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A STUDY OF PICTORIAL PERCEPTION AMONG BANTU AND WHITE PRIMARY SCHOOL CHILDREN IN SOUTH AFRICA

A THESIS PRESENTED TO THE UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG, IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

by

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May, 1969

DECLARATION

I declare that this is my own work and that it has not been submitted to any other university.

Hall J. Duncan

A C K N O W L E D G E M E N T S

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SUMMARY OF THE INVESTIGATION

1. Purpose of Study

Previous research had shown that non-European groups in Africa have difficulty with the interpretation of pictorial material drawn according to Western pictorial conventions. This has obvious educational implications if, as usually happens, the non-European is to be educated through Western textbooks.

The present study had three primary objectives:-

(i) to test the hypothesis that the degree of difficulty experienced by the South African primary school child varies according to the level of acculturation of his ethnic group (Western culture being taken as the norm).

(ii) to obtain some measure of the developmental pattern of pictorial perception for ethnic groups at different levels of acculturation; and

(iii) to present a scheme for training the pictorial perception of non-European children.

2. Method

Pictorial material, in the form of line drawings (some with simple half-tone effects) and covering most of the common conventions in Western pictorial art, was presented to samples of primary school children taken from five ethnic groups differing in level of acculturation. The educational level of each sample varied from Standard I to Standard V. With the presentation of each picture, each child was asked a specific number of questions designed to elicit responses from the child which would reveal his interpretation of the picture.

The response data were then treated statistically (i) to give measures of the modal responses of each group, (ii) to test the significance of the differences between such measures and (iii) to derive and test measures of the developmental patterns.

The interpretation of the results followed.

3. Subjects

South African boys and girls from European and Bantu primary schools (Standards I to V).

Ethnic groups:-

European: Middle-class English-speaking Europeans living in the Eastern suburbs of Johannesburg and the adjoining part of Germiston.

Urban Bantu: Second and third generations of urbanized Zulu and Tsonga living in the Bantu townships of Johannesburg, mainly in the Soweto area.

Rural Bantu: Average Bantu rural economy with traditional tribal social systems quite prevalent.

Rural Zulu - Nkandla District, Zululand.

Rural Tsonga - Elim District, Northern Transvaal.

Sampling:-

4 boys and 4 girls per standard for each of 5 schools in each ethnic group. Each ethnic group sample consisted therefore of 100 boys and 100 girls - a total of 1000 children for the 5 groups combined.

In the case of each of the Bantu groups, the subjects were screened in order to ensure that the samples were pure (i.e. both the father and mother of each

child had to belong to the same ethnic group as the subject). In the case of the European group, care was taken not to include subjects who had difficulty in expressing themselves in English.

4. Test Material

Picture series:-

After some preliminary experimentation, the pictorial material was organized in the form of ten series of pictures. Nine of the series were designed so that each dealt with a different aspect of pictorial perception, involving the use of a limited number of Western artistic conventions. The tenth series consisted of one complex picture, in which most of the conventions, presented separately in the other series, are to be found. This picture was included in order to ensure that the interactions of the various conventions did not alter materially the results obtained from the simpler presentations of the other series. The pictorial conventions covered by the ten series of pictures are as follows:-

	Convention	Series
1.	Pictorial Depth:	
	(a) Cues of Size, Position and Tone	A
	(b) Cues of Overlap, Size, Position and Tone	B
2.	Position in Pictorial Space (Position Preferences)	C
3.	Borders (drawn and implied)	D
4.	Shadows	E
5.	Art Styles Depicting the Human Figure (Art Style Preferences)	F
6.	Foreshortening	G
7.	Implied Motion	H
8.	Person Identification in a Panel of Pictures	I
9.	Combination of Conventions (to test interaction)	J

Test Questionnaire:-

The specific questions which each tester had to give with the presentation of each picture to a child made up what is called the Test Questionnaire. It was translated from English into Zulu and Tsonga and administered to each ethnic group in the language of that group.

Testing equipment:-

The testing equipment consisted of a view box (light box) for the Series A depth perception tests and a view board (frame) on an adjustable stand for the remaining series. The test pictures were presented within a constant frame size of [illegible] inches by 4½ inches which was found to accommodate most common textbook illustration sizes.

Biographical and Educational Questionnaires

These two questionnaires were also administered in order to obtain information from the subjects and their teachers on relevant cultural characteristics of the groups, particularly type and frequency of exposure to pictorial materials in school and home.

5. Testing Procedure and Recording of Data

Two European, two Zulu and two Tsonga testers were carefully selected and trained to test subjects within their respective groups. With two tests for each group, the tests were divided up between them so that each tester gave the same tests for all the children in a group. Also the same sequence was followed for the testing of each of the 1.000 children.

The data were recorded in the following manner. Multiple or dual choice item responses were recorded either by drawing a ring round the appropriate choice or verbatim or in summarized form. Verbal information was categorized under various headings.

6. Results

Tests of Pictorial Perception

(i) The Perception of Pictorial Depth Involving Cues of Size, Position and Tone: Series A

Although the results for this series are undoubtedly of psychological interest, it might be argued that the guiding principle of presenting conventions or cues as far as possible in isolation was carried too far in this series. None of the pictures was such as would normally appear in an educational textbook.

When the cue of position was the only one present it would appear that the Bantu used it as a depth cue but there was a distinct possibility that some of their responses were not so much an indication of the perception of depth in the picture as an expression of the spatial relationship between the drawn objects (as opposed to the depicted objects) and the viewer's body. In the case of the European group, there was strong evidence for believing that the picture, involving only position as a depth cue, was really 'cueless' for them and their responses therefore were random. When the cues of size and tone were introduced, the differences between the groups followed more the pattern of the primary hypothesis - the Urban Bantu being closer to the European than the Rural Bantu. One picture in the series involved linear perspective and, in this case, all group differences disappeared.

An analysis of the developmental pattern showed a significant increase in the use of the depth cues from Standard I to Standard V, the results for the cue of position in isolation being anomalous in that the difference between European and Bantu increased with standard instead of decreasing as might be expected on the primary hypothesis.

(ii) The Perception of Pictorial Depth Involving the Cues of Overlap, Size, Position and Tone: Series B

The results on this series confirmed the primary hypothesis, the Urban Bantu being closer to the European than the Rural Bantu in their ability to see the pictures three-dimensionally. However, there was little indication that the ability to see depth improves for any of the groups over Standards I to V. This result is particularly important for the Bantu groups whose performance fell well short of that of the European group.

(iii) Position Preferences in Pictorial Space: Series C

The preference of the centre position is to a small extent correlated with the degree of acculturation of the ethnic group, the European showing the greatest preference for the centre position. Examination of the developmental patterns showed that there was a marked increase in preference for the central position in the case of the European group (as one passes from Standard I to V) but that the increase for the Bantu groups was small although significant statistically.

(iv) The Perception of Pictorial Objects Overlapped by Drawn or Implied Borders: Series D

It was hoped that the results on this series would indicate whether, the more unacculturated a group, the more

it would have difficulties with borders cutting off parts of live figures, human and otherwise. The results, however, were ambiguous. The questions put to the children were quite inadequate. Further questioning was obviously required.

(v) The Perception of Shadows: Series E

The results again substantiated the basic hypothesis of the investigation in that, the less acculturated the Bantu group, the greater the difficulty in the interpretation of shadows. Clear evidence of improvement with standard was obtained for all groups, the rate of improvement for any one group depending on the level of difficulty of the shadow item.

(vi) Art Style Preference in Depicting the Human Figure: Series F

The 'realistic' style is the most popular with all five ethnic groups and the stick figure by far the most unpopular. The cartoon is significantly more popular with the European group than with the other Bantu groups. The cartoon is more popular with the Tsonga than with the Zulu; and the reverse is the case for silhouette. Large majorities of the Bantu children had no difficulty in identifying the boy in both the cartoon and the 'realistic' pictures as being a Bantu. This finding points out that skin tone is not a critical factor in such recognition provided other details such as hair, nose and proper dress are present.

(vii) The Perception of Foreshortening: Series G

The test on Foreshortening can be regarded as a test of depth perception in that it involves the correct

interpretation of the overlap of one part of a body by another part (in a picture). In accordance with the primary hypothesis, it was expected that the less acculturated a group the greater would be the number of interpretations of foreshortening (of the limbs) as being a deformity.

As with Series C on borders, the results were inconclusive. The questions given to the pupils were inadequate and further questioning would have been necessary in order to arrive at any definite conclusion.

(viii) The Perception of Implied Motion Cues: Series H

As with Series F on Shadows, this series provided clear-cut evidence for the primary hypothesis, European being superior to Bantu and Urban Bantu being superior to Rural Bantu. Also the underlying ability improved significantly with standard (age) for all groups.

(ix) The Perception of Views of the Same Person Depicted in a Panel of Drawings: Series I

Again there was confirmation of the primary hypothesis and some indication of an improvement in ability with standard.

(x) The Perception of a Complex Picture Involving a Number of Artistic Conventions: Series J

The results for this series showed that the findings obtained for the earlier series, in which the artistic conventions were presented separately or in small groups still applied when the conventions were combined in a more complex picture.

Also, this series provided a composite score for each child which could be regarded as a measure of his overall ability to interpret Western pictorial material.

An analysis of variance of composite scores confirmed the primary hypothesis that the mean score for a group was correlated with its level of acculturation. It also showed up more clearly sex differences which had appeared with some of the earlier series. Boys were found to be superior to girls for both Urban Bantu groups and for the Rural Tsonga group. But there was no difference between the sexes for the Rural Zulu. The sex difference was also non-significant for the European group.

In addition, a regression analysis of composite scores on standards revealed a clear pattern of development for all groups. All the growth curves showed a flattening off at the upper standard levels. The relative positions of the curves reflected the differences in main composite scores among the groups, the European curve coming highest followed by the Urban Zulu, the Urban Tsonga, the Rural Tsonga and the Rural Zulu in that order. At the Standard V level the Urban Bantu growth curves reach the Standard I level on the European curve. Because of the flattening at the upper end of the growth it is reasonable to deduce that the Urban Bantu (and a fortiori the Rural Bantu) will not reach the European Standard V level at any subsequent stage.

Reliability of Pictorial Tests

An indication of the reliability of the tests was obtained by intercorrelating test items within a number of the picture series. Most of these correlations were high. Only in the case of Series A were low correlations obtained. It is reasonable to deduce therefore that the reliability of the pictorial tests was high.

In the case of Series C (Position Preferences) and Series F (Art Style Preferences), which involved the

use of the method of paired comparisons, reliability has to be measured in terms of consistency (between the choices of each subject) and concordance between the preferences of all the subjects in a group. This was carried out for Series C only. Both consistency and concordance were highly significant for all groups. It is likely that the same applied also to Series F.

Correlation of Pictorial Perceptual Ability with General Scholastic Ability

By obtaining the class standing for all the pupils involved in the investigation, it was possible to show that there was a significant correlation between general scholastic ability and pictorial perceptual ability (as measured by the composite scores obtained from Series J).

Relevant Cultural Factors

From the Educational and Biographical Questionnaires, information was obtained for each group about a number of factors likely to have produced the group differences in pictorial perception. Probably the most important among them is exposure to pictorial material both inside and outside the school which varied considerably between European and Bantu and between Urban Bantu and Rural Bantu (in particular the Rural Zulu). It was also found that only some of the schools in each Bantu group provided training in graphic art for their pupils. However a comparison of pictorial perceptual ability for those receiving and those not receiving graphic art training showed no significant difference between the two groups of pupils.

7. A Scheme for Training Pictorial Perceptual Ability.

In order to raise the level of pictorial perceptual ability for the Bantu and other non-European groups so that they can deal adequately with Western pictorial material, this investigation sets forth a remedial programme. The main steps are:-

(i) Diagnosis

It is suggested that tests of pictorial perception be devised which the non-European teacher can apply in order to obtain a measure of the specific difficulties of her pupils and for gauging their progress after instruction. These tests could be modelled, with some modification, on the tests used in this investigation.

(ii) Remedial Training

Special methods are described for training pictorial perception involving the use of a simple piece of apparatus called the Portable View Window. It is also shown how a camera can be used in order to help the non-European to interpret photographs and other pictorial material.

(iii) Teacher's Handbook

It is suggested that a handbook be prepared for the teacher which would present the problem of pictorial perception, give the procedure for administering the tests and describe the methods to be used with the training apparatus.

The tests and the apparatus would also have to be made available to the teacher.

8. Critique of Investigation

The study concludes with a brief critique of the investigation.

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PART I

BACKGROUND, PURPOSE AND PLAN OF THE INVESTIGATION

CHAPTER 1

RESEARCH BACKGROUND AND THE OBJECTIVES OF THE PRESENT STUDY

There is a considerable body of research findings available on the problems of pictorial perception among unacculturated groups. The research work which has been done follows two main approaches - one in which investigations are carried out in pictorial perception, seen as a perceptual habit which develops and persists as a result of ecological determinants, and the other in which studies have been made of the difficulties which unacculturated people encounter in the perception of pictorial material prepared in the Western manner and containing Western representational conventions.

PICTORIAL PERCEPTION AND ENVIRONMENT

Studies of geometric illusions among unacculturated groups have a long history beginning with the work of Rivers in 1901. Since Rivers' early work, findings in this field have sometimes been contradictory. Allport and Pettigrew (1957), using a trapezoidal window, tested both rural and urban Zulus and found a direct relationship between their resistance to the illusion and their degree of non-acculturation. No significant difference was found between thoroughly urbanised Zulus and Europeans. In the work of Segall et al (1963), three types of geometric illusion, viz, Müller-Lyer, Sander, and two horizontal-vertical illusions were used on a large number of different cultural groups coming from various parts of the world. As a result of their findings, they hypothesized that perceptual inferences depended upon habits of pictorial

interpretation acquired at an early age. They associated the physical environment directly with responses to the illusions, claiming that people living in cultures where rectangular shapes were dominant, were far more susceptible to the Müller-Lyer and parallelogram illusion than those dwelling in non-rectangular environment. Gregor and McPherson in 1965, carried out work on two groups of Australian aborigines and found that they supported the findings of Segall et al, namely, that there was a direct correspondence between rectangularity in the environment and the perception of geometric illusion.

In 1966, in Ghana, Jahoda tested these hypotheses using the Müller-Lyer illusion and the horizontal-vertical illusion on illiterate subjects selected from contrasting physical environments. In addition, 41 subjects were tested in Britain. The expected differences were obtained between the Ghanaian and the British subjects, but no difference was found between the Ghanaian samples in terms of environmental variation. This contradictory finding Jahoda examined and came to the conclusion that the difference in the results was due to possible contamination by a modifying factor distinct from the carpentered environment, viz, the difficulty in the interpretation of two-dimensional drawings.

Deregowski (1967) suggests, as a result of hi- experiments on Zambian school children, that the postulated ecological influence of the horizontal-vertical illusion can only be measured directly by using a cruciform or L-type figure. He believes that the illusory effect owing to the dichosection of the line requires a hypothesis other than the one put forward by Segall et al (1963).

Further studies in this field have made use of perceptual stimuli other than geometric illusions. Typical of these studies is the work of Schwitzgebel (1962), who used a number of cognitive and visual tasks, such as, size and length estimation and the Gottschaldt embedded figures, on South African European and Bantu samples. He concluded that specific visual perceptual habits were culturally and environmentally bound, and doubted further whether some of the perceptual skills, which a training process might attempt to teach to an adult, would be attainable.

Cowley and Murray (1962), using the Piaget and Inhelder tests of special development, carried out tests on two groups of urban Zulus and urban European school children matched for age and sex, with an educational range from Standards I to V. Although the developmental sequence in both groups appeared to be the same, the developmental rate for Zulus was far slower.

Deregowski (1968c), in his study on the pictorial perception by Zambian subjects in a remote rural area, found that they were capable of recognizing photographs of models of familiar animals. He concluded that such unacculturated people were capable of perceiving the content of rather simple photographs.

Berry (1966), carried out a study on groups of Temne from Sierra Leone, Eskimo from Baffin Island and Scotsmen, giving each of these groups a number of special tests. They found that the Eskimos and Scots put up similar performances which were markedly superior to that of the Temne. He further related these findings to the environment, particularly of the Eskimos, whose survival depended largely upon the perceptual analysis of their

environment. At this point, Berry approached the findings of Witkin et al (1962), who postulated an association between field dependence and conformity-producing child-rearing practices. This view hypothesizes that mental patterns persist as a result of cultural environment and social disciplines. What is important in cross-cultural contact is the extent to which such mental patterns are malleable in the cross-cultural situation. This is the question which is raised by Doob (1957). On the whole, in spite of contradiction which is probably due to experimental artifact, the research findings indicate the influence which environment has in the formation and persistence of mental patterns. We may therefore accept, as a working hypothesis, the view that perceptual habits which are peripheral in a hierarchical model of mental abilities are determined to a considerable extent by ecological factors and hence are culturally discrete.

PICTORIAL PERCEPTION AND REPRESENTATIONAL CONVENTIONS

If we accept this working hypothesis, it follows that we must expect that representational conventions in pictorial material should raise problems with unacculturated groups. In this decade a good deal of interest has been shown by educationalists in this field and a number of studies have been carried out. Various problem areas have been examined, such as, depth perception and foreshortening, object position, symbolism and extended meaning, shadow and texture effects, art style and detail and multi-stage pictorial art. As the findings of research work in each of these areas is germane to the present study, it is worthwhile to examine them in some detail.

Depth Perception

Hudson (1960), tested the perception of depth in pictorial material, using simple black and white line drawings in which successive depth cues were superimposed. Responses to a series of cross-checking questions were taken to be self-evident indications of two-dimensional or three-dimensional pictorial perception. With groups of white children covering the primary school range, he found that competence in the perception of three-dimensions in pictures was a learned process, and that by the end of primary school, most of the white pupils were competent. He did not find a direct cross-cultural relationship between educational level and competence in the perception of three-dimensional pictorial material, as might have been expected from his findings with the white primary pupils. Where unacculturated groups were concerned, formal education appeared to be less effective than informal educative processes. Highly educated black subjects did not perform materially better than white primary school children, and white labourers with primary schooling saw the pictures flat in the same way as the illiterate black labourers did. Hence, he concluded that neither constitutional endowment nor educational level, could account for the problems of pictorial depth perception. Further evidence in the same direction was obtained by him in 1962 on groups of Indians and Coloureds.

