributory causes several of them cannot be ruled out), and we are of the opinion that cultural background of the subjects has led to observed results. We have made an attempt, here, to suggest some background factors which might have been responsible for patterning of results obtained. Further research will be necessary in order to substantiate whether or not our hypotheses are capable of verification, and worthy of credence.

In concluding this section it must be emphasised that the writer is well aware of having compared means of measures not well attested to as statistical entities. By virtue of having used Wechsler's norms, this is, however, a legitimate process. For this group, using these measures, Verbal ability appears adequately developed and well integrated with general ability - Performance ability less so. The decrement in ability for the group studied may then be in a sphere less relevant to what is considered to be "general intelligence" for it, a sphere which is relatively undeveloped because of lack of emphasis placed upon it by the cultural group from which it is drawn. Ramphal (1961) has stated that he feels that discrepancies between Indian and European intelligence test achievement may largely be accounted for in terms of differing environments. Results of this research lend credence to this statement.

3. A third question posed was whether Maxwell's abbreviated WISC was a valid predictor of WISC IQ for the present group. An attempt was to be made, if not, to suggest other WISC short forms with possible utility for groups similar in background to this group.

We summarise information regarding findings with Maxwell's short form of the WISC as follows:

a. Correlations between short and full forms were .873, .736 and .883 for Verbal, Performance and Full Scales respectively.

b. Standard errors of estimate were 11.08, 10.57 and 9.06 points for the above scales.

c. On the Verbal scale, discrepancies between full and short forms ranged from +19 to -5; on the Performance scale the range of discrepancies was from +19 to -17, and on the Full Scale the range was from 12 to -14. A conclusion from these results is that it appears rather ambitious to attempt to predict Verbal and Performance IQ's in addition to Full Scale IQ, on the basis of only four subtests. In substantiation of this we cite results of examining Verbal-Performance discrepancies on the short form. While, for most subgroups, a pattern of Verbal dominance established on the full WISC was replicated when the short form was used, this was not the case for the boys' group, where the mean short form Performance IQ actually exceeded the short form Verbal mean, but insignificantly so. A discrepancy obtained on the short form may, then, not replicate a discrepancy obtained on the full WISC, and may in fact be quite misleading. Users of Maxwell's form are therefore cautioned against drawing implications regarding Verbal-Performance discrepancies in the case of Indian children.

What of the validity of the short form Full Scale IQ? For the entire group and for boys' and girls' groups WISC Full Scale and short form Full Scale means are within one point of one another (Table XXVII, p.114). For normals, however, there is a tendency for the short form to underpredict, and for retards, a tendency towards overprediction - both of these significant. As the groups become more homogeneous with respect to intellectual level, so the prediction appears to become less accurate. It has been noted in the text that Maxwell's method of deriving Full Scale IQ's (itself a "deviation" method) restricts variation around the mean of 100, and that good correspondence between Full Scale means for the entire group may be only an artifact of method.

An important question would appear to be the extent to which <u>individuals</u> are rated in similar fashion on full and short forms of the WISC. Using Wechsler's categories of intelligence, 12 of the 72 individuals, or nearly 17 per cent of the sample are miscategorised (Table XXIX, p.117). This, and the fact that the correlation between short and full forms (.88) falls rather lower than that normally accepted for adequate validity, suggested that there was room for research with alternative short forms suitable for Indian children similar in background to the present group.

A preliminary investigation of several selected subtest combinations followed. This was by no means a full investigation, as only the multiple correlation between the form in question and Full Scale IQ has been reported, and no research has been undertaken

into standard errors of estimate or extent of over- or underprediction. After evaluation of several combinations, the most promising of those investigated appeared to be the C-S-BD-OA and S-V-BD-OA quartets. Validity of prediction would, of course, be improved if these two quartets were combined and the C-S-V-BD-OA quintet used. Two other quartets, A-S-PC-OA and V-D-PC-OA were suggested in that they contained subtests manifesting no sex differences.

In conclusion, this study was not intended to be an attempt to validate the WISC for Indian children, but some evidence has arisen which suggests its suitability for groups similar to the present one, at least as a measure with usefulness in the interim before an individual scale of intelligence is standardised for Indian children. As such, it is considered that enquiries into the use of short forms of the scale are not out of place. This study is presented as exploratory research within the field, and it is hoped that its findings will prove useful to those interested in the measurement of the intelligence of Indian children in South Africa.

A P P E N D I C E S

APPENDIX I

MAXWELL'S SHORTENED FORM OF THE WISC

yschy Handbook
Psychology Dept)

HAND/AE:/1618 by A.E. Maxwell

SHORTENED FORM OF W.I.S.C.