Deregowski (1968b), carried out experiments on Zambian pupils and domestic servants, using Hudson's pictorial depth perception test as well as a performance type test, in which the subjects were required to construct three-dimensional models, from line drawings of the Necker cube type. His findings corroborated those of

Hudson, but he ascribed them to the inability of the perceiver to organize the pictorial material with the result that there was a failure in the perception of depth. Deregowski's conclusion seems to differ from Hudson's hypothesis, more in emphasis than in basic interpretation. The ability to perceive pictorial material three-dimensionally depends upon the perception and organisation of the appropriate pictorial cues. Non-identification of depth cues prevents the candidate from organising the pictorial material in the conventional manner. To a large extent, Deregowski's work refuted the argument which Du Toit presented in 1966, that semantic deprivation might be responsible for the two-dimensional pattern of perceptual response. In Deregowski's study, responses went beyond the purely language type, in that the candidates were required to draw and construct what they perceived.

Mundy-Castle (1966), in his study of pictorial depth perception in Ghanaian children, supported the hypothesis that cultural stimulus is critical for the development of pictorial depth perception. He reported that the homes and communities of his subjects provided almost no opportunities for informal pictorial exposure.

Kilbride and Robbins (1968), using four pictures from Hudson's (1960) depth perception test in their testing of Ugandan subjects, found a positive and significant relationship between the amount of formal education and the use of the linear perspective cue to pictorial depth perception. In an earlier experiment Kilbride et al (1968) reported that the use of superimposition as a cue to pictorial depth appeared to be less dependent on education than on object size and perhaps other cues.

Working along the lines of the hypotheses of

Witkin et al (1962) and Berry (1966), Dawson (1967a,b) studied the cultural and physiological influences upon spatial-perceptual processes of the Temne and Mende in Sierra Leone. His findings suggest that a subject's exposure to specific experience to acquire ability to use perceptual cues is in part in Sierra Leone a function of the subject's field-independence potential. He found that the field-independent Mende compared with the field-dependent Temne had significantly higher scores on the measure of pictorial perception.

Firdings from studies in which pictorial material has been used for health propaganda purposes in Kenya and for safety posters in South Africa, corroborate these earlier findings. Holmes (1964), using East African data, takes note of the difficulties involved in seeing perspective and comments upon the diminution in understanding which arises when more than one object is introduced into a picture. In South Africa, Winter (1963) in her study on accident posters showed that superimposition and size reduction to give the impression of depth led to misinterpretations. These findings led to a new approach to poster design which took account among other things of the problems of the perception of depth in pictorial material among Bantu industrial workers in South Africa (Duncan, 1966).

Foreshortening

Foreshortening is a type of perspective applied to figures. Hudson (1962), found significant differences between the responses of white primary school children and illiterate black labourers.

Holmes (1963), using more educated Kenyan samples, reported that foreshortening did not present a

problem to them. However, Deregowski (1968a) found that depth perception difficulties of African school children may be prompted by the very point of view from which the artist portrayed the scene and position of the subject relative to the depicted scene. It may be that illiterate black samples are those most influenced by the difficulties of this particular representational convention.

Object Position

Fonseca and Lassey (1964), investigated the perceptual patterns of literate and non-literate subjects in Costa Rica and found that they differed in perceptual fixation behaviour. Literates preferred the top left quadrant, whereas non-literates tended to have a less systematic perceptual pattern. In 1945 Brandt had reported that the eye fixations of Europeans tended to be located in the upper left quadrant. Harrison (1962), quoted by Fonseca and Lassey, corroborated Brandt's view using symmetrical designs, and argued that illiterates would be more likely to have a more random eye fixation.

Symbolism and Extended Meaning

In the Western pictorial mode symbolism is extensively used and often has an extended meaning, such as, the skull and cross bones signifying danger. Studies have shown that this type of symbolism presents difficulties to unacculturated groups. Holmes in 1963 reported misinterpretations of pictorial symbols. Fonseca and Kearl in 1960 found that the humanization of animals reduced comprehension. Duncan (1962), found in the study on the understanding of cartoon strips by educated Bantu that extended political symbolism might be read into pictorial sequences which involved the humanization of

animals and where there were no accompanying captions. Religious symbolism such as is commonly used in the western world leads to difficulties of interpretation as is shown in an experiment by Ravemcco (1958), where halos were taken to be the sun, devils were seen to be forest monsters, and an angel a man with an umbrella. Since a great deal of symbolism is employed in Western pictorial art, it is clear that it is one of the prevalent problems in cross-cultural pictorial communication.

Shadow and Texture Effects

A number of studies have shown that shading has been given a meaning additional to that of the conventional or artistic one. The UNESCO East African Regional Workshop on Book Production (1963), reported that shading on doors was misinterpreted as dirt or rainwater. Afamai (1956), reported that shading on the face of a woman was often seen as dirt or disease. It appears that shadows and texture are often resolved into excessive detail by the unacculturated viewer because he has not learned how to orientate objects in a picture with respect to an implied or shown light source.

Art Style and Detail

Related to the problem of symbolism is that of art style. A number of studies both in South Africa and overseas indicate the problems arising.

Robbins (1966), reported unexpected trends for graphic art styles in 30 non-Western societies. His research revealed that curvilinear graphic designs significantly prevail in societies with rectangular houses and, conversely, linear designs predominate in societies where the houses are principally circular. These findings

were the reverse of what he hypothesized and indicated that graphic art tastes reflect the need for novelty in the non-Western societies he studied.

Wober (1967), in a testing of drawings carried out on Nigerians discovered that a line drawing which represents a 'Negro' to Europeans and to some Africans through cues of facial structure and hair outline, is not commonly interpreted as such especially by the less skilled workers. He described these workers as needing to see such drawings with the faces blackened in order to perceive the human figures in the pictures as African.

Duncan (1962) reported that details of musculature in the drawings of a human torso were seen as incisions made by the witch doctor. Lines intended to indicate wrinkles were also seen as cuts in the face. Holmes (1963) in Kenya found that stick-figure drawing had a high comprehension rating. However, in Brazil, Fonseca and Kearl (1960) reported that the comprehension of pictorial symbols among rural people, was affected by excessive unnecessary detail or excessive deletion of detail. It seems to follow from these studies that unless pictorial representation is reduced to realistic simplicity it will tend to be rejected by unacculturated viewers.

Multi-Stage Pictorial Art

It is a common practice to depict a series of actions in a sequence of pictures, but it has also been shown that the ability to read such pictorial serials has to be acquired. Winter (1963) and Afamal (1956), demonstrated this requirement for safety posters and cartoon strips.

It is clear from all these studies on pictorial

perception that a good deal is known about the difficulties which confront unacculturated groups when they encounter pictorial material in the Western mode. Western pictorial conventions are often misunderstood or misidentified, and this leads to misinterpretation of the significance of the picture. This is of vital concern to the teacher and educationalist particularly if the picture has didactic value. It has been suggested by studies that in the adult certain culturally imposed perceptual patterns may be irreversible. It has also been suggested in other studies that formal education in itself is not sufficient to familiarize unacculturated samples with Western pictorial representation. What role therefore can the educationalist play in these two apparently contradictory situations? A diagnosis of perceptual problems is important but what is required is the preparation of a remedial programme which takes account of the perceptual diagnosis. This is basically the objective of the present study.

OBJECTIVE OF THE STUDY

The first objective is concerned with diagnosis. Pictorial representation is to be reduced to its atomistic constituent components and to be presented in this form, to samples of black and white children, in order to estimate the modal responses of the groups to which the samples belong. Once these modal responses have been determined, then the amount that each black group deviates from the Western norm can be assessed. Five samples are involved, an urban European sample, a rural and an urban Zulu sample and a rural and an urban Tsonga sample. All samples cover the five school years from the third through

the seventh year. It is with this longitudinal aspect of the study that the second objective is concerned. In this part the developmental pattern (differences between standards) of pictorial perception within the five ethnic groups is to be examined. This longitudinal diagnosis is of the utmost value when we come to the third objective which is the development of a programme of remedial instruction for those groups which the diagnosis identifies as requiring assistance.

In the chapters which follow, systematic studies have been made of the perceptual modes of the five samples in respect of the most important and widely used representational conventions in educational text-books. What should emerge from these studies is, (i) an indication to what extent existing text-book illustration falls short of fulfilling its didactic role; (ii) information on the acculturation rate with respect to pictorial perception; and, (iii) a basis upon which to place an educational programme tailored to the needs of unacculturated groups as far as pictorial perception is concerned.

The test material, the samples and the educational levels have been selected with these three objectives in mind. Depth perception, preference for centred pictures, interpretation of borders, foreshortening, shadows, implied motion and art style are problem areas which are to be investigated. The art material used is principally in the form of line drawings with a limited degree of simple half-tone effects. The perceptual and didactic problems lie in these areas and with this type of material. The findings which emerge are to be understood in this context.

CHAPTER 2

TEST MATERIAL AND CONSTRUCTIONAL PROBLEMS

Test Material

The form the test material took was determined by current educational practice in schoolbook illustration. It consisted of a number of test pictures based on primary school textbook illustrations at present in use in sub-Saharan Africa.

Wherever these books are printed, the bulk of the illustration is done in the Western style. Most drawings are line drawings though half-tone effects may be used. It is usual for these illustrations to contain a variety of representational conventions such as depth cues, with which Western illustrators are familiar and which pupils in Western schools come to understand by the end of the primary school.

The test material used in the investigation was organized in the form of ten series of pictures, labelled A to J. With the exception of Series J, each series was intended to deal with one aspect of pictorial perception and therefore with a limited number of Western artistic conventions. In this way, it was hoped to bring out the differences between the ethnic groups in their interpretation of these conventions. Series J consisted of one complex picture, in which most of the conventions, presented separately in the other series, are to be found. The reason for including Series J was to ensure that the interaction of the various conventions did not alter materially the results obtained from the simpler presentations of the other series.

The pictorial conventions covered by the ten series of pictures are as follows:-

Convention	Series
1. Pictorial Depth	
(a) Cues of Size, Position and Tone	A
(b) Cues of Overlap, Size, Position and Tone	B
2. Position in Pictorial Space (Position Preferences)	C
3. Borders (drawn and implied)	D
4. Shadows	E
5. Art Styles Depicting the Human Figure (Art Style Preferences)	F
6. Foreshortening	G
7. Implied Motion	H
8. Person Identification in a Panel of Pictures	I
9. Combination of Conventions (to test Interaction)	J

It is to be noted:-

(a) that the ten test series were presented to the children in the alphabetical order given above (this variety in arrangement was chosen in order to reduce monotony and increase interest for the children);

(b) that test series C and F are different from the other series in that they are not so much tests of perceptual ability as tests of the children's artistic tastes;

(c) that series G on Foreshortening might be regarded as a test of depth perception in that it is mainly concerned with the understanding of the convention of overlap - a depth cue.

We proceed now to consider the ten series in detail. At the end of the chapter the reader will find reproductions of all the pictures making up the ten series. These reproductions are of course drawn to a smaller scale than the pictures presented to the children.

Series A. Depth: Object Size, Position and Tone (p.22)

In Western art it is customary to interpret objects located in the lower third of a picture as nearer to the viewer than those positioned elsewhere. In fact, there is a tendency to perceive a gradient of distance from bottom to top of a picture. To study responses to this convention nine pictures were constructed in which the cues of position, object size and tone were manipulated. Each child was required to describe the positional relationship between himself and objects (huts) in the pictures.

Pure position is to be found in Picture A-1. Pictures A-2 and A-3 use object size firstly, to contradict conventional positioning and secondly, to enhance it. In Picture A-4 the distance gradient is emphasised by linear perspective where the items are graded from large to small as they ascend the picture space. In Picture A-5 object size remains constant but tone is used to confirm conventional positioning. The remaining four pictures (A-6, A-7, A-8 and A-9) are mirror images of pictures A-2, A-3, A-4 and A-5 to test for binocular rivalry.

Series B. Depth: Overlap, Object Size, Position and Tone (p.23)

It is normal practice for a Western illustrator to convey the impression of depth in a picture by drawing nearer objects larger, by superimposing nearer objects on

more distant objects and by grading tone from foreground to background. To study the effect of these conventions, a basic picture was devised in which positioning of objects and overlap was constant, but in which size and tone of objects could be manipulated. Picture B-1 is the basic picture. Picture B-2 uses a tone gradient to enhance the distance effect. Pictures B-3 and B-4 repeat this presentation but add a differentiating factor of object size. Pictures B-5 and B-6 are mirror images of the first two pictures.

In this series of six pictures there is a basic difference of approach from the previous series. In the Series A the picture stimuli were designed to elicit responses providing an assessment of relationships between viewer and picture whereas the Series B was constructed to obtain responses of the viewer to the relationships of objects within the picture.

Series C. Position in Pictorial Space. (p .24)

In Western pictures the most important features are generally placed more centrally in pictorial space. This is an acquired taste and does not occur naturally with young children and need not be found among non-Western samples. To explore the relative values given to different areas in pictorial space five pictures were drawn and presented in pairs for comparison. Each of the five pictures contained line drawing composition showing a human figure, a hut and a tree in a fixed relationship to one another. Size was constant. Positions of compositions were as follows:- Picture C-1., left top gradient; Picture C-2, right top gradient; Picture C-3., centre; Picture C-4., left bottom gradient; Picture C-5., right bottom gradient.

Series D. Bordering. (p. 25)

Frequently figures and objects within a picture are truncated by a border or implied border. It is assumed by the perceiver that the figures or objects thus shown are not deformed but that the reference frame shown is not sufficiently large to include what are irrelevant details. Four pictures were drawn to examine this aspect. In the first picture (D-1) the border cuts off the lower half of the body of the human figure. In Picture D-2 the human figure and the dog are both truncated, the dog severely so. Picture D-3 shows the effect of an implied border on the two figures. Picture D-4 introduces cut-off on inanimate objects.

Series E. Shadows. (p. 26)

Since shadows cast by objects assume forms not directly related to the shape of the objects themselves but determined by factors such as angle and distance of illumination source, the representation of shadows pictorially introduces an element into a picture which may cause misperception. It is customary also to represent shadows in different artistic ways, viz., by hatching or by blocking in. To establish responses to this conventional treatment four pictures were constructed. The first, Picture E-1, showed a single object with a blocked-in shadow cast from an illumination source at 45° above right. In Picture E-2 three items were shown with shadows angularly offset to a common illumination point. In the one case the form of the shadow bore little resemblance to the object (house) casting it. Pictures E-3 and E-4 showed an identical human head with shadow differently treated.

Series F. Human Figure. (p.27)

In Western style art human figures can be represented in a number of different ways from realism, through cartoon and silhouette to stick figure drawings. To test the effect of these different styles of representation four pictures containing basically the same figure composition were constructed. Picture F-1 shows a stick figure style. Picture F-2 presents a silhouette, Picture F-3 is a cartoon. Picture F-4 is a more realistic presentation.

Because both white and black samples were to be tested, alternate versions of these pictures were prepared. In the one set, the human figure was modified to resemble a black child. In the other set, a more typically white child was modelled.

Series G. Foreshortening. (p.28)

Foreshortening is a form of perspective whereby depth effect is represented in drawing human and animal figures. It results in obscuring parts of the figure by overlap. To examine its effect on pictorial interpretation two pictures, G-1 and G-2, were drawn showing human figures in two different poses.

Series H. Implied Motion. (p.29)

To represent implied motion pictorially Western artists resort to a variety of procedures, e.g., lines of direction, tracking dots, multiple images, vibration lines and impact marks. These features are illustrated singly or in combination in five pictures. Picture H-1 shows apples dropping from a tree, one apple only within motion lines. Picture H-2 includes speed lines and vibrating

implied movement. Picture H-3 gives the classic tracking effect. Picture H-4 makes use of multiple image and circular movement lines. Picture H-5 demonstrates impact marks and includes a typical onomatopoetic device often associated with implied motion.

Series I. Person Identification. (p. 30)

The zoom-lens principle is commonly practised in Western art where human figures, particularly in cartoon strips, are presented in a range of distance shots from far-sighted to close-up. The cartoon strip itself imposes certain interpretation requirements in the viewer, namely that the human figures repeated in it should be identified as the same persons regardless of positioning or of foreshortening. To determine responses in this field three cartoon strips were prepared: I-1 illustrating far to close-up views, 1-2 showing one figure in a variety of positions (all profile views), and I-3 depicting a human figure in a number of positions with three-quarter and profile views as well as foreshortening.

Series J. Combined Conventions. (p. 31)

In the previous series of pictures, representational conventions were examined in a controlled and restrictive context, if not in isolation. To examine the effect of combining a number of these conventions into a meaningful context a picture was constructed which contained such cues as overlap, implied borders, shadows and tone. In particular, the object was to test whether the same pattern of group modal responses and variation with standard are obtained with a complex picture as when the different types of conventions are presented separately.

Problems of Test Construction

The chief constructional problem was to meet the requirements of standardization both in the nature of the test material and in its presentation. Since the objective was to obtain responses under controlled pictorial conditions, irrelevant detail was discarded and simple familiar objects such as a hut, a hill, a tree, a dog and the human figure were employed either singly or in combination. When pictures had to reproduced several times with exactly the same detail, this was done photographically.

Since both black and white samples were tested, objects familiar to both were used equivalently, e.g., a hut and a hill; but the human figures were either modelled to a compromise pattern as in Series B, C, D, G and I and Pictures E-3 and E-4 or alternate forms were constructed as in Series F, and to a limited extent in Picture H-5.

The representation of certain pictorial relationships provided difficulties. In the overlap Series B the problem was to relate the human figure to the huts and hills in both foreground and background without distorting it by oversizing. This was achieved by placing the human figure on a hill in the foreground which allowed the picture to be perceived either three-dimensionally or two-dimensionally. Also in Picture E-1 of Series E. the unhatched portion of the ball had to be given a tone, otherwise some perceivers saw it as a hollow basket.

It was necessary to arrange that the test pictures should be presented in a standard fashion, keeping viewing distance and illumination as constant as possible. Initially various complicated procedures were resorted to, such as strapping the candidate's head or using a light box

(view box)[1] in which the test pictures could be inserted. This last procedure was in fact used with Series A.

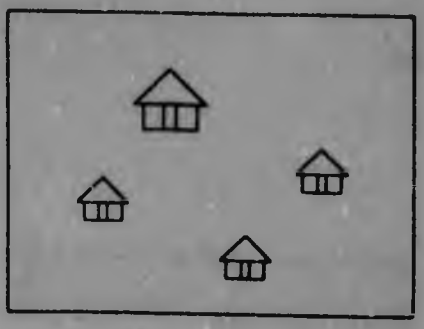
But since much of the testing was carried out in remote parts of the country where illumination was daylight and where with unacculturated samples of children restrictive devices such as headstraps and complicated gadgets such as light boxes were distracting, it was decided to use a simple view board[1], which resembled an adjustable music stand. It carried a viewing frame which presented each test picture within a constant frame size of $10\frac{3}{8}$ inches by $4\frac{1}{2}$ inches, which was found to accommodate most common textbook illustration sizes. The board could be readily adjusted to the normal reading angle and viewing distance of the child who was tested seated.

The solution to these constructional problems was reached through preliminary trials made on small samples of children drawn from the ethnic groups to be studied in the main investigation. A picture was considered to be in its final form when all pilot samples could identify the objects delineated without necessarily understanding their pictorial interrelationships.

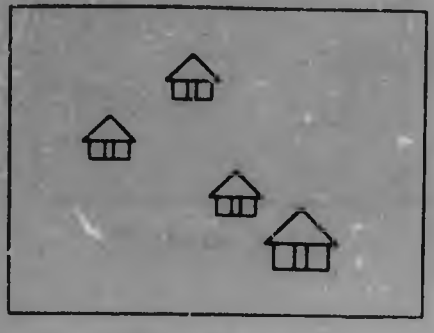
1. See Appendix III for constructional details and procedure for using testing equipment.



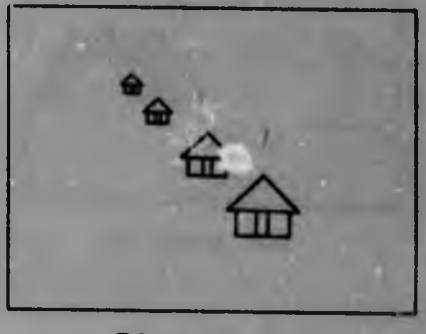
Picture A-1



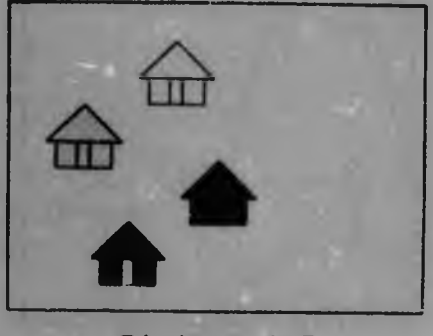
Picture A-2



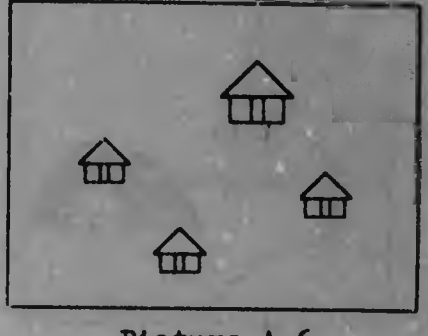
Picture A-3



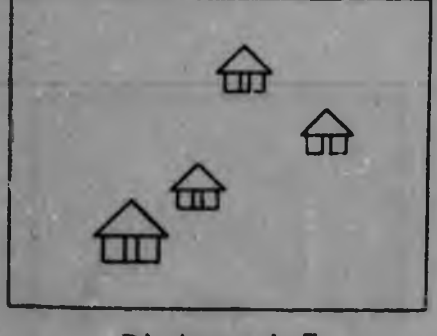
Picture A-4



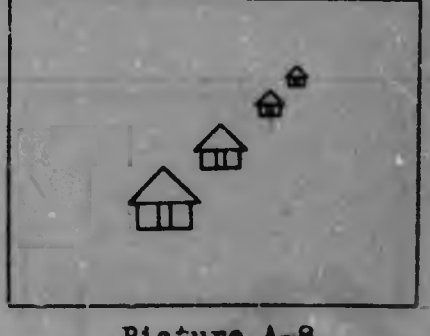
Picture A-5



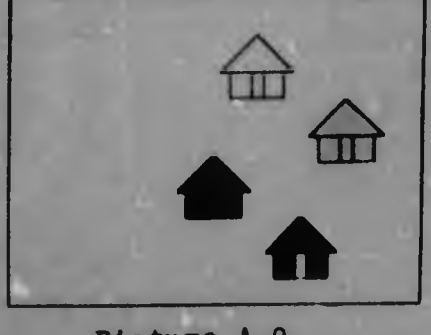
Picture A-6



Picture A-7



Picture A-8



Picture A-9

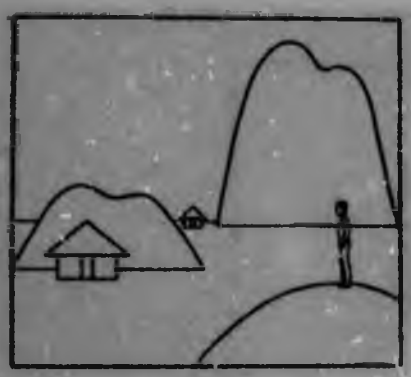
Series B



Picture B-1



Picture B-2



Picture B-3



Picture B-4



Picture B-5



Picture B-6

Series C



Picture C-1



Picture C-2



Picture C-3



Picture C-4



Picture C-5



Picture D-1



Picture D-2



Picture D-3



Picture D-4



Picture E-1



Picture E-2



Picture E-3



Picture E-4



Picture F-1 (Bantu)



Picture F-2 (Bantu)



Picture F-3 (Bantu)



Picture F-4 (Bantu)



Picture F-1 (European)



Picture F-2 (European)



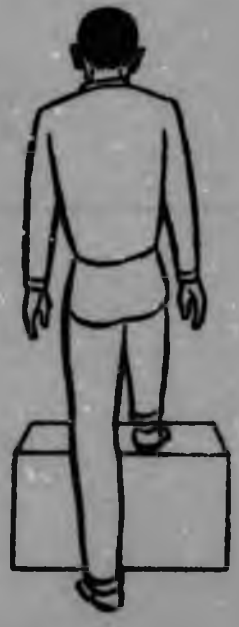
Picture F-3 (European)



Picture F-4 (European)



Picture G-1



Picture G-2



Picture H-1



Picture H-2



Picture H-3



Picture H-4



Picture H-5 (Tsonga)



Picture H-5 (Zulu)



Picture H-5 (European)

Series I



Picture I-1



Picture I-2



Picture I-3

Series J



Picture J-1

CHAPTER 3

THE SAMPLING DESIGN AND GENERAL BACKGROUND OF THE EXPERIMENTAL SAMPLES

General Considerations

It was decided to test children drawn from the five standards of the primary school. Previous experience had shown that pupils in standards lower than Standard I had difficulty in understanding the requirements of the testing situation. The upper limit of Standard V was selected because it marks the end of the primary school for the European children and is only one year short of the end of school for most Bantu children.

It was necessary to have a European group in order to have a set of Western norms with which the performances of the Bantu children could be compared.

For practical reasons, only a limited number of Bantu groups could be tested. It was decided to test four groups, an Urban Zulu group, a Rural Zulu group, an Urban Tsonga group and a Rural Tsonga group. It was necessary to have this balanced arrangement in order to separate out Urban-Rural differences from any tribal differences i.e. differences between Zulu and Tsonga.

Obviously sex differences had to be considered and sampling at all levels involved equal numbers of boys and girls.

Furthermore, since school differences exist in respect of most tests of ability, it was necessary to sample children from a number of schools, and not just from one or two schools, in order to get results of general validity. For practical reasons, it was decided that each ethnic group should be drawn from five representative

schools for the group concerned.

Details of Sampling Design

Table 1 shows the sampling design for each ethnic group.

Table 1 Sampling Design for Each of the Five Ethnic Groups

M = Male
F = Female

	Standards									
	I		II		III		IV		V	
Schools	M	F	M	F	M	F	M	F	M	F
1	4	4	4	4	4	4	4	4	4	4
2	4	4	4	4	4	4	4	4	4	4
3	4	4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4	4	4
5	4	4	4	4	4	4	4	4	4	4

It follows that each ethnic group sample consisted of 100 boys and 100 girls. Table 2 shows the distribution of the total sample of children according to ethnic group and sex.

Table 2 Distribution of Experimental Sample According to Ethnic Group and Sex

	Ethnic Group	Sex	
		Boys	Girls
Rural Bantu	Zulu	100	100
	Tsonga	100	100
Urban Bantu	Zulu	100	100
	Tsonga	100	100
	European	100	100

The sub-sample of 4 boys and 4 girls for any one standard in a school was selected at random by drawing up alphabetical lists of boys and girls in the standard and then choosing children at suitable equal intervals in order to obtain the necessary number.

Because of absenteeism it was found necessary to have alternate candidates for testing in each school standard. These alternate cases were selected randomly in the same manner as the others.

General Background of the Experimental Samples

A brief account of the general background of the experimental samples will assist the reader when he comes to consider the statistical analysis and its results presented in Part II and the later discussion in Part III. More detailed information, based on the Biographical and Educational Questionnaire data, is provided in Chapter 18 at the end of Part II.

It is to be appreciated that the Zulu and Tsonga are related Bantu-speaking tribes domiciled in different parts of South Africa, the Zulu in Natal and the Tsonga in the Northern Transvaal, but that many of the Zulu and Tsonga now live in large industrial areas such as the huge industrialised Reef area with Johannesburg as its centre. It was from the latter area that the Urban Zulu and Urban Tsonga samples were obtained.

In the account which follows, the Rural Zulu and Rural Tsonga groups are discussed separately since they represent two different stages of acculturation towards the European mode, the Rural Zulu being less Europeanised. The Urban Zulu and Urban Tsonga are presented together as an Urban Bantu group since both come from similar town-

ship areas near Johannesburg.

The Zulu Rural Group

The Rural Zulu group was the most isolated ethnic group tested. The children's contact with European life is very limited. The influence of European culture on the Zulu household comes largely from Zulus who itinerate between their work in the big cities and their rest periods in Zululand. European influence on the children is therefore more of a secondhand nature except for that of the limited numbers of missionaries, store owners and government officials living in the area.

The Rural Zulu children were tested in the western part of Zululand in the Nkandla district, an area roughly some seventy miles southeast from Dundee, Natal. It is a rolling mountainous country laced with deep valleys and roads with hairpin turns. Trading stores link the arteries of supply, communication and transport and are spaced along the main roads every ten miles or so.

The testing area extends some twenty-five miles from Ekhombe to Dinuntuli with the schools interspaced four to eight miles apart. A conservative estimate from local inhabitants is that 50% of the families in the area are polygamous. The livelihood of the people is primarily agriculture and the raising of cattle. A few of the inhabitants work at local government offices, trading stores, and mission centres. However, the economy is largely supported by many of the Zulu fathers working in the industrial areas of Natal and the Transvaal. Some of the local people estimated that 50% of the fathers are employed outside the area and visit their families on the average once every other year for a period of three to six months.

Schools in the area are faced with a number of problems. One rural Zulu school principal reported that homework is not assigned because of poor light in the kraals and that school books are damaged by rain and insects if taken to the children's homes. Testers reported that the rural Zulu boys are encouraged to attend school more than girls. Many boys, however, are kept out of school to herd cattle and to help in the planting season. It was found at the time of testing that schools were overcrowded because of the shortage of teachers and need for larger facilities, and it was common to find 60 to 70 pupils in one classroom.

The Tsonga Rural Group

Since the latter part of the last century the Tsonga area in which the investigation was carried out has been largely under the influence of the Swiss Presbyterian Mission. In fact, three of the schools tested identify themselves very closely with this church. The two remaining schools draw children from private rather than mission farms. At one of these latter schools many children attend classes only for some two-thirds of the scholastic year as they are required for particular agricultural work on the surrounding farms.

One does not find the high percentage of polygamy in the Tsonga area as one does among the Rural Zulu. For the parents of the children at one of the experimental schools it was estimated by the principal to be about 5%. Polygamy was reported to be declining because of the established Christian churches and the excessive economic strain required to maintain several wives.

The local economy of the Rural Tsonga is

supported principally by two sources: (1) work on the local European farms and institutions, and (2) money brought into the area by members of the household working in the cities. A conservative estimate by local inhabitants was that 70% of the fathers live away from their families working in outside areas, primarily in the big industr[illegible] mining centres along the Reef area in the Trans[illegible]

The Urban Bantu Groups

The Urban Zulu and Urban Tsonga groups represent two of many Bantu ethnic groups living in the sprawling complex of townships known as Soweto which covers an area of 26 square miles and is situated, at the nearest point, eight miles from the centre of Johannesburg. Soweto with a population of just over one half million, represents possibly the most urbanised and wealthiest Bantu population in South Africa. Soweto borders on Johannesburg which is the largest and most prosperous European city in South Africa. Soweto's townships are not luxury suburbs although there is a small section in the Dube area which might be classified as such. There are schools, sports and recreation facilities and even a golf course in the Zola suburb. Soweto has cinemas, many churches and shopping centres.

Of the ten Urban Bantu school groups tested in this investigation, nine are from Soweto and one from Alexandra, another township bordering Johannesburg whose population is presently being resettled in Soweto.

A recent market survey (Market Research Africa, 1968) shows an increasing trend of Soweto's inhabitants to prefer city life rather than life in the rural homelands

largely because of better pay and a better life in general. However, the survey revealed that crime, lower moral standards, cost of living and high rentals are the main problems faced by the township families.

The Urban Bantu groups in the Soweto townships have undergone several generations of Europeanisation due to the immediate proximity to Johannesburg which provides employment and services. Urban Bantu no longer seem to fit in or be satisfied with the rural life of the kraal, but continue to maintain their rural homeland contacts.

There appears to be a decline in the number of people who go to the witch doctor (3% in 1967 as compared with 5% in 1962) (Market Research Africa, 1968) yet one Zulu tester used in the investigation revealed that old ways die hard and estimated that 80% of the Zulu families in Soweto practice ancestor worship.

More Urban Bantu mothers are going to work. In fact, 30% of the housewives interviewed (Market Research Africa, 1968) were either in full-time or part-time employment as compared with 19% in 1962. Thus more Urban Bantu children are cared for by other members of the family, primarily older children, particularly girls, and sometimes the grandmother. The investigator believes that the greater restriction of the girls to the home accounts, to some extent, for the fact that their scores on the pictorial tests tend to be lower than those of the boys.

Intermarriage between Urban Bantu ethnic groups has been taking place for some time as tribe affiliation weakens through education and the constant influence of European ways of life. This affected the present investigation in two ways. First, the Zulu and Tsonga testers reported that the Urban Bantu children often had difficulty

in expressing themselves in their own Bantu language due to the use of many other Bantu languages as well as English and Afrikaans in the townships. Secondly, there was a certain amount of difficulty involved in ensuring that all the children in the two Urban samples were of pure descent and truly representative of their respective ethnic group. With care, however, this was achieved.

The Urban Zulu and Tsonga groups have access to various big city amusements such as swimming pools, cinemas and large sports stadiums. Library facilities are available though somewhat limited. The general economy and environment of the Urban Bantu is such that their children are significantly more 'westernised' than those of their cousins in Zululand and the Tsonga homeland.

The European Group

The European group represents a cross-section of middle-class European society in the eastern suburbs of Johannesburg and an area extending into the adjoining city of Germiston. It is conservatively estimated that about 60% of the mothers are employed half or full-time, thus a considerably high standard of living is enjoyed by this group. The group is primarily of South African origin although there is a very small percentage of immigrants from Western European countries. In selecting the European sample for the investigation, it might be noted that care was taken not to include immigrants who had special difficulty in expressing themselves in English.

Because of its much higher income and other advantages which it enjoys over the Bantu groups, the European group has far greater access to all types of pictorial materials. A substantial portion of the family

budget is spent on daily newspapers, weekly magazines, books and cinemas. Of all the groups tested, the European has easily the richest pictorial environment.

CHAPTER 4

TEST PROCEDURES AND RECORDING OF DATA

The Test Questionnaire (Vide Appendix I)

This was the questionnaire followed by the testers in testing the children on the ten series of pictures. It was constructed as a result of a series of small preliminary investigations carried out on samples of children from the ethnic groups involved in the main study. In its final standardised form, it consists of sets of specific questions, which accompanied the presentation of each picture to the children, and which vary from picture to picture. The questions are such that they evoke responses which can be easily handled quantitatively.

The questions follow a routine plan. Except in the two picture series where paired comparisons were required, interrogation began with a global question designed to obtain a response indicating each candidate's first perception of the stimulus picture. Thereafter followed more detailed questioning designed to seek responses relevant to the particular representational convention being studied either by probing the internal relationship of pictorial items or by seeking object identification. In the case of the paired comparison sets, the preference of the candidate for a particular presentation was elicited by questioning. In certain instances an attempt was made to obtain corroborative data on the significance of a pictorial convention such as bordering by asking for an explanation of the intended purpose. In the case of the picture series in which the human figure was manipulated in distance (Series I) identification questions were supported by further queries designed to explore the

ratiocinative principle involved in the identification process.

Questioning was done orally and individually by a tester ethnically appropriate to each sample. Where necessary, testers pointed to specific pictorial items as in identification type questions. Both oral questioning and gestures were controlled by standard procedures.

The Biographical and Educational Questionnaires (Vide Appendix I)

Both these questionnaires were designed to provide information on possible determinants of pictorial perception.

The Biographical Questionnaire covered such items as educational level, religious affiliation, class standing, exposure to pictorial material (outside the school) and degree of acculturation. It was administered orally to each pupil according to a standard pattern.

The Educational Questionnaire was aimed at providing information on the children's exposure in the classroom to pictorial material in the shape of illustrated text-books, blackboard drawings and films. Information was also sought on the training which the teachers in Standards I - V had received in visual aid training and which could be passed on to their pupils in formal art lessons. This questionnaire was completed by the teachers of the children tested.

Translation of Questionnaires

The test questionnaire was translated into Zulu and Tsonga by members of the Bantu Language Department of the University of the Witwatersrand. The other two questionnaires were translated into the same languages by

the testers.

The Testers

Three testing teams of two women each were selected and trained (two Zulu women, two Tsonga women, and two European women). Each of these women had had considerable experience in working with children. They had all raised their own families and several had been primary school teachers.