Use the four subtests 1) Similarities, 2) Vocabulary, 3) Block Design, 4) Object Assembly, and find the scaled score on each. Then for

a) the sum of the scaled scores on tests 1 and 2

	7½ yrs	10½ yrs	13½ yrs
Expected mean	20	20	20
S.D.	5.11 (.196)	5.43 (.184)	5.47 (.183)

(to facilitate calculations the inverses of the S.D.s are given in brackets)

b) the sum of the scaled scores on tests 3 and 4

Expected mean	20	20	20
S.D.	5.25 (.191)	5.35 (.187)	5.42 (.185)

c) for half the sum of the scaled scores on tests (1 + 2 + 3 + 4)

Expected mean	20	20	20
S.D.	6.14 (.163)	6.58 (.152)	6.57 (.152)

(half the sum of the total score is taken so that the expected mean for this score is also 20 and so corresponds with a and b)

d) Correlations between (1 + 2) and (3 + 4)

r	0.406	0.489	0.459

e) S.D. of difference between (1 + 2) and (3 + 4)

S.D. diff.	5.82 (.172)	5.45 (.183)	5.66 (.177)

f) Standard errors of measurement of I.Q.s ($\bar{X}$ = 100, S.D. = 15)

Verbal Tests (1 + 2)	~~8.40~~ 6.11	~~7.45~~ 4.11	~~7.93~~ 4.35
Performance " (3 + 4)	~~10.27~~ 5.87	~~10.11~~ 5.00	~~9.16~~ 5.06
Full Scale	~~9.03~~ 4.43	~~7.86~~ 3.32	~~7.49~~ 3.42

f) Standard errors of measurement of I.Q.s ($\overline{X}$ = 100, S.D. = 15)

Verbal Tests (1 + 2)	6.11	4.11	4.35
Performance " (3 + 4)	5.87	5.00	5.06
Full Scale	4.43	3.32	3.42

EXAMPLE

Suppose a child of 10 years gets the following scores

Test	1	2	3	4	Total
Score	15	13	6	10	44

g) Verbal scale standardized score = (28-20)/5.43 Or (28-20)0.184 = 1.47

" " I.Q. = 100 + 15 x 1.47 = 122.05

h) Performance scale standardized score = (16-20)/5.35 = -.75

" " I.Q. = 100 - 15 x 0.75 = 88.75

i) Corresponding full scale standardized score = ($\frac{1}{2}$ x 44 - 20)/6.58

= (22 - 20) 0.152 = 0.304

j) Abnormality of difference between verbal and performance scores (using e above) is

(28-16)/5.45 = 12 x 0.183 = 2.20 (98.5 %ile)

APPENDIX II

QUESTIONNAIRES USED IN THE STUDY

BACKGROUND QUESTIONNAIRE

1. What is your full name?.....
2. Are you a girl or a boy?.....
3. a) How old are you now? .....

   b) When is your birthday?.....
4. How many brothers have you?.....
5. How many sisters have you?.....
6. What work does your father do?.....
7. If your mother works, what work does she do?.....
8. What is your religion?.....
9. What languages do you speak at home -

   a) To your parents and other grown-ups?.....

   b) To your brothers and sisters? .....

   c) To your friends? .....
10. What languages do you speak at school -

    a) During class, to your friends and teachers?.....

    b) During playtime, to your friends? .....
11. What standard are you in now?.....
12. How many years have you spent at school?.....
13. Have you ever failed a standard?.....
14. Did you go to nursery school?.....
15. What country were you born in?.....
16. How long have you lived in this country?.....
17. How long have you lived in Durban?.....
18. Have you ever attended any other school besides this one?.....

    If you have, please write down the names of the other schools you have attended.....

    .....
19. How long have you been at this school?.....
20. Do you play games at school?.....
21. What games do you play at playtime?.....

    .....
22. What games do you like to play at home in your spare time?.....

    .....

    .....

23. What toys do you have at home to play with?.....

.....

.....

24. Do you ever go to play at friends' homes?.....

25. What toys do your friends have to play with?.....

.....

.....

-oOo-

RAVEN'S PROGRESSIVE MATRICES

STANDARD

A	B	C	D	E
1....	1....	1....	1....	1....
2....	2....	2....	2....	2....
3....	3....	3....	3....	3....
4....	4....	4....	4....	4....
5....	5....	5....	5....	5....
6....	6....	6....	6....	6....
7....	7....	7....	7....	7....
8....	8....	8....	8....	8....
9....	9....	9....	9....	9....
10....	10....	10....	10....	10....
11....	11....	11....	11....	11....
12....	12....	12....	12....	12....