The testing teams were restricted to testing only in their respective ethnic groups. This was done to overcome any language or cultural problems which might arise during the testing. The same Zulu testers tested both rural and urban Zulu samples. The same Tsonga testers tested both rural and urban Tsonga samples. The European testers tested only the European sample. Every effort was made to ensure that the tester was completely acceptable by the ethnic group she was testing.

Previous experience of the writer in the testing of children in visual perception has shown that it is preferable to have mature women as testers. They are more patient, more understanding and more acceptable by children in the primary school. For these reasons only mature women were selected as testers for this investigation.

The Training of Testers

Each tester was trained in every aspect of the method of screening and selecting the test cases, the presentation of the stimuli, the care of the equipment, the method of recording responses and the recording of additional useful information. Training sessions were organised to deal with each of these.

Testing Periods

Preliminary testing of local ethnic groups of children indicated that it would be best to have the testing divided into two test periods of two sessions each.

The first session of the first test period (about twenty-five minutes) involved the testing of Series A and Series B. This was followed by a rest period of about ten minutes after which the second session began. The second session (about twenty minutes) was devoted to obtaining the biographical information from the child followed by the testing of the Series C and D.

Several days elapsed before the second test period. This was done in order to keep the child's absence from the class to a minimum. In this second period the child was tested on Series E, F and G in the first session (about twenty minutes), had a short rest and then continued with the second session (about twenty-five minutes) on Series H, I and J.

It has been mentioned that several days elapsed before the child returned to do the second period of tests. However, this was not always possible especially in Zululand where the children completed all tests during the course of one day. Otherwise, there was no assurance that they would return to complete the remaining series of tests. However, in these particular cases a rest period of several hours was arranged between the first and second periods of testing.

Normally it took approximately nine school days working from 8 a.m. to 1 p.m. to test forty children. The total time of testing of one child for one period (two sessions) averaged about forty-five minutes each. Urban children often responded more quickly than the rural.

No fatigue factor was observed by any of the testers. Occasionally the testing was slowed down due to special school functions or the absence of particular children who were selected for the experiments. Testers were requested to organise their testing so that it did not interfere with the normal school routine. Pre-arrangements with the school authorities avoided such disruption and only a few of the children selected for the tests were ever absent at any one time from a class.

Presentation of Stimuli

All stimuli were presented in the same sequence throughout the testing of the five samples. This sequence followed the procedure as presented in the test questionnaire beginning with Series A and finishing with Series J.

Special cleaning materials were provided for the testers to ensure that the pictorial materials were presented in a good and clean condition.

The same tester always tested the same stimuli. The testing was divided as follows between the pairs of testers. The first tester tested Series A, B, H, I and J. The second tester interviewed the child for biographical information and tested Series C, D, E, F and G.

Testing Rooms

The testers conducted their testing in separate rooms. Every effort was made to select rooms which were clean and comfortable, had good light and ventilation and were furnished simply.

Screening of Children

The testers assisted in the screening of their particular sample, making certain that the children were

representative of their ethnic group. This was necessary as it was found in some schools that there were a large number of children of mixed parentage. (Example: Zulu father and a Xhosa mother).

Children with physical or mental disabilities that interfered with their ability to do the tests were not selected for testing. In a few rare cases, the testers discovered such disabilities only after proceeding with the tests, and such children were replaced with alternates.

Special Considerations in the Organisation of the Testing Schedule

Accommodation and transport of the testers were two of the biggest problems in this research. Contracts were concluded with teachers and local truck owners for the transport of the testers and equipment from school to school. Accommodation of the testers was usually arranged with school principals or in the case of the Tsonga testers, with relatives living in the area near the schools where the testers worked.

Recording of Data

Multiple or dual chcice item responses were recorded by drawing a ring round the appropriate response as in Series A, B, C, F and J. Otherwise answers were recorded verbatim or in summarised form. This form of record taking was used where the ratiocinative type of question was used.

Scoring and Codification of Responses

Responses considered to indicate expected perception were recorded as correct.

Verbal information was categorised under a series

of representative responses into which all obtained responses were ultimately fitted. Thereafter, categories were assigned numerical values.

All test responses and all relevant biographical information were codified for mechanical processing.

PART II

STATISTICAL ANALYSIS

OF THE EXPERIMENTAL DATA

CHAPTER 5

STATISTICAL PROCEDURES USED IN THE INVESTIGATION

As stated in Chapter 1, two of the primary objectives of this study are:-

(a) to obtain estimates of the modal responses of the ethnic groups, from which the samples were drawn, to the various perceptual tests which accompanied the presentation of the ten series of pictures to the children; and

(b) to obtain estimates of the variation in the test performance of the groups with age i.e. as one passes from Standard I through to Standard V of the primary school.

Since these estimates had to be derived from the samples drawn from the group populations involved, it was necessary, as in most statistical investigations, to apply tests of significance to them. In particular, it was necessary, under (a), to test the significance of differences between European and Bantu, Urban Bantu and Rural Bantu, Zulu and Tsonga, and also between boys and girls for all five ethnic groups.

When one begins to organise the data obtained from the tests, it soon becomes apparent that most of the data take the form of two-category responses. The child gives one of two possible responses to the item, one of these responses usually being the 'correct' one - at least in the Western sense - and the other the 'incorrect' one. The result is the drawing-up of a contingency table

for each item, in which the frequencies of 'correct' and 'incorrect' responses are presented for each sample. (Actually in the chapters which follow, these frequencies are presented as proportions e.g. 60 'correct' responses out of a possible 100 is presented as a proportion of 0.60). It is well-known that some form of χ^2-analysis is the appropriate technique to use in the analysis of such data and, in the present study, most of the statistical analyses take the form of χ^2-tests.

However, it is possible to combine the results of several test items, giving each child '1' for each 'correct' response and a '0' for each 'incorrect' response. The result is a total or composite score for each child on the set of items considered. These composite scores can then be treated as measures obtained for a continuous variable and subjected to an analysis of variance. Several such analyses were employed in the present study.

In proceeding now to present the various statistical procedures used in the analysis of the pictorial test data, it is perhaps easier to begin with an account of the analysis of variance techniques which were employed before describing the applications of χ^2-analysis. It will be seen that the procedures are designated by Roman numerals and it is to be noted that where any one of these procedures is used in the chapters which follow it will usually be referred to by its number.

1. Procedure 1 : Analysis of Variance of Composite Scores - Testing of Group and Sex Differences

It follows from the account of the sampling design given in Chapter 3, that with an experimental sample of 1,000 children, any analysis of variance of com

posite scores must begin with a 1,000 such scores. Also these scores can be classified in four ways:-

(i) Ethnic group - in particular, European v Bantu, Urban Bantu v Rural Bantu and Zulu v Tsonga;

(ii) Sex (i.e. boys' scores v girls' scores);

(iii) Standards (I to V);

(iv) Schools (five schools being involved in the case of each ethnic group sample).

Since school differences are a characteristic of most measurements obtained from school children and it was thought likely that to some degree such differences must pertain to the measures obtained in this investigation, it was necessary to use the school as the unit for calculating error variances and not the pupil. Also the analysis of the data was simplified by splitting it up into two parts.-

(a) In the first part of the analysis, the standards factor is ignored, and ethnic group and sex differences are tested against an error variance derived from schools, each school term being an average over its five constituent standards.

(b) In the second part of the analysis, the standards factor is tested, sex differences being ignored (in other words, each standard term is an average over the two sexes). Also, the analysis was simplified further either by treating the data for each ethnic group separately or by applying an analysis to group-standard means, these means being an average over the five schools for a group.

The analysis described under (b) will be dealt with under Procedures III and IV respectively. Procedure I,

with which we are now dealing, is the analysis described under (a). (Procedure II is a simplified version of Procedure I).

It will be seen from (a) that Procedure I involves the analysis of 50 school means. There are two means for each school, one for boys and one for girls, and with five schools in each ethnic group sample, there are 50 means in all.

In order to illustrate the Procedure, Table 3 is presented. This is a reproduction of Table 61 which appears later in Chapter 15 and which presents an analysis of variance of the composite scores for Series J. The actual computation involved is to be found under Procedure I in Appendix V.

Table 3 Series J Picture. Analysis of Variance of Composite Scores (Reproduction of Table 61, Chap. 15).

Variance		d.f.	Sum of Squares	Variance
Groups	(a) European v Bantu	1	13.99	13.99
	(b) Urban Bantu v Rural Bantu	1	8.19	8.19
	(c) Zulu v Tsonga	1	.38	.38
	(d) (b) x (c)	1	1.72	1.72
Sex		1	2.42	2.42
Sex x Groups		4	1.03	.26
Residual	between schools	20	2.39	.12
	within schools	20	2.78	.14
Total		49		

It is to be noted that the sum of squares for Groups can be analysed into four components. The fourth component (b) x (c) is an interaction term and could be described as a measure of the extent to which the Urban-

Rural difference for the Zulu differs from that of the Tsonga. Each of these terms is tested for significance by testing against the Residual between Schools. The F-ratio is formed in the usual way and the F-table entered with the appropriate degrees of freedom. Variances (a), (b) and (d) are all highly significant but (c) is not significant. It follows that the overall difference between Zulu and Tsonga is slight but that the difference between the two Urban groups (Zulu and Tsonga) is different significantly from the difference between the two Rural groups (Zulu and Tsonga).

The variance components Sex and Sex x Groups are tested against the Residual within Schools. The Sex variance is highly significant, showing that there is an overall difference between boys and girls; but the Sex x Groups variance falls considerably below the 5 per cent level of significance which would suggest that the sex difference does not vary significantly from group to group. (Actually on the basis of other results, it is argued in Chap. XV that it would be reasonable to assume a variation in sex differences from group to group). There remains one important test, namely that for school differences. This is carried out by testing the Residual between Schools against the Residual within Schools. As with the analyses of other composite scores derived from other series, the difference between these two variances is quite non-significant. School differences would appear therefore to be negligible. This is important for the χ^2- analyses applied to responses for individual test items (Vide Procedure V).

Procedure II : Analysis of Variance of Composite Scores - Testing of Group Differences only.

When sex differences are negligible, the analysis described under Procedure I becomes simplified to that of an analysis of 25 school means (the mean for each school being obtained from the scores of boys and girls combined).

The analysis now takes the form:-

	Variance	d.f.
Groups	(a) European v Bantu	1
	(b) Urban Bantu v Rural Bantu	1
	(c) Zulu v Tsonga	1
	(d) (b) x (c)	1
Residual between schools		20
	Total	24

This is virtually a simple analysis of variance. An example of the application of this Procedure is to be found in Chapter 8, which deals with Series C.

Procedure III : Analysis of Variance of Composite Scores for One Ethnic Group to Test Variation of Score with Standard.

This Procedure can also be described as a regression analysis in that it provides a test of the regression of score on standard.

The mean standard score, boys and girls combined, is calculated for each of the five Standards in each of the five schools from which the ethnic group sample was drawn. There are thus 25 mean scores in all.

Examples of the application of this Procedure are to be found in Chapter 8, which deals with Series C (the positioning of a drawing in pictorial space). We shall consider its application to the preference scores of the

European group in respect of the centre position. The resultant analysis is shown in Table 4. The computation involved is shown under Procedure III in Appendix V.

Table 4 Series C. Regression Analysis for Centre Position Preference Scores : European Group Only

Variance		d.f.	Sum of Sqs.	Variance
Standards	(Regression	1	2.4998	2.4998
	(Residual	3	.0783	.0261
Schools		4	.2537	.0634
Schools x Standards (Error variance)		16	2.0022	.125

To test the variation of scores with standards (or the regression of scores on standards), the Regression variance is tested against Schools x Standards. In this case a highly significant result is obtained. The fact that the Residual Standards variance is quite non-significant means that the regression in this case is linear, as can be seen from the graph of the variation presented in Chapter 8.

It is also possible, using the formula given in the Appendix to calculate the average increase in score per standard. In this case it amounts to 0.22 which is considerable in that the maximum possible score is 4.

Special note

It is to be noted that the same procedure was adopted in the present study when only one test item was being considered and each pupil could give only one of two responses - the 'correct' one or an 'incorrect' one. Since the above analysis (i.e. Procedure III) is applied

to mean standard scores for schools and not individual scores, it is argued that no serious error will be incurred if the analysis is applied to the mean proportions of pupils in school standards getting an item 'right'. These proportions are approximately normally distributed and with approximately the same variance.

(It is also possible to combine the data for the five schools within an ethnic group and apply a χ^2-regression analysis to the combined frequencies. It is difficult to say which method is the superior of the two. Probably the more significant the school differences the better Procedure III. But since school differences would appear to be small in the present investigation, it might be that the χ^2-analysis is somewhat superior).

Procedure IV : Regression Analysis Using Group Mean Standard Scores

On several occasions in the chapters which follow, the method described under Procedure III was applied to the mean standard scores for groups (i.e. ethnic groups). In other words, the same procedure was applied but 'groups' now replaced 'schools'. It is only to avoid some confusion that this procedure is designated Procedure IV.

As with Procedure III, this Procedure was also applied to data obtained from individual items as well as composite scores derived from several items. (In this case, the procedure is probably superior to a χ^2-regression analysis since group differences, unlike school differences, are considerable in the present study).

Procedure V : Testing of Group and Sex Differences for Responses to Single Items

As stated above, the usual technique is some form of χ^2-test. The method adopted in the present study was very simple. On the assumption that school differences were not important, the response frequencies for the five schools of an ethnic group were combined and a χ^2-analysis applied to the combined data.

To illustrate the procedure, Table 5 is presented. This is a reproduction of Table 6 in Chapter 6 which gives the proportions of boys and girls in each ethnic group who saw the lowest huts in Picture A-1 as 'nearest'.

Table 5 Picture A-1. Proportions Who Saw the Lowest Huts as Nearest : Question (b) (Reproduction of Table 6, Chap. 6)

Group	ZR	TR	ZU	TU	E
Boys	.71	.85	.62	.89	.40
Girls	.70	.87	.70	.88	.58
Average	.71	.86	.66	.89	.49

Sex differences:- If we apply a simple χ^2-test to the results for each of the five ethnic groups, remembering that there are 100 boys and 100 girls in each group, the χ^2-values obtained are 0.024, 0.17, 1.43, 0.049, 6.48 respectively. Only the χ^2-value for the European group reaches any appreciable level of significance ($.01 < P < .02$). It might therefore be deduced that there is a significant sex difference for the European group. However, it is to be remembered that five χ^2-tests are involved here, thus increasing the chances of getting a significant result. (With 100 χ^2-tests one would expect, on the null hypothesis, five χ^2-values, on the average,

to be significant at the 5 per cent level and one at the 1 per cent level).

The correct procedure therefore, in testing whether there is any significant sex difference within the table is to combine the five χ^2-values, giving a value of 8.15 with 5 degrees of freedom which does not reach the 10 per cent level of significance. The sex difference for the European group is therefore not significant statistically.

In testing sex differences for all similar tables throughout the investigation, the same procedure was adopted. Only where the overall χ^2-value was significant was it justified to consider sex differences for any one ethnic group.

Group differences:-

When sex differences are not significant the results for boys and girls can be combined before testing for group differences. When significant sex differences occur, χ^2-tests for group differences should be applied to the data for boys and girls taken separately, after which the χ^2-value for one test applied to the girls' data can be combined with the corresponding χ^2-value obtained from the boys' data. The level of significance can then be obtained from a χ^2-table, after entering the table with 2 degrees of freedom.

With the data given in Table 5 above, there are no significant sex differences, and the data for boys and girls can be combined.

Urban-rural differences are then tested by obtaining a χ^2-value for the two Zulu groups and a second value for the Tsonga groups. The combined χ^2, with two

degrees of freedom, is not significant.

On the other hand, the same procedure applied to the two Urban groups and then the two Rural groups show the Tsonga proportions to be significantly higher than the Zulu proportions ($P < .01$).

Other Procedures

1. In the case of many of the test questions, as, for example, when the children were asked why they had given a certain answer, the responses to such questions could vary considerably in form. The statistical procedure then took the form of classifying the responses and drawing up a table which showed the frequency distribution of the responses according to these categories. No χ^2-tests were applied to such data.

2. In Chapters 16 and 17, other statistical procedures are applied but these will be dealt with in the chapters themselves.

CHAPTER 6

THE PERCEPTION OF PICTORIAL DEPTH INVOLVING CUES OF SIZE, POSITION AND TONE

SERIES A

Test Material:- Nine Pictures, each of which shows four huts. No other features are presented in the pictures but the huts vary in size, position and tone from picture to picture. (Vide Chap. 2, pp. 15, 22)

View Box (Vide Chap. 2, pp. 20, 21)

As stated in Chapter 2, each child was required to describe the positional relationship between himself and the objects within the picture. The child was asked which hut was nearest or farthest from him.

When he designed the test, the investigator favoured the hypothesis that the greater the acculturation of the testee sample, the more frequent will be the sample's perception of the huts lowest in the picture as being the closest, regardless of the manipulation of the variables of size, position or tone. It is interesting that the subsequent analysis of the responses of the subjects completely refuted this hypothesis.

Analysis of Responses to Individual Pictures

1. Picture A-1. (Four huts of equal size placed equidistantly from the centre of the picture in the four quadrants of the pictorial area).

It is reasonable to suppose that position is the only cue to depth perception in this picture since the huts all have the same size.

(i) Question (b): "Which (hut) is the nearest to you?"

Table 6 shows the proportions of boys and girls in each ethnic group who saw the lowest huts as nearest.

Table 6 Picture A-1. Proportions Who Saw the Lowest Huts as Nearest: Question (b)

Group	ZR	TR	ZU	TU	E
Boys	.71	.85	.62	.89	.40
Girls	.70	.87	.70	.88	.58
Average	.71	.86	.66	.89	.49

Sex differences:- The application of a χ^2-analysis (Procedure V) shows sex differences for the data in Table 6 to be non-significant ($P > 0.1$) even although there would appear to be a significant difference between European boys and girls. The results for boys and girls can therefore be combined.

Group differences:- The proportion of European children who saw the lowest huts as nearest is significantly less than that for the Zulu-Urban group ($P < .01$) and therefore significantly less, a fortiori, than the proportions for the other Bantu groups.

A χ^2-analysis applied to the four Bantu groups (Procedure V) shows no significant difference between the Urban and Rural groups but a significant difference between Zulu and Tsonga groups ($P < .01$), the Zulu children tending to respond more like the European children than did the Tsonga.

(ii) Question (c): "Why?" (i.e. the children had to state why they gave the answer that they did to question (b).)

Two kinds of responses have to be considered:-

A. Those where, in answer to (b), the child responded that lowest huts were nearest.

B. Those where, in answer to (b), the child responded that the upper huts (the 'highest') were nearest.

The various categories of response for both A and B are shown in Table 7. The percentages given show the distribution of the responses for each ethnic group (boys and girls combined).

Table 7 Picture A-1. Percentage Distribution of Reasons Why or Why Not the Lowest Huts were Nearest: Questions (b) and (c)

A Reasons Why Lowest Huts were Nearest

Group	ZR	TR	ZU	TU	E
Reasons:					
Unclear, irrelevant	51%	34%	48%	48%	13%
Tone	-	-	-	-	-
Size	3%	-	2%	6%	8%
Position	17%	50%	16%	34%	11%
Position and Size	-	-	-	-	-
Tone and Combination of Size and Position	-	2%	-	-	-
Don't know, no response	-	-	-	1%	17%
Total	71%	86%	66%	89%	49%

B Reasons Why Lowest Huts were Not Nearest

Group	ZR	TR	ZU	TU	E
Reasons:					
Unclear, irrelevant	20%	10%	20%	6%	4%
Tone	-	-	-	-	-
Size	1%	1%	2%	1%	4%
Position	6%	3%	10%	4%	3%
Position and Size	-	-	-	-	-
Tone and Combination of Size and Position	-	-	-	-	1%
All alike - but Reason Indefinite	2%	-	1%	-	21%
No Response, don't know	-	-	1%	-	18%
Total	29%	14%	34%	11%	51%

A feature of Table 7 is the large number of unclear and irrelevant responses made.

The types of responses made by the European group are particularly interesting: 35% no response, 38% unclear, irrelevant or indefinite responses and only 27% apparently definite responses. This analysis, together with the fact that the European children were almost equally divided in their choice of the lower and upper huts (49% and 51%) would suggest that the European children had considerable difficulty in giving an answer to the question of nearness and were probably choosing at random. More will be said about this later.

On the other hand, it is quite clear from the proportions presented in Table 6 that the Bantu groups had a distinct tendency to choose the lower huts as nearest.

In other words, it would appear that a considerable proportion of the Bantu were being influenced by the cue of position (the only cue really present in picture A-1) whereas the European group found the picture 'cueless'.

(iii) Question (d): "Which (hut) is the farthest from you?"
Question (e): "Why?"

As was expected, the answers to these questions are consistent with the responses to questions (b) and (c). The questions were really inserted as a check on the responses to (b) and (c).

The same consistency is found for the other pictures in the series, and, for this reason, the responses to questions (d) and (e) are not included in the analyses presented in this chapter.

Picture A-2. (A large hut in the upper part of the pictorial area with three smaller huts of equal size positioned in a staggered formation below.)

In this picture the cues of position and size are both present but are acting in opposition to each other.

(i) Question (b): "Which (hut) is the nearest to you?"

Table 8 shows the proportions of boys and girls in each ethnic group who saw the lowest huts as nearest.

Table 8 Picture A-2. Proportions Who Saw the Lowest Huts as Nearest: Question (b)

Group	ZR	TR	ZU	TU	E
Boys	.75	.88	.60	.70	.30
Girls	.67	.82	.61	.82	.46
Average	.71	.85	.61	.76	.38

Sex differences:- The application of a χ^2-analysis (Procedure V) shows sex differences in Table 8 to be non-significant. The data for boys and girls can therefore be combined for the purpose of analysing group differences.

Group differences:- The proportion of European children who saw the lowest hut as nearest is significantly less than that for the Zulu-Urban group ($P < .01$) and therefore significantly less, a fortiori, than the proportions for the other Bantu groups.

There is a significant difference between the Urban and Rural Bantu ($.01 < P < .05$) and between the Zulu and Tsonga groups ($P < .01$) (Procedure V).

(ii) Question (c): "Why?"

The percentage distribution of the various categories of response to this question is shown in Table 9.

Table 9 Picture A-2. Percentage Distribution of Reasons Why or Why Not the Lowest Hut was Nearest: Questions (b) and (c)

A Reasons Why Lowest Hut was Nearest:

Group	ZR	TR	ZU	TU	E
Reasons:					
Unclear, irrelevant	45%	24%	32%	30%	14%
Tone	-	-	-	-	-
Size	2%	-	3%	3%	4%
Position	24%	61%	27%	43%	17%
Size and Position	-	-	-	-	-
All Same	-	-	-	-	-
No response, don't know	-	-	-	-	3%
Total	71%	85%	62%	76%	38%

B Reasons Why Lowest Hut was Not Nearest:

Group	ZR	TR	ZU	TU	E
Reasons:					
Unclear, irrelevant	15%	7%	19%	7%	6%
Tone	-	-	1%	-	-
Size	7%	3%	13%	9%	36%
Position	6%	5%	4%	7%	5%
Size and Position	-	-	1%	1%	1%
All Same	-	-	-	-	7%
No response, don't know	1%	-	-	-	7%
Total	29%	15%	38%	24%	6[illegible]%

It is reasonable to deduce from Table 9 that the European children tended to be influenced more by the cue of size whereas the Bantu tended to be influenced more by position. Also from Table 8 it can be seen that the Urban Bantu were closer to the European than the Rural, and the Zulu closer than the Tsonga.

3. Picture A-3. (A large hut placed in the lowest position in the picture with three other huts of equal size positioned in a staggered formation towards the top.)

In this picture, as in the case of A-2, the only two cues provided for depth perception are position and size but in this case, unlike A-2, the two cues are acting in conjunction.

(i) Question (b): "Which (hut) is the nearest to you?"

Table 10 shows the proportions of boys and girls in each ethnic group who saw the lowest huts as nearest.

Table 10 Picture A-3. Proportions Who Saw the Lowest Hut as Nearest: Question (b)

Group	ZR	TR	ZU	TU	E
Boys	.93	.95	.88	.89	.85
Girls	.90	.92	.81	.86	.78
Average	.91	.93	.85	.88	.82

Sex differences:- There would appear to be a small overall sex difference but, in view of the non-significant sex differences obtained from the other pictures, this is likely to be unimportant. (No statistical test was applied.)

Group differences:- Group differences are much smaller than was the case for pictures A-1 and A-2 but they are still in the same direction. (No statistical tests were applied.)

(ii) Question (c): "Why?"

The percentage distribution of the various categories of response to this question is shown in Table 11.

Table 11 Picture A-3. Percentage Distribution of Reasons Why or Why Not the Lowest Hut was Nearest: Questions (b) and (c).

A Reasons Why Lowest Hut was Nearest:

Group	ZR	TR	ZU	TU	E
Reasons:					
Unclear, irrelevant	53%	27%	43%	29%	9%
Tone	12%	6%	16%	16%	-
Size	26%	58%	26%	43%	46%
Position	-	1%	-	-	18%
Position and Size	-	-	-	-	6%
No response, don't know	-	1%	-	-	3%
Total	91%	93%	85%	88%	82%

B Reasons Why Lowest Hut was Not Nearest:

Group	ZR	TR	ZU	TU	E
Reasons:					
Unclear, irrelevant	6%	2%	11%	5%	8%
Tone	1%	-	1%	1%	-
Size	1%	5%	3%	6%	-
Position	-	-	-	-	5%
All Same	1%	-	-	-	2%
No response, don't know	-	-	-	-	3%
Total	9%	7%	15%	12%	18%

As with previous tables of its kind, many of the responses are unintelligible, but it is fairly clear that in this case, where the cue of size is working in conjunction with the cue of position, it has become an important cue of depth perception for the Bantu as well as for the European.

(iii) Question (d): "Which (hut) is the farthest from you?"

The proportions who saw the highest hut as farthest are given in Table 12.

Table 12 Picture A-3. Proportions Who Saw the Highest Hut as Farthest: Question (d)

Group	ZR	TR	ZU	TU	E
Boys	.89	.73	.86	.88	.58
Girls	.87	.76	.83	.88	.66
Average	.88	.75	.84	.88	.62

This table has been provided in order to show that while the responses to question (d) were consistent with those to question (b), the proportions in the two cases are not quite the same. Particularly is this so in respect of the proportions for the European group. It is obvious that, while the cue of size determined in most cases the response to question (b), it was not so effective in determining the response to question (d) (since the uppermost three huts are all of the same size.)

4. Picture A-4. (Four huts whose proportions became smaller as they receded towards the upper left corner.)

In this case, the two cues of size and position are not only working in conjunction, but they are further reinforced by the new factor of linear perspective.

(i) Question (b): "Which (hut) is the nearest to you?"

Table 13 shows the proportions of boys and girls in each ethnic group who saw the lowest hut as nearest.

Table 13 Picture A-4. Proportions Who Saw the Lowest Hut as Nearest: Question (b)

Group	ZR	TR	ZU	TU	E
Boys	.93	.94	.95	.94	.95
Girls	.93	.92	.89	.91	.91
Average	.93	.93	.92	.92	.92

The proportions are all high and more or less the same. The surprising feature is that as many as 7 or 8 per cent in any one group should not choose the lowest hut as nearest. A likely explanation is that, in all groups and for all pictures, there were some children who answered questions (b) and (d) in terms of the drawings of the huts

and not of the huts themselves. In other words, in answering (b), they chose the hut, the drawing of which was nearest to their eye.

5. Picture A-5. (Four huts of the same size positioned in a staggered formation. The lowest is coloured black, the second one up a dark grey (approximately a 65% grey tone), the next hut a lighter grey (approximately a 30% grey tone) and the highest hut a pure white).

In this picture it might be said that position and tone are the only two cues present and that they are operating in conjunction.

Question (b): "Which (hut) is the nearest to you?"

Table 14 gives the proportions who saw the lowest hut as nearest.

Table 14 Picture A-5. Proportions Who Saw the Lowest Hut as Nearest: Question (b)

Group	ZR	TR	ZU	TU	E
Boys	.88	.88	.82	.90	.70
Girls	.91	.90	.83	.88	.72
Average	.90	.89	.83	.89	.71

The reasons for choosing or not choosing the lowest hut as nearest have not been presented for this picture but it is quite clear that tone not only provided a depth cue for the European but also reinforced the position cue in the case of the Bantu groups.

The differences between Bantu groups are not significant but the European proportion is obviously significantly different from the proportions for the Bantu.

6. Pictures A-6, A-7, A-8, A-9

These pictures are the mirror images of pictures A-2, A-3, A-4, A-5.

No significant differences were found between the responses to any one picture and its mirror image.

Differences between Standards in their Responses to the Pictures

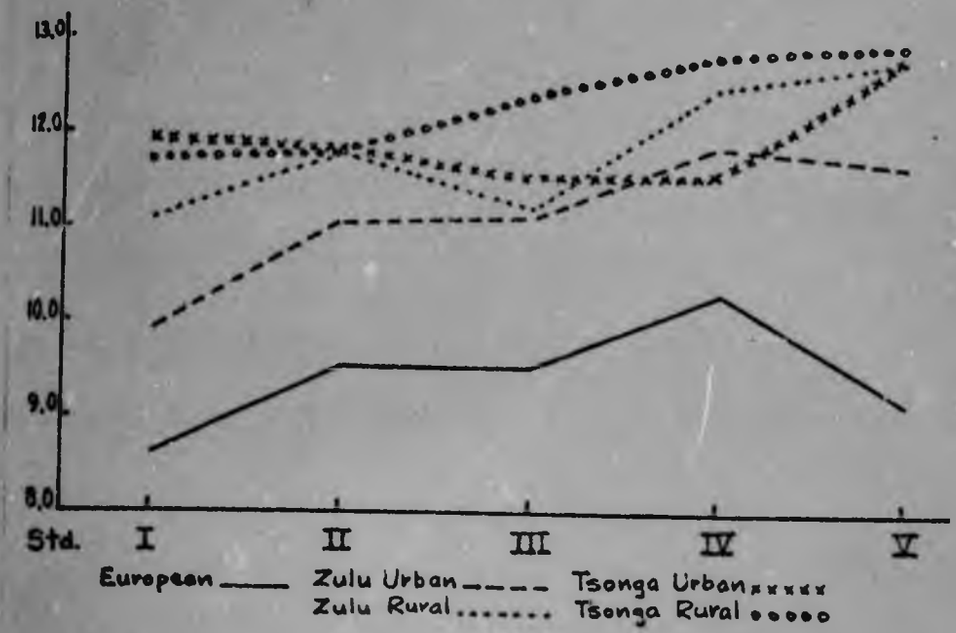
In the case of each ethnic group and for each of the pictures A-1 to A-5, the proportions who saw the lowest hut (s) as nearest were worked out for each standard. In all cases, with one exception, the proportions tended to increase from Standard I to Standard V. That is, the ability of the children to use depth cues improved with age.

The exception is rather to be expected. In the case of A-2, where size and position are in opposition, the European children, as has been shown, used mainly the depth cue. Therefore, if ability to use cues increases with age, the proportion choosing the highest hut (the largest hut) as nearest would increase with age and therefore the proportion choosing the lowest hut would decrease.

Fig. 1 shows clearly the general tendency. In order to obtain this figure, each child was given a score of '1' or '0' according to whether his response to each of the questions (b) and (d) was 'correct' or not (in the sense, lowest but nearest and highest but farthest).

Since there are nine pictures in all in Series A, each child had an overall score which could be anything from '0' to '18'.

Fig. 1. Series A. Average Overall Scores per Standard and Group. (Lowest Hut(s) as Nearest and Highest Hut(s) as Farthest).

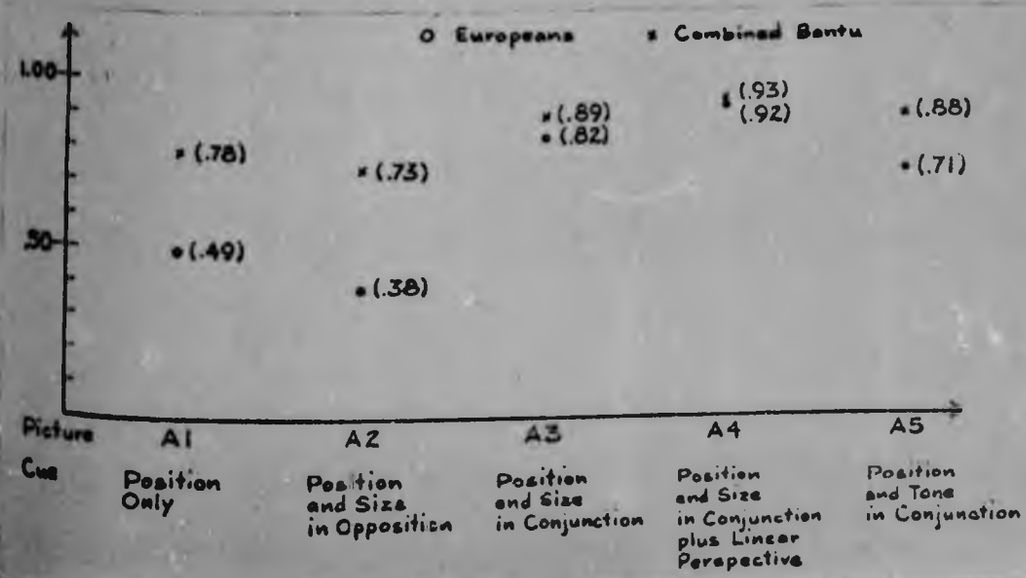


In Fig. 1, the average overall scores have been plotted against standard for each ethnic group. By means of a regression analysis (Procedure IV), it can be shown that, for the Bantu groups, the increase with standard is highly significant ($P \ll .01$).

Summary of findings - Series A

A useful summary of the main findings of this chapter is provided by Fig. 2.

Fig. 2. Proportions Who Saw Lowest Hut(s) as Nearest (European and Combined Bantu Groups).



For picture A-1, where Position is the only cue provided, it is clear that a considerable proportion of the Bantu were influenced in their responses by this cue; whereas the European children would appear to have found the picture 'cueless' and, as a result, made random responses (51% chose the upper huts as nearest and 49% chose the lower huts as nearest).

When we pass to picture A-2, where the cues of Position and Size are in opposition, both groups are obviously influenced by the Size cue to some extent, but since the two cues are in opposition, this means a reduction in both proportions relative to the proportion for A-1.

Similarly, in the case of picture A-3 where Position and Size operate in conjunction, both proportions increase relative to the proportions for A-1.

Picture A-4 adds the cue of perspective to Position and Size and as a result, the highest proportions for all five pictures are obtained.

The results for A-5 are similar to those for A-3 except that Tone replaces Size.

CHAPTER 7

THE PERCEPTION OF PICTORIAL DEPTH INVOLVING THE CUES OF OVERLAP, SIZE, POSITION AND TONE

SERIES B

Test Material:



Fig. 3
Picture B-1

Six Pictures, each of which consisted of (a) a man standing on a hill in the foreground, (b) in the middle distance and to the left or right of the man, a hut against a hill, and (c) in the far distance a second hut and another hill (three hills in all). The head and shoulders of the man overlapped the third (and distant) hill. The first of the six pictures, B-1, is reproduced in Fig. 3.

Differences between the six pictures were produced by introducing tone and by varying the size of one of the hills and in two cases by presenting the mirror image of the arrangement in B-1 (i.e. figure on left-hand side instead of right-hand side, etc.)
(Vide Chap. 2, pp. 15, 23)

View Board (Vide Chap. 2, pp. 20, 21)

It will be seen that Series B presents a more highly structured picture than those contained in Series A. In particular, there is the factor of overlap and the use of a horizon line.

In order to test the children's ability to see depth and to determine how they were influenced by the cues presented, the following questions were asked in respect of the pictures:-

(a) "What do you see?"
(b) "Which house is nearest to the man?"
(c) "Why?"
(d) "Can the man see the other house?" "Why?" "Why not?"
(e) "What is this?" (horizon)
(f) "Which hill is nearest to the man?"
(g) "How do you know?"

Analysis of Responses

It was originally intended that the responses to the questions asked should be analysed for each picture separately. But when the responses for the six pictures were compared with one another for each of the five ethnic groups, it was found that the differences were no greater than could be attributed to chance variation. In other words, the general character of the responses of each of the five groups was not influenced by the minor differences that had been introduced among the pictures - the variation in hill size, tone and the reversing of two of the pictures (man on left instead of right, etc.).

The analysis of the responses therefore takes the form of analysing the responses to each question for the six pictures combined.