COLOURED

A	AB	B
1....	1....	1....
2....	2....	2....
3....	3....	3....
4....	4....	4....
5....	5....	5....
6....	6....	6....
7....	7....	7....
8....	8....	8....
9....	9....	9....
10....	10....	10....
11....	11....	11....
12....	12....	12....

INFORMAL QUESTIONNAIRE - AREAS COVERED

The child is to be set at ease and the test presented in a non-threatening light. It will have no bearing upon school results and should be regarded in the nature of fun. The examiner makes clear that the "puzzles" have never been set to a large number of Indian children, and that she is interested in how they fare on these, and also how they will like them.

1. Asking for the child's address gives the lead to enquiries about the home. Region of situation, and whether the child lives in a flat, house, cottage or on a farm are enquired into.

2. Further information regarding the occupation of the family breadwinner is sought e.g. "You told me, before, that your father was a ..... Could you tell me a little bit about his work?"

3. Linguality is checked and the child is asked regarding attendance at vernacular school.

4. Free time activities are enquired into. The child is asked
   a) regarding the nature of chores and duties performed at the request of elders, and how regularly such services are performed;

   b) regarding leisure pursuits. Further information is sought on contact with toys and puzzles.

5. After the test, the child is asked for his comments, and to state the parts of the test which he enjoyed most. He is specifically asked whether he has had contact with toys or puzzles in any way similar to those encountered in the Performance Scale.