1. Question (b): "Which house is nearest to the man?"

Unfortunately, in translating this question into Zulu, a mistake was made, the question actually presented to the Zulu children being "What house is nearest to you?" The two Zulu groups had therefore to be omitted from this part of the analysis.

Table 15 shows the overall proportions of responses (i.e. the average proportions over the six pictures) which indicated that the house in the middle distance was nearest the man.

Table 15 All Series B Pictures. Overall Mean Proportions of Responses which Indicated the House in the Middle Distance as "Nearest" to the Man: Question (b)

Group	TR	TU	E
Boys	.52	.76	.91
Girls	.41	.62	.90
Average	.47	.69	.91

Group and Sex Differences:- The differences between the groups follow the same pattern as with Series A, the Urban Bantu being closer to the European than the Rural Bantu. The application of a χ^2-analysis (Procedure V) shows all group differences to be significant at the 1 per cent level.

Also the difference between boys and girls for the two Tsonga groups is significant at the 5 per cent level, (Procedure V) the boys being closer to the European than the girls.

Standard differences:- An analysis of the overall mean proportions of pupils per standard responding that the house in the middle distance is nearest gives the following results:-

European group: There is no significant variation from standard to standard, the overall mean proportions being about .90 - .91 for each standard.

Tsonga-rural group: The average increase in overall mean proportion from standard to standard is .03 but this figure does not reach the 5 per cent level at significance.

Tsonga-urban group: The average increase in overall mean proportion from standard to standard

is .054, which is significant at the 1 per cent level (Procedure III).

2. Question (c): "Why? (i.e. Why is the house in the middle distance or house near horizon nearest to the man?)

Table 16 shows the percentage distribution of responses.

Table 16 Percentage Distribution of Responses (over Six Pictures of Series B) as to why House in Middle Distance or House near Horizon was Nearest to the Man

A House in Middle Distance Seen as Nearer

Group	TR	TU	E
Reason:			
Don't know, no response, unclear	2%	1%	2%
Size	4%	10%	45%
Position and Position plus Size (of House)	38%	51%	40%
Visual Position (of Man)	3%	7%	5%
Total	47%	69%	92%

B House near Horizon Seen as Nearer

Group	TR	TU	E
Reason:			
Don't know, no response, unclear	3%	3%	2%
Size	1%	1%	0%
Position and Position plus Size	45%	25%	4%
Visual position	3%	2%	0%
Total	52%	31%	6%

C No Response

Group	TR	TU	E
	1%	0%	2%

It will be seen from Table 16 that in giving the reasons for their answer to question (b) (in most cases the correct answer), the European children were fairly equally divided in referring to the cues of size and position. The Bantu, on the other hand, referred mainly to the cue of position, whether right or wrong in their response to question (b).

3. Question (d): "Can the man see the other house?" "Why?" (or "Why not?")

Since this question is linked with question (b), the 'other house' being determined by the response given to (b), it would be reasonable to argue that the Zulu groups should again be omitted from any comparison since they had not been given the correct version of question (b). However, since the 'correctness' of the response to (d) does not appear to depend on which of the two houses one takes as the 'other house', the Zulu groups have been included in the analysis of the responses to question (d).

Table 17 shows the mean proportions (over all six pictures of Series B) of the boys and girls in each ethnic group who said that the man could see the 'other house'. (Once again, the variation in the responses to the question asked does not appear to be significant over the six pictures and the responses have therefore been averaged over the pictures).

Table 17 All Series B Pictures. Overall Mean Proportions Who Saw the Man as Being Able to See the 'Other House': Question (d)

Group	ZR	TR	ZU	TU	E
Boys	.40	.46	.47	.48	.79
Girls	.47	.37	.36	.42	.72
Average	.44	.42	.42	.45	.76

Group, Sex and Standard Differences:- It will be seen from Table 17 that, as with question (b), the European group gives a highly significant greater proportion of correct responses than do the Bantu groups. The differences Urban v Rural and Zulu v Tsonga are quite non-significant. The sex differences also are minor (no statistical test was applied).

An examination of mean proportions for standards also shows non-significant differences between standards

Reasons why man can or cannot see 'Other House':- These are given in Table 18.

Table 18 All Series B Pictures. Percentage Distribution of Reasons (over Six Pictures) Why Man Can or Cannot See Other House: Question (d)

A Man Can See the Other House:

Group	ZR	TR	ZU	TU	E
Reason:					
Don't know, no response, unclear	1%	1%	3%	2%	16%
House not blocked	12%	24%	15%	19%	29%
Position of Man	15%	12%	16%	16%	14%
Visual Position of Man	16%	5%	8%	8%	17%
Total	44%	42%	42%	45%	76%

B Man Cannot See Other House:

Group	ZR	TR	ZU	TU	E
Reason:					
Don't know, no response, unclear	1%	0%	1%	4%	3%
House blocked	48%	45%	37%	28%	5%
Position of Man	3%	8%	11%	14%	4%
Visual Position of Man	4%	5%	9%	9%	12%
Total	56%	58%	58%	55%	24%

It will be seen that the main reason given by the Bantu children for the man's not being able to see the 'other house' is that the house is blocked (from the man's view) - an obvious failure to see the pictures three-dimensionally.

4. Question (e): "What is this?" (horizon)

The purpose of this test question is to determine what proportion of the children can recognise the symbolic representation of the horizontal line in the background as the horizon and consequently use it as a further depth cue.

Table 19 shows the mean proportions (over the six pictures) of the boys and girls in each ethnic group who identified the horizon line.

Table 19 All Series B Pictures. Overall Mean Proportions of Children Identifying Horizon Line: Question (e)

Group	ZR	TR	ZU	TU	E
Boys	.03	.04	.04	.04	.20
Girls	.01	.05	.03	.00	.12
Average	.02	.05	.04	.02	.16

The European children differ significantly from the other (Bantu) children in their ability to identify the horizon line ($P < .05$). Other differences are non-significant.

It is perhaps somewhat surprising that such a small proportion, even of the European group, was able to identify the horizon line. Further light is thrown on this when one considers the percentage distribution of all the types of responses given to question (e). This distribution was worked out for Figure B-1 and is presented in

Table 20.

Table 20 Picture B-1. Percentage Distribution of Responses to Question on Horizon Identification

Group	ZR	TR	ZU	TU	E
Response:					
Horizon	1%	5%	4%	2%	16%
Road	33%	27%	31%	25%	6%
Object	15%	23%	2%	10%	1%
Line	29%	10%	34%	24%	24%
Others	22%	29%	29%	37%	12%
Space gap	-	-	-	-	34%
Don't know, no response	-	6%	-	2%	7%

It is to be noted in Table 20 that a considerable number in all groups identified the horizon as a line and it is possible that, with further questioning (which was not carried out), many of these might have shown that they knew what the line signifies. Of particular importance is the fact that a considerable proportion (34%) of the European children took the question as referring not to the horizon line but to the gap or space between the hill and house in the background.

Differences between standards:- In the case of the European group, a significant increase in the ability to identify the horizon is shown as one passes from Standard I to V. The relevant figures are given in Table 21.

Table 21 All Series B Pictures. Mean Proportions (over Six Pictures) of European Boys and Girls in Each Standard Who Identified Horizon

Standard	I	II	III	IV	V
Boys	.00	.07	.18	.20	.57
Girls	.00	.06	.15	.22	.18
Average	.00	.07	.17	.21	.37

5. Question (f): "Which hill is nearest to the man?"

Table 22 shows the mean proportions (over the six pictures of the series) of boys and girls in each ethnic group who gave the correct response i.e. that the hill in the middle distance is closer to the man than the hill in the background.

Table 22 All Series B Pictures. Mean Proportions of Boys and Girls Who Responded that Hill in the Middle Distance was Nearest to the Man: Question (f)

Group	ZR	TR	ZU	TU	E
Boys	.34	.35	.69	.60	.86
Girls	.33	.26	.56	.40	.84
Average	.34	.31	.63	.50	.85

Group and Sex Differences:- As with the other questions, the European children are significantly superior to the Bantu groups ($P < .01$). Also, as with question (b), the urban Bantu groups are significantly better than the rural Bantu ($P < .01$).

Once again, a pattern of sex differences is obtained in which the boys are better than the girls for all the Bantu groups except the Bantu rural where the difference is slight. (No significance test was applied).

Standard Differences:- An examination of the mean proportions per standard showed no improvement from standard to standard for any of the ethnic groups. There was therefore no point in applying a statistical test.

6. Question (g): "Why?" (i.e. Why was the hill in the middle distance or hill in the background seen as nearest?)

The table of responses is not reproduced. It is sufficient to state that, both where the wrong and the correct response was made to question (f), the vast majority of the children gave as their reason "the position of the hill".

Summary of findings - Series B

The responses to each of the questions asked show clearly that the Bantu groups are well below the European group in their ability to see depth in the Series B type of picture (main cues: overlap, size and horizon line). The importance of the acculturation factor is shown by the fact that in the case of at least two of the questions asked, the Urban Bantu are significantly superior to the Rural Bantu. There is, however, little indication that the ability involved improves significantly for any of the groups in passing from Standard I to V. (There was one exception).

C H A P T E R 8

POSITION PREFERENCES IN PICTORIAL SPACE

SERIES C

Test Material:-

xC-1	C-2x
xC-3	
xC-4	C-5x

Fig. 4.
Positions of drawing group for each of five pictures in C-series.

Five Pictures, C-1, C-2 --- C-5

In each picture the same group was presented, consisting of a man, a tree and a hut; but the positioning of the drawing of the group varied from picture to picture. The accompanying diagram, Fig. 4, shows the positions of the group for each of the five pictures.
(Vide Chap. 2, pp. 16, 24)

View Board

This test series was designed to discover whether there are any differences between the ethnic groups in their preferences for the positioning of a drawing in pictorial space. In particular, it seemed reasonable to suppose that the greater the acculturation of a group, the more it would tend to prefer the centre position (the 'balanced' position). On the other hand, it was recognised that children are often exposed to cards in which group drawings are presented in the corners of the cards, perhaps in the lower left quadrant more than any other, and this must influence their position preferences.

The test procedure followed the method of paired comparisons. The five pictures were presented in the following sequence of combinations:-

1. C-2 and C-3
2. C-3 and C-5
3. C-4 and C-5
4. C-3 and C-4
5. C-1 and C-5
6. C-1 and C-2
7. C-2 and C-4
8. C-1 and C-4
9. C-2 and C-5
10. C-1 and C-3

In the case of each combination, the tester placed the first picture on the left and the second picture on the right of the view board. Each testee was then asked:

"Which picture do you like best?" "Why?"

The scoring procedure adopted for purpose of analysis was simple. In the case of each combination and for each testee, the picture chosen was given a '1' and the other picture a '0'. Where the child was unable to make a choice, suggesting that his preference was equally divided between the two pictures, the score of '½' was assigned to each picture.*

It follows that for each testee, the maximum score that any one picture could receive was '4' and the minimum '0'. These picture preference scores per testee were then averaged in the usual way over groups, sexes and standards.

Analysis of responses

An examination of the mean picture preference scores per testee for boys and girls in the different groups showed sex differences to be non-significant statistically. The analysis which follows is therefore a

*As might be expected, many children had difficulty in choosing between Pictures C-1 and C-2 and between Pictures C-4 and C-5 and most of the no-choices occurred in respect of these comparisons.

analysis of the responses for boys and girls combined.

1. Overall group differences:- Table 23 shows the mean picture preference scores for each of the ethnic groups.

Table 23 Series C. Position Preference: Mean Picture Preference Scores for Each of Five Ethnic Groups

Picture Position	1	2	3	4	5
Ethnic Group					
ZR	1.11	1.77	2.33	2.34	2.45
TR	1.63	1.65	2.46	2.13	2.13
ZU	.95	1.66	2.43	2.47	2.49
TU	1.78	1.84	2.53	1.81	2.04
E	1.31	1.35	2.75	2.26	2.13
Total	1.40	1.65	2.50	2.20	2.25

Several features of the table are to be noted:-

(i) All ethnic groups showed least preference for positions 1 and 2 (the drawing in the left and right upper quadrant).

(ii) Positions 3, 4 and 5 in practically all cases scored more than 2 (the average score each position would receive if all received the same preference).

(iii) Position 3 (the centre position) is obviously the most popular for the European and the two Tsonga groups but is not significantly different in popularity from positions 4 and 5 in the case of the two Zulu groups.

(iv) The centre position (position 3 is favoured

most by the European. The average score for the European group is significantly different from that of the Bantu groups ($P < .01$, Procedure II). The Urban Bantu are closer than the Rural to the European group in their preference for the centre position but the difference between Urban and Rural Bantu is not significant.

(v) There would appear to be highly significant differences between the Zulu and Tsonga group in their preferences for positions 1, 4 and 5. The difference between Zulu and Tsonga is most marked for position 1.

2. Standard differences:- In order to study the variation in preference with age, the mean picture preference scores were worked out for each standard in each ethnic group. On the whole, the variation with standard tended to be the same for all Bantu groups in respect of each picture (or position). The results for the Bantu groups were therefore combined to give five mean scores, one for each standard, for each of the five pictures. The five mean standard scores are shown for the five positions in Figs. 5 - 9. Also, in each of these Figures, the corresponding mean standard scores for the European group are shown for comparison.

Fig. 5 Series C. Preference for Position 1 (Upper Left Quadrant)

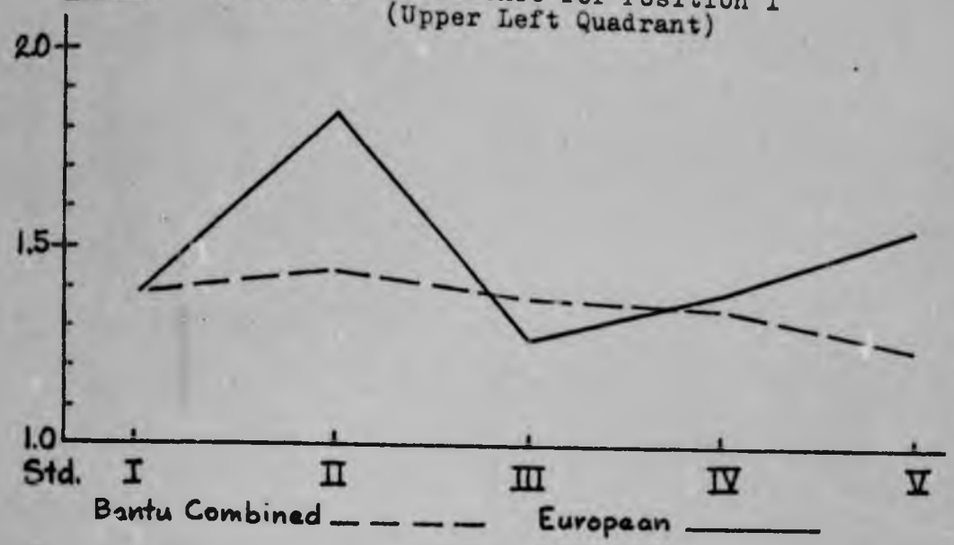


Fig. 6 Series C. Preference for Position 2 (Upper Right Quadrant)

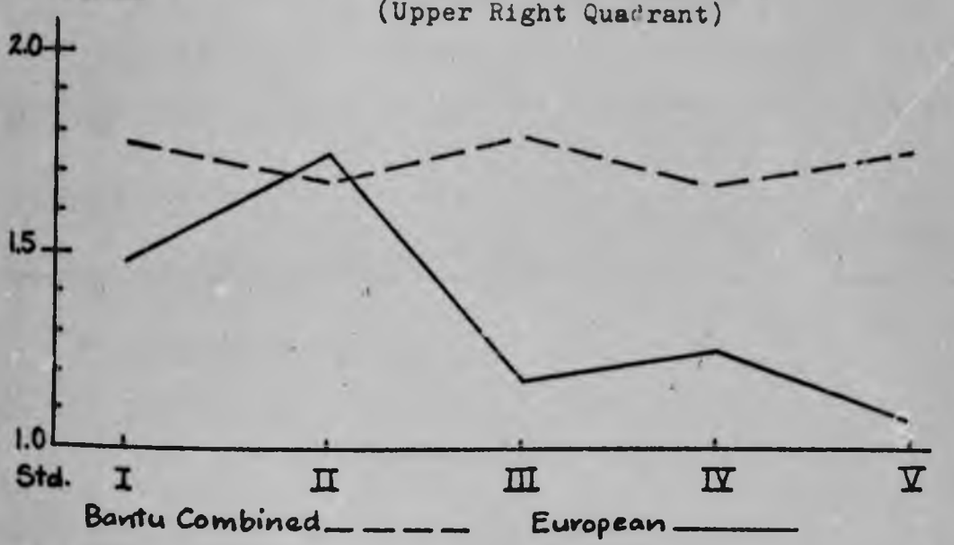


Fig. 7 Series C. Preference for Position 3 (Centre Position)

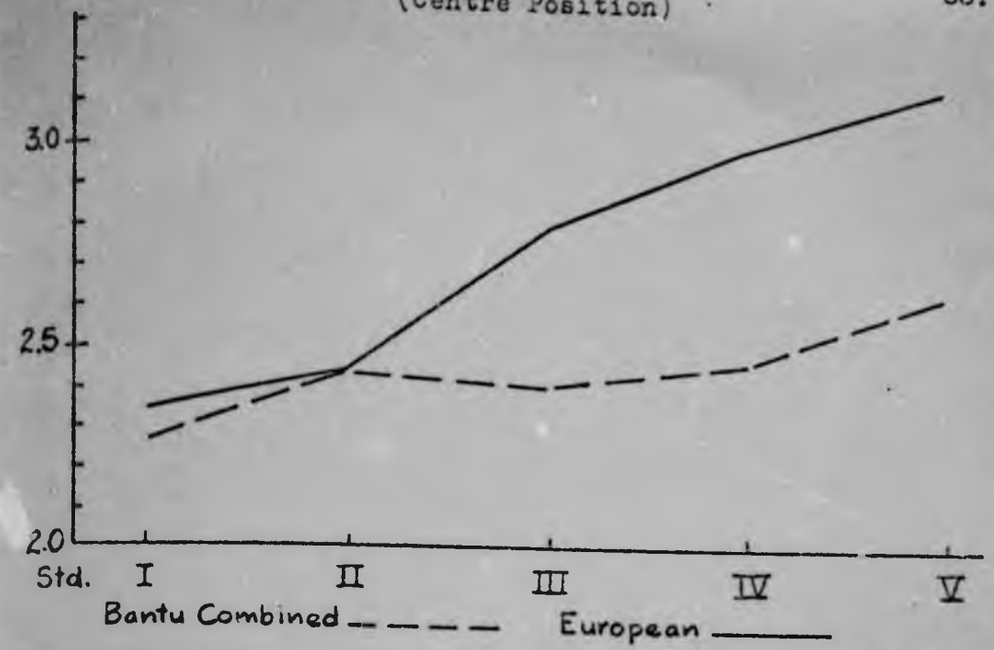


Fig. 8 Series C. Preference for Position 4 (Lower Left Quadrant)

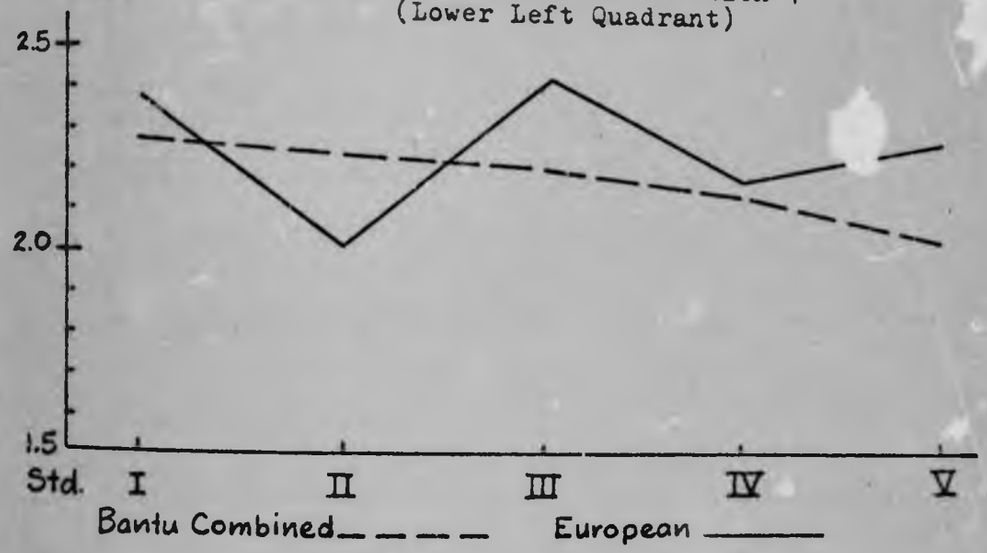
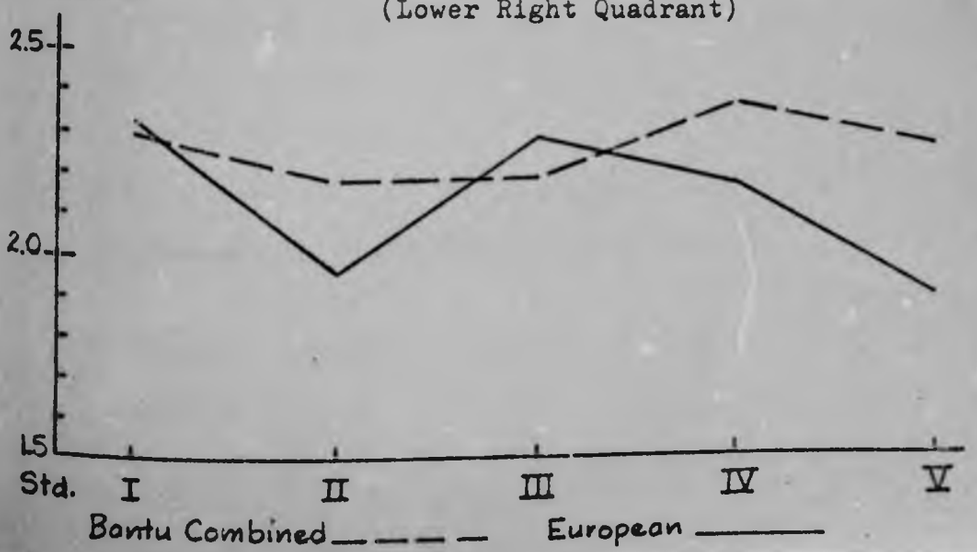


Fig. 9 Series C. Preference for Position 5 (Lower Right Quadrant)



It will be seen from Fig. 7 that, in the case of position 3 (the centre), the preference for this position increases markedly for the European group ($P \ll .01$, Procedure III). There is also a small but significant increase in the case of the Combined Bantu ($P < .05$). It should perhaps be noted that the difference between European and Bantu is not apparent at the Standard I and II level but only at the level of the upper Standards.

Naturally, from the nature of the manner in which the picture scores were obtained, the increase in performance for the centre position for all groups must be accompanied by a decrease in preference for one or more of the other positions. It will be seen that, in the case of the European group, most of this decrease takes place in respect of position 2 but there is also some small decrease in respect of positions 4 and 5.

3. Reasons for preferences

The children's reasons for stating their preferences were recorded and the frequency distribution of the reasons for their choice was drawn up for each of a representative number of the paired comparisons. Little however emerged from this. The common reason was that of position. There was the usual number of irrelevant responses and a few referred to the fact that the one drawing was nearer to them than the other - an obvious carry-over from some of the earlier test situations.

Summary of findings - Series C

The results of this test series would suggest that preference for the centre position (the 'balanced' position) is to a small extent correlated with the degree

of acculturation of the ethnic group, the European group showing the greatest preference for the centre position.

More striking is the increase in preference for the centre position as one passes from Standard I to Standard V of the European group. The same rate of increase does not take place with the Bantu groups. In fact, at the level of the lower standards, European and Bantu children are about the same in their preference for the centre, the difference between the two groups occurring as one passes to the upper standards.

CHAPTER 9

THE PERCEPTION OF PICTORIAL OBJECTS OVERLAPPED BY DRAWN OR IMPLIED BORDERS

SERIES D

Test Material:- Four Pictures, D-1, D-2, D-3, D-4 involving respectively (a) a boy, (b) a boy and dog, (c) the same and (d) a boy, house and tree. In each case one or more of the figures or objects are shown only in part, the rest being cut off by the border (drawn or implied). (Vide Chap. 2, pp. 17, 25)

View Board

As a result of an earlier investigation, the writer had formed the impression that less acculturated groups show a preference for the human figure drawn as complete - with both arms and legs - rather than cut off in part by the border. It was thought that some might have rejected the pictures of human figures overlapped by drawn or implied borders because they represented a person who is 'unreal' or badly crippled.

The present series of pictures was intended to clarify the less acculturated child's interpretation of animate and inanimate objects overlapped by drawn or implied borders. It was hoped that this could be achieved by an analysis of the responses which the children made to the questions presented with each picture. In the analysis which follows, only those questions are considered which appeared to show significant differences between the groups.

Analysis of Responses

1. Picture D-1. (Boy standing, arms by side, with hands and lower part of body cut off by border).

Question (b): "Does the child have hands?" "Yes?" "No?" "Where are they?"

The responses to this question (really a set of questions) were classified under various headings. It was obvious that differences between boys and girls are non-significant and the result for the two sexes were therefore combined. Table 24 shows the percentage distribution of the responses to the questions for the children in the five ethnic groups.

Table 24 Picture D-1. Percentage Distribution of Responses to Questions: "Does the child have hands?" "Yes?" "No?" "Where are they?"

Group	ZR	TR	ZU	TU	E
Responses:					
No Cut off (i.e. boy crippled)	6%	14%	1%	17%	1%
Yes/No Hidden	80%	33%	28%	34%	62%
Yes/No Reasons other than 'hidden' but boy has hands	8%	21%	36%	16%	28%
No Not visible (do not show)	5%	23%	13%	22%	5%
No Not drawn	-	5%	1%	9%	3%
No Missing (reason unclear)	1%	-	20%	-	-
No Don't know, unclear	-	-	1%	-	-
Don't know No response	-	4%	-	2%	1%

There are obviously significant differences between the groups in their responses to the questions.

But these are difficult to interpret. It will be seen that only a small percentage of the children saw the boy as crippled. It is difficult, however, to explain why it is only in the case of the two Tsonga groups that the percentages reach any sizeable proportion. One suspects that the nature of the responses must, to some extent, have been determined by the testers i.e. that group differences might be more a reflection of tester differences than genuine differences between the children in the groups. There is also the imponderable factor of language. It would appear that the majority of children had no difficulty in interpreting the border, although their responses to the questions varied in form.

2. Picture D-2. (Boy holding out bone to dog with right hand, left arm and both legs cut off by border. Only the dog's head is showing, the rest being cut by border).

Question (b): "Does the dog have a body?" "Yes?" "No?" "Where is it?"

As might be expected, an analysis of the responses to these questions for Picture D-2 gives exactly the same pattern of responses as for D-1. The analysis is therefore not reproduced.

3. Picture D-3. (Again a boy and dog. One side of boy and the hind quarters of dog are cut off by implied border).

Question (d): "Why did the artist not draw all the boy?"

Again, a classification of responses was made. The percentage distribution of responses (boys and girls combined) is shown in Table 25.

Table 25 Picture D-3. Percentage Distribution of Responses to the Question: "Why has the artist not drawn all the boy?"

Group	ZR	TR	ZU	TU	E
Response:					
Limited Space	-	5%	6%	14%	25%
Artist's Whim	5%	33%	17%	26%	15%
Boy is a cripple	5%	19%	1%	18%	1%
Boy hiding Limbs hiding	77%	21%	12%	14%	6%
Action of boy	7%	3%	35%	9%	13%
Don't know No response Unclear	6%	19%	29%	19%	40%

The pattern of responses still resembles that for D-1 and D-2. This is particularly so for the 'cripple' responses, the Tsonga groups again producing by far the highest proportions of such responses.

Of particular interest is the large number of European children whose responses fall into the Don't know. No response. Unclear' category. This is perhaps understandable when one considers that the question now being asked is of a different nature from that presented with D-1 and D-2. It might be said that the present question deals with the motivation of the artist and for an intelligent child, in particular the European, a reasonable response would be 'I don't know'.

4. Picture D-4. (Boy with tree and house showing only in part, the tree and house being cut off by border).

Questions (d): "Is it a finished house?" "Yes?" "No?"

(e): "How do you know?"

Again the responses were classified. The percentage distribution of the different categories of

responses are presented in Table 26.

Table 26 Picture D-4. Percentage Distribution of Responses to the Questions: "Is it a finished house?" "Yes?" "No?" "How do you know?"

Group	ZR	TR	ZU	TU	E
Response:					
Yes No more space	-	1%	1%	-	1%
Yes/No Other side hidden	48%	2%	9%	2%	3%
No Detail of construction	1%	1%	1%	3%	5%
No Don't know Irrelevant	4%	3%	13%	3%	1%
No Part is missing One half a house	13%	15%	38%	22%	37%
No Partly visible	32%	71%	24%	58%	33%
No Other part not drawn	1%	3%	8%	6%	7%
No Limited space	1%	-	4%	1%	6%
Yes One half house but complete	-	-	-	-	5%
Don't know No response	-	-	1%	-	-
Yes Don't know Irrelevant	-	4%	1%	5%	2%

Although Table 26 shows a considerable variation in the responses of the children, it is reasonable to suppose that the children in all groups had a reasonably clear idea of the function of the border. And this further adds to the doubt one has about the 'cripple' responses recorded with respect to the figures in the earlier pictures.

Summary of findings - Series D

This part of the investigation would appear to offer no clear-cut evidence that the children in any of the groups had serious difficulty in dealing with pictures where figures and objects are cut off by drawn or implied borders. Certainly 'cripple' responses were obtained, par[illegible] with the Tsonga groups, but it is possible th[illegible] something of an artefact of the test sit[illegible] sibly something to do with the tester or perhaps a matter of language usage.

At this stage it might be appropriate to remark that, in any investigation on pictorial perception, there is always the difficulty in asking questions about the pictures, that some of the children will answer in terms of the actual drawings whereas some will accept the questions as referring to the persons or objects represented by the drawings. Thus in the case of D-1, where one cannot see the boy's hands (if any) because of the border, it would be true to say that the boy as a drawing has not hands (i.e. is 'crippled') but, if one takes the question as referring to some boy represented by the drawing, it would be true to say that one cannot say whether he has hands, since the border of the picture cuts off the area where his hands should be and we are therefore unable to check. Of course, no primary school child is sophisticated enough to give a response of this kind, but it is probable that there is a certain amount of confusion which results from this distinction between a drawing and what it represents and this is reflected in the variety of the responses given by the children to the questions.

Probably for a more satisfactory investigation of the problem set in this part of the investigation one

should use the so-called 'clinical approach' of Piaget which involves the interview of each child by a highly skilled tester who asks as many questions of an appropriate nature as he finds necessary.

CHAPTER 10

THE PERCEPTION OF SHADOWS

SERIES E

Test Material:- Four Pictures. E-1, E-2, E-3 and E-4, each of which displays shadows. E-1 shows a ball and its shadow, E-2 the sun (or moon) shining on a house, a man and a tree each of which throws a shadow; E-3 and E-4, a man's head covered with a broad-rimmed hat with one side in shadow (E-3 is of lighter tone than E-4). (Vide Chap. 2, pp. 17, 2[illegible])

View Board

This series was introduced to test the hypothesis that the less acculturated the ethnic group the more frequent will be the misinterpretation of shadows.

In the case of each picture, the standard question was "What is that?", a shadow being indicated. This was usually followed up by a further question such as "How do you know?" or "Why is it shown like that?"

Analysis of Responses

1. Picture E-1 (Ball and shadow)

Question (b): "What is this?" (Black shadow)

Table 27 shows the proportions of boys and girls in each ethnic group who identified the shadow of the ball correctly.

Table 27 Picture E-1. Proportions Correctly Identifying Shadow of the Ball

Group	ZR	TR	ZU	TU	E
Boys	.69	.80	.97	.87	.96
Girls	.71	.65	.93	.84	.95
Average	.70	.73	.95	.86	.95

Group differences:- Sex differences are non-significant. It will also be seen that the Urban Zulu did as well as the European group. The application of χ^2-tests shows the Urban Bantu (and therefore also the European) to be significantly better than the Rural Bantu.

Standard differences:- Table 28 shows the proportions, correctly identifying the shadow of the ball, according to standard, sex and ethnic group.

Table 28 Picture E-1. Proportions of Boys and Girls in Each Standard, Correctly Identifying Shadow of Ball: Question (b)

Standard		I	II	III	IV	V
Group						
ZR	Boys	.35	.50	.80	.95	.85
	Girls	.35	.65	.75	.85	.95
TR	Boys	.60	.60	.90	.91	1.00
	Girls	.40	.60	.65	.73	.91
ZU	Boys	.90	1.00	.95	1.00	1.00
	Girls	.80	.95	1.00	.95	.95
TU	Boys	.85	.85	.85	.95	.85
	Girls	.75	.60	.90	.95	1.00
E	Boys	.90	1.00	.95	.95	1.00
	Girls	.85	1.00	.95	.95	1.00

The application of a regression analysis (Procedure III) shows the increase in correct identification over the five standards to be highly significant for the Rural Bantu ($P < .01$). There is still an increase in the case of the other three groups but it is obviously not significant statistically.

Question (c): "How do you know?"

The responses to this question are shown in Table 29.

Table 29 Picture E-1. Percentage Distribution of Responses to Question "How do you know?" Following Correct and Incorrect Identification of Shadow.

A Responses (Correct Identification)

Group	ZR	TR	ZU	TU	E
Reasons:					
Irrelevant, unclear	13%	18%	56%	33%	27%
Colour	31%	13%	14%	15%	25%
Position	21%	26%	18%	31%	11%
Position and Colour	1%	5%	-	-	2%
Because of the sun	1%	2%	7%	5%	24%
Shape	3%	9%	-	2%	6%
Total	70%	73%	95%	86%	95%

B Responses (Incorrect Identification)

Group	ZR	TR	ZU	TU	E
Reasons:					
Don't know, no response	4%	9%	1%	1%	1%
Object (tray, dish, leaf)	24%	14%	4%	11%	4%
Irrelevant	2%	4%	-	2%	-
Total	30%	27%	5%	14%	5%

2. Picture E-2: (Sun shining on house, man and tree, each throwing shadow)

Question (b): "What is this?" (Sun)

Table 30 shows the proportions of boys and girls in each group who identified the 'Circle' in the drawing as the source of light (sun or moon).

Table 30 Picture E-2. Proportions Identifying 'Circle' in Drawing as Source of Light: Question (b)

Group	ZR	TR	ZU	TU	E
Boys	.52	.65	.93	.78	.93
Girls	.54	.59	.84	.73	.96
Average	.53	.62	.88	.75	.94

Group differences:- Sex differences are again not significant. The European group is significantly better than the Urban Tsonga ($P < .01$) but has only a small non-significant advantage over the Urban Zulu. The Urban Bantu are again significantly better ($P < .01$) than the Rural Bantu

Standard differences:- Table 31 shows the proportions correctly identifying the sun (or moon), according to standard, sex and ethnic group.

Table 31 Picture E-2. Proportions per Standard Correctly Identifying Circle in Drawing as Source of Light (Sun or Moon)

Standard		I	II	III	IV	V
Group						
ZR	Boys	.15	.35	.80	.65	.65
	Girls	.20	.65	.55	.55	.75
TR	Boys	.30	.50	.80	.78	.82
	Girls	.50	.40	.40	.78	.83
ZU	Boys	.80	.95	.95	.95	1.00
	Girls	.75	.80	.95	.91	.80
TU	Boys	.70	.80	.70	.85	.85
	Girls	.55	.55	.85	.70	1.00
E	Boys	.75	1.00	1.00	.95	.95
	Girls	.95	1.00	1.00	.95	.91

The increase in correct identification from Standard I to Standard V is highly significant for both the Rural Bantu groups ($P \ll .01$). A smaller but obviously less significant increase is shown by the two Urban Bantu groups.

Table 32 shows the proportions, averaged over the three questions, who made correct identifications of the shadows.

Table 32 Picture E-2. Mean Proportions, Averaged over Questions (d), (f) and (g), Who Identified Shadows (House, Tree and Man.)

Group	ZR	TR	ZU	TU	E
Boys	.78	.93	.99	.94	.99
Girls	.81	.81	98	.91	.99
Average	.80	.87	.99	.93	.99

Group differences:- It will be seen from Table 32 that the children in all groups had less difficulty in identifying the shadows presented in Picture E-2; also the group differences follow the same pattern as for E-1.