APPENDIX III

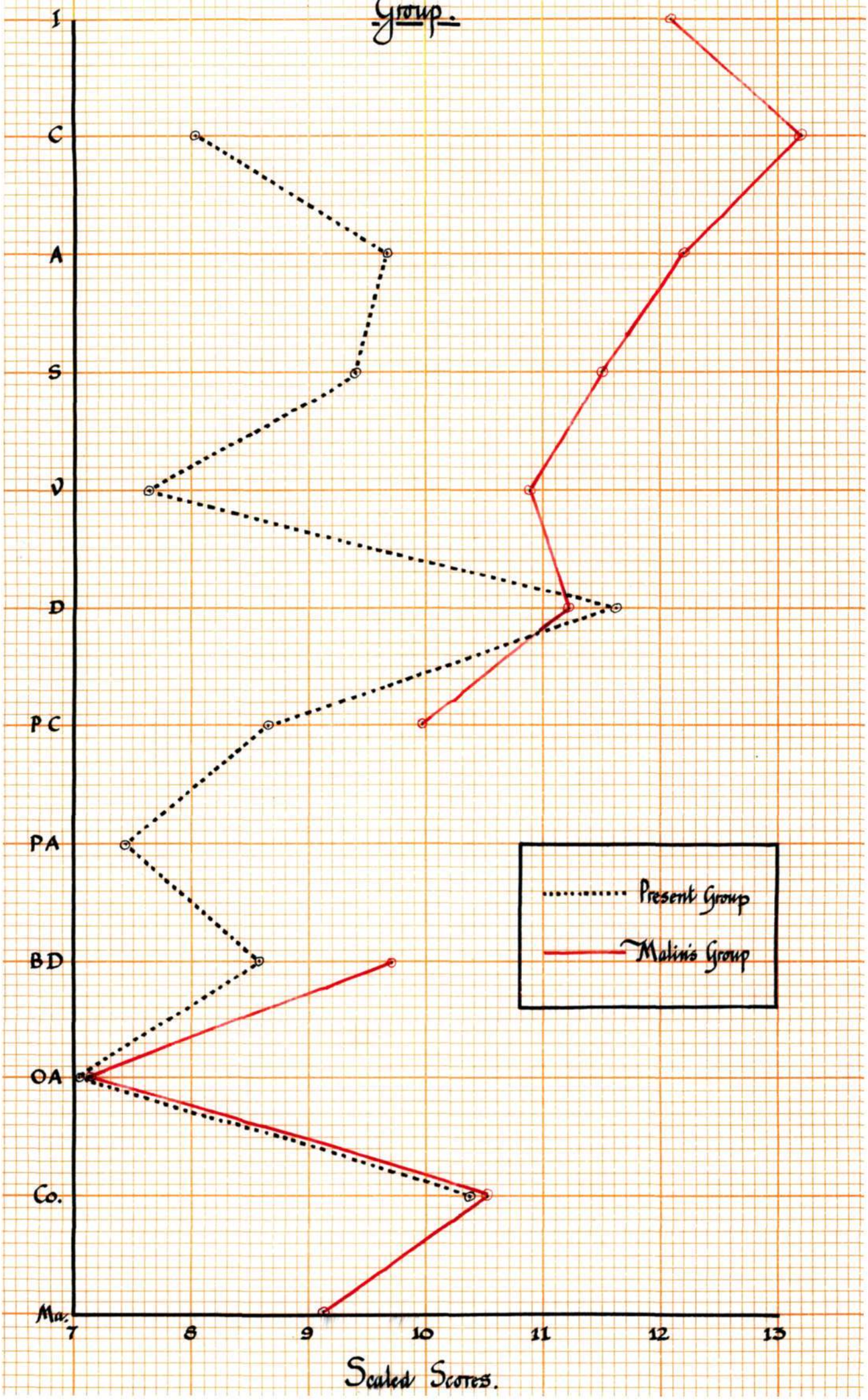
PARTICULARS OF SCORES OF THE EXPERIMENTAL SAMPLE

IDENTITY NUMBER	WISC SUBTEST SCORES										WISC IQ'S			S.F. WISC IQ'S			MONTHS	RAW SCORE	CUBAN
	C	A	S	V	D	PC	PA	BD	OA	Co.	VIQ	PIQ	FSIQ	VIQ	PIQ	FSIQ			
1	12 8	14 16	13 12	30 7	17 20	9 7	18 6	32 12	16 6	45 11	116	89	104	97	94	97	140	41	G
2	13 9	9 9	16 14	36 9	13 15	9 7	28 10	10 7	22 9	45 11	108	92	100	106	90	96	143	30	H
3	11 8	10 10	7 7	28 7	12 14	9 7	23 7	10 7	8 3	37 8	95	75	84	83	72	82	142	38	G
4	14 9	9 8	15 12	38 10	14 15	16 15	29 10	34 11	23 9	40 9	105	106	106	106	100	102	146	39	T
5	14 9	10 9	12 10	30 6	13 14	10 7	25 8	22 9	22 8	36 7	97	85	91	89	92	92	148	31	G
6	9 5	12 11	9 8	29 6	13 14	9 6	16 5	23 9	15 5	33 6	92	74	82	83	83	86	150	39	T
7	14 9	10 9	12 10	32 7	12 13	15 13	29 10	19 8	19 7	33 6	97	92	94	92	86	91	148	42	G
8	13 9	10 10	12 11	34 9	10 10	10 8	30 10	28 11	22 9	25 5	99	90	94	100	100	100	142	38	G
9	14 9	11 10	12 10	32 7	11 12	11 8	24 7	18 8	17 6	46 10	97	85	81	92	82	90	152	32	T
10	14 9	9 8	12 10	29 6	11 12	10 7	28 9	29 10	10 3	54 13	94	89	91	89	81	87	153	41	G
11	14 8	11 9	12 9	31 6	13 14	12 9	33 10	20 8	16 5	56 12	95	92	93	86	81	86	158	38	G
12	14 8	8 5	14 10	37 7	9 8	12 9	35 10	17 7	19 6	42 7	85	85	83	92	81	89	170	27	G
13	11 6	7 4	11 8	36 7	13 13	13 10	23 6	14 6	24 9	46 8	85	85	83	86	86	89	173	35	G
14	13 7	13 11	12 9	36 7	12 12	10 7	20 5	44 13	23 8	45 8	95	87	91	89	103	97	171	24	G
15	15 9	10 8	12 9	34 7	10 10	13 10	18 5	14 7	17 5	52 11	91	83	86	89	77	84	167	26	T
16	12 9	11 11	12 11	31 8	14 16	12 10	25 8	28 11	21 9	45 11	106	99	103	97	100	99	136	37	G
17	12 9	12 13	12 12	33 9	12 14	11 9	29 10	23 10	25 12	43 12	109	104	107	103	106	103	133	42	G
18	14 9	11 10	12 10	33 7	12 13	11 8	30 10	35 12	22 8	43 10	99	97	98	92	100	97	147	29	T
19	13 10	12 13	11 11	33 8	12 14	13 12	39 14	30 12	18 7	50 13	108	111	110	97	97	98	136	40	G
20	14 10	10 10	12 11	33 8	14 16	12 10	24 8	21 10	18 7	40 10	106	93	100	97	92	95	139	37	G
21	9 6	8 8	5 5	33 9	10 10	15 14	26 9	17 9	22 9	43 12	85	104	93	83	94	91	134	35	G

APPENDIX IV

WISC PROFILES OF MALIN'S INDIAN GROUP AND THE PRESENT EXPERIMENTAL GROUP

W.I.S.C. Profiles of Malin's Indian Group and the Present Group.



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