Standard differences:- Table 33 shows the variation in proportion of correct identification as one passes from Standard I to Standard V for each group.

Table 33 Picture E-2. Mean Proportions per Standard Correctly Identifying Shadows of House, Tree and Man

Standard		I	II	III	IV	V
Group						
ZR	Boys	.47	.78	.78	.93	.95
	Girls	.57	.85	.80	.92	.93
TR	Boys	.80	.87	1.00	1.00	1.00
	Girls	.67	.67	.75	.94	.99
ZU	Boys	1.00	1.00	.95	1.00	1.00
	Girls	.92	1.00	1.00	1.00	1.00
TU	Boys	.87	1.00	.92	.95	.95
	Girls	.80	.87	.92	1.00	.98
E	Boys	.95	1.00	1.00	1.00	1.00
	Girls	.97	1.00	1.00	1.00	1.00

It will be seen again, as with E-1, that only the Rural Bantu groups show a significant increase in correct identifications as one passes from Standard I to Standard V. It is reasonable to deduce that, in the case of the other more acculturated groups, the Urban Bantu and the European, the children had passed through this stage of development before reaching Standard I and certainly before Standard II.

3. Picture E-3. (Man's head with hat, with one side in shadow)

It was decided that it would be unnecessary to analyse the responses to all the questions which were given in the case of pictures E-3 and E-4. (E-4 being the same picture but darker in tone.) In the case of E-3 the analysis was confined to questions (d) and (e):-

Question (d): "What is this?" (Cheek in shadow)

Question (e): "Why is it shown like that?"

Table 34 shows the proportions of boys and girls in each group who identified the textured area as the cheek of the man in E-3 as shadow.

Table 34 Picture E-3. Proportions Who Identified the Textured Area on Man's Cheek as Shadow: Question (d).

Group	ZR	TR	ZU	TU	E
Boys	.52	.33	.70	.48	.62
Girls	.59	.24	.59	.28	.63
Average	.55	.29	.65	.38	.63

Sex differences:- The application of a χ^2-analysis (Procedure V) shows that there are significant sex differences within Table 34 ($P < .02$). Sex differences are most apparent for the Urban Tsonga ($P < .01$).

Standard differences:- Table 35 shows the proportions identifying shadow on cheek according to standard, sex and ethnic group.

Table 35 Picture E-3. Mean Proportions per Standard Correctly Identifying Shadow on Cheek

Standard		I	II	III	IV	V
Group ZR	Boys	.15	.50	.60	.75	.60
	Girls	.40	.55	.70	.65	.65
TR	Boys	.05	.30	.38	.39	.52
	Girls	.25	.15	.15	.21	.41
ZU	Boys	.60	.68	.55	.82	.88
	Girls	.40	.52	.55	.66	.80
TU	Boys	.20	.30	.50	.70	.70
	Girls	.15	.10	.10	.45	.60
E	Boys	.40	.50	.60	.78	.83
	Girls	.30	.65	.70	.70	.83

Again the pattern of improvement with standard is obvious, even with the European group.

Analysis of incorrect responses

Table 36 shows the percentage distribution of correct and incorrect responses, the latter being classified under a number of headings.

Table 36 Picture E-3. Percentage Distribution of Correct and Incorrect Identification of Shadow on Man's Cheek

Group	ZR	TR	ZU	TU	E
Correct identifications	55%	29%	65%	38%	63%
Incorrect identification responses					
Irrelevant	18%	24%	17%	24%	21%
Complexion and Colour	25%	23%	13%	24%	8%
Beard	-	20%	2%	13%	5%
Disease	1%	3%	1%	1%	-
Don't know	-	1%	1%	-	-
Other	1%	-	1%	-	3%
Total incorrect	45%	71%	35%	62%	37%

4. Picture E-4. (Same as E-3 but darker in tone: Shadows now black)

Question (b): "What is this?" (Forehead)

Question (c): "Why is it shown like that?" (Forehead in shadow)

The responses to both these questions were analysed but since the results obtained were very similar to those obtained for questions (d) and (e) in respect of E-3 they are not reproduced here. The only important difference is that the children found questions (b) and (e) for picture E-4 easier to answer than question (d) and (e) for E-3.

Question (e): "What is this?" (Chin mark)

Question (f): "What does it show?" (In shadow)

This pair of questions presented much greater difficulty to the children of all groups. Table 37 shows the proportions who identified the chin mark and gave 'shadow' reasons.

Table 37 Picture E-4. Proportions Identifying Chin Mark and Giving 'Shadow' Reasons

Group	ZR	TR	ZU	TU	E
Boys	.20	.28	.10	.17	.31
Girls	.11	.19	.09	.11	.30
Average	.16	.24	.10	.14	.31

Group differences:- There is again evidence of a sex difference among the Bantu groups in favour of the boys.

The European group is now significantly superior to the Bantu groups. The Urban Zulu no longer equals the performance of the European, the Bantu group closest to the European being the Rural Tsonga. Also now there is the reverse situation of the Rural Bantu being superior to the Urban ($P < .01$) and the Tsonga being slightly superior to the Zulu.

Standard differences:- Proportions of identifications according to standards are not reproduced but again show the clear pattern of a steady increase from Standard I to Standard V.

Detailed Analysis of Responses

Table 38 gives the percentage distribution of correct and incorrect responses, the latter being placed in a number of different categories.

Table 38 Picture E-4. Percentage Distribution of Correct and Incorrect Identifications of Cleft in Chin and Its Shadow

Group	ZR	TR	ZU	TU	E
Both Correct - chin and shadow	16%	24%	10%	14%	31%
Chin identified but not shadow					
Don't know, no response, irrelevant	2%	4%	2%	5%	16%
Cut, scar	-	7%	2%	4%	1%
Beard	19%	22%	9%	42%	-
Complexion, colour	7%	1%	17%	4%	3%
Fold, end of chin	1%	4%	1%	11%	33%
Total	29%	38%	31%	66%	53%
Neither Chin nor Shadow identified					
Beard	53%	26%	51%	13%	3%
Cut, scar	-	10%	2%	2%	4%
Others	2%	-	2%	3%	6%
Don't know, no response	-	2%	4%	2%	3%
Total	55%	38%	59%	20%	16%

Summary of findings: Series E

There is no doubt that the findings of this chapter substantiate the thesis that the less acculturated the group, the greater the difficulty in the interpretation of shadows appearing in pictures. There is also clear evidence of improvement with age, i.e., as one passes from Standard I to V.

C H A P T E R 11

ART STYLE PREFERENCE IN DEPICTING THE HUMAN FIGURE

SERIES F

Test Material:- Four Pictures, F-1, F-2, F-3 and F-4 for each of which there was both a European and a Bantu version. Each picture depicted a boy playing with a dog but the art style varied, F-1 consisting of stick figures, F-2 black silhouettes, F-3 cartoon figures and F-4 using a normal or realistic style. (Vide Chap. 2, pp. 18,27)

View Board

As with Series C, which deals with position preferences, Series F is not a test of perceptual ability but is intended to reveal differences between groups in their preferences for art style.

After a few preliminary questions about pictures F-1 and F-2 to ensure that the testee had no perceptual difficulty with stick figures or silhouette representations, the same procedure was adopted as with Series C, i.e. the method of paired comparisons was applied. The four pictures were presented to each child in the following sequence of combinations:-

1.	F-2	and	F-4	4.	F-1	and	F-3
2.	F-1	and	F-2	5.	F-1	and	F-4
3.	F-3	and	F-4	6.	F-2	and	F-3

In the case of each combination, the testee was asked:

"Which picture do you like best?" "Why?"

Once again the scoring procedure took the form of giving a '1' to the picture chosen and a '0' to the other picture, allotting '½' to each picture where no choice was made. (There were very few such cases.)

In this case, with four pictures and therefore only three comparisons in which any one picture is involved, the maximum score that a picture can receive from each testee is 3 and the minimum 0. These picture preference scores for testees were then averaged over groups, sexes and standards.

In addition, the Bantu groups were asked to identify the race of the boy in pictures F-3 (cartoon) and F-4 (realistic style) and to give their reasons. This was done to determine how shape and detail in a drawing of the human figure aid or impede racial identification. The investigator believed that the figures would be seen as Bantu even though the detail of skin tone was omitted, provided other details were correct.

The following questions were asked:-

"To which race does the boy belong?" "Why?"

The scoring procedure was to give a '1' for responses which indicated the race as Bantu and a '0' for the other responses. Reasons for choices were recorded. These race identification responses were then averaged over groups, sexes and standards.

Analysis of Responses

As with Series C, an examination of the mean picture preference scores per testee for boys and girls in the different groups showed sex differences to be non-significant. The responses for boys and girls were therefore combined for purposes of analysis.

1. Overall group differences

Table 39 shows the mean picture preference scores for each of the ethnic groups.

Table 39 Series F. Art Style Preferences: Mean Picture Preference Scores for Each of Five Ethnic Groups

Picture	1 (Stick)	2 (Silhouette)	3 (Cartoon)	4 (Realistic)
Ethnic Group				
ZR	.17	1.75	1.38	2.70
TR	.17	1.46	1.56	2.81
ZU	.16	1.56	1.43	2.85
TU	.18	1.31	1.68	2.84
E	.28	1.24	1.86	2.64
Total	.19	1.46	1.58	2.77

Mere examination of Table 39 shows that the realistic figure (picture F-1) is easily the most popular for all groups and obviously the stick figure representation is by far the most unpopular for all groups. The silhouette and the cartoon figures come more or less halfway between the other two, the cartoon having some slight advantage on the average over the silhouette.

Further analysis shows:-

(i) The cartoon figure is significantly more popular with the European group than with the other Bantu groups ($P << .01$) (Procedure III). Also the cartoon is more popular with the Tsonga than with the Zulu ($P < .01$); and would appear to be more popular with the Urban Bantu than with the Rural Bantu, although the difference does not reach the 5 per cent level of significance.

(ii) The results obtained for the cartoon are, as one might expect, reversed in the case of the silhouette. The silhouette is least popular with the European, more popular with the Zulu than with the Tsonga and more popular with the Rural

Bantu than with the Urban Bantu.

(iii) The realistic style would appear to be slightly less popular with the European than with the Bantu; and the reverse would appear to be the case for the stick figure. These differences, however, were not tested statistically.

2. Standard differences

Variation of the mean picture preference scores with standard was found to be slight. Figures 10 and 11 show the variation in the case of the cartoon and the silhouette for both the European and the combined Bantu group.

Fig. 10. Series F. Preference for Silhouette per Standard. European and Combined Bantu

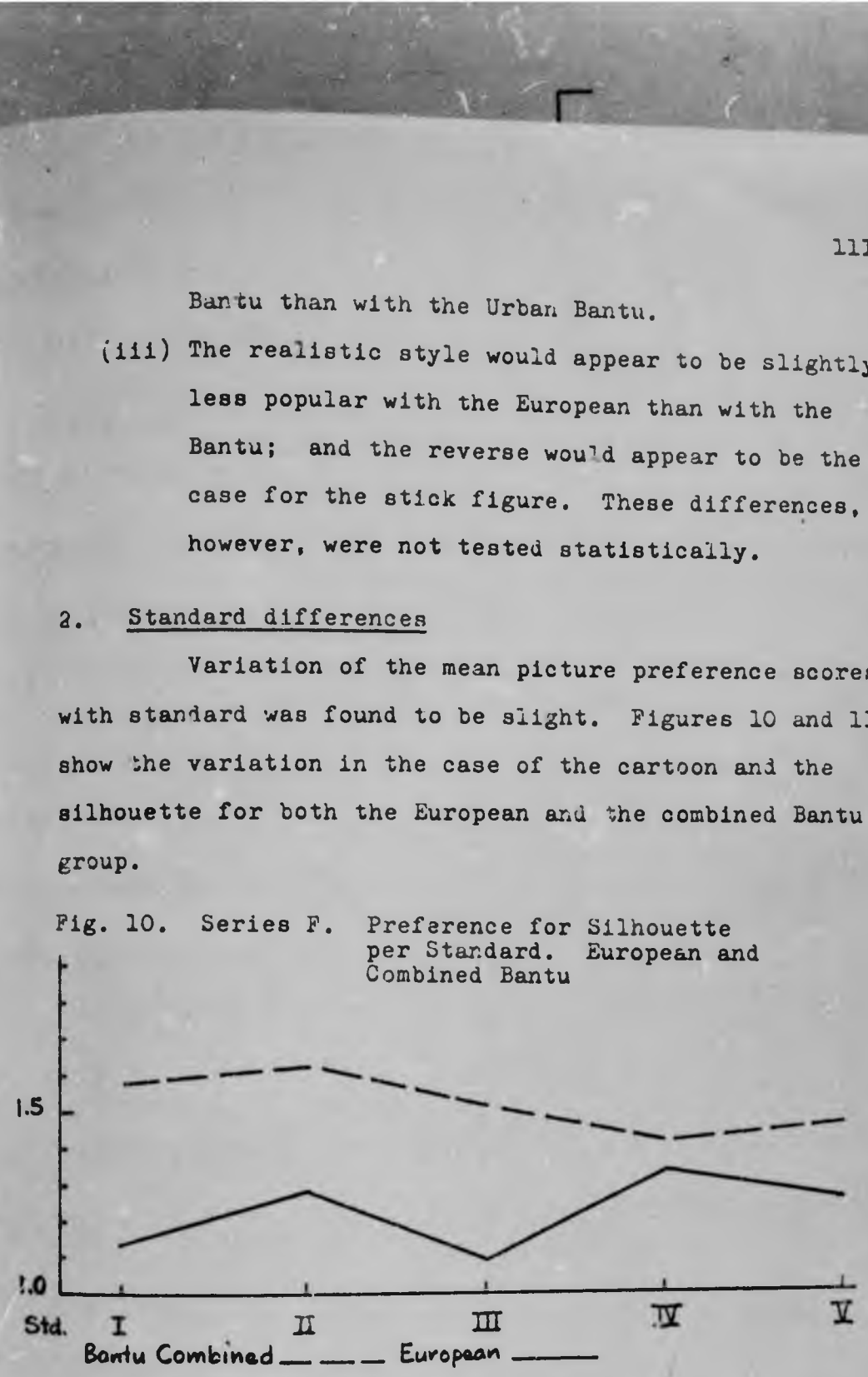
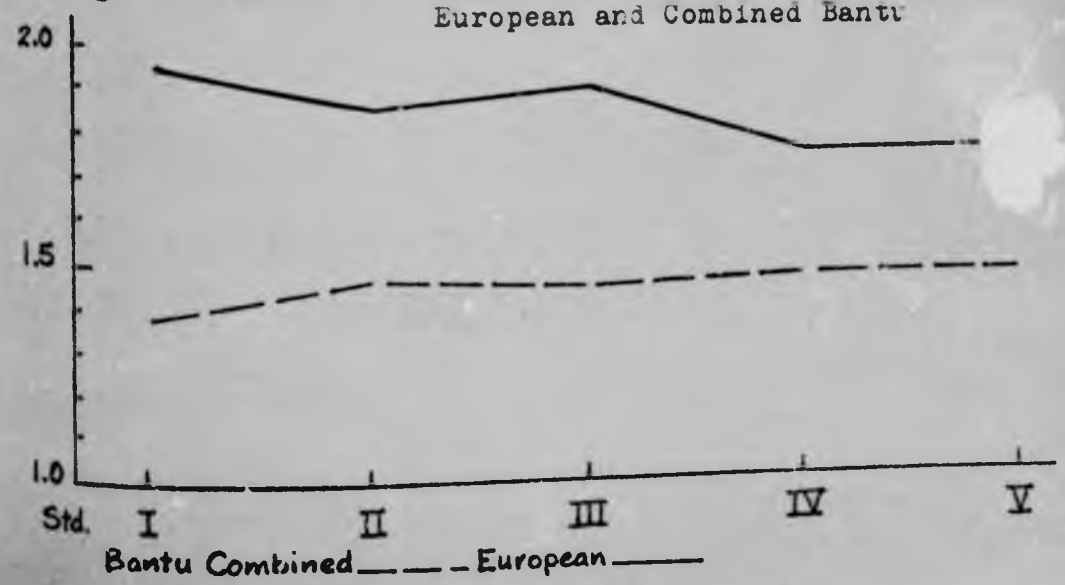


Fig. 11. Series F. Preference for Cartoon per Standard. European and Combined Bantu



3. Reasons for preferences

All groups preferred pic ure F-4 (the realistic style) to the other styles primarily because of its more 'realistic shape' and detail. In the case of the silhouette and cartoon figures (the stick figure can be ignored since it received so few choices), there was rather more variation among the groups in the reasons they gave for choosing these figures. Table 40 shows the percentage distribution for each ethnic group of the reasons the children gave for their preferences when they had to choose between these two particular styles.

Table 40 Pictures F-2 and F-3 (Silhouette and Cartoon) Percentage Distribution of Reasons for Preferences between Silhouette and Cartoon

Preference for 'Silhouette'

Group	[illegible]	TR	ZU	TU	E
Reasons:					
Don't know, unclear, irrelevant	30%	34%	47%	25%	7%
Proportion of body	17%	6%	5%	3%	21%
Detail	7%	-	2%	1%	1%
Colour	7%	2%	1%	4%	4%
Total	61%	42%	55%	33%	33%
No Preference					
Total	5%	0%	5%	0%	1%

Preference for 'Cartoon'

Group	ZR	TR	ZU	TU	E
Reasons:					
Don't know, unclear irrelevnat	2%	24%	18%	40%	4%
Proportion of Body	1%	4%	1%	12%	18%
Detail	10%	11%	12%	3%	23%
Colour	21%	19%	9%	12%	21%
Total	34%	58%	40%	67%	66%

A noticeable feature of Table 40 is the large percentage of 'don't know, unclear, irrelevant' responses of the Bantu groups in comparison with the European group which, on the whole, gave highly specific responses.

4. Identification of Figure of Boy as a Bantu in Pictures F-3 and F-4

As stated earlier, all the Bantu children, when presented with pictures F-3 and F-4, were asked the questions:-

"To which race does the boy belong?" "Why?"

Picture F-3 (Cartoon)

Table 41 shows the proportions within each ethnic group who identified the boy in picture F-3 (Cartoon) as a Bantu.

Table 41 Series F. Picture F-3 (Cartoon). Proportions Who Identified Boy as Bantu

Group	ZR	TR	ZU	TU
Boys	.88	.78	.78	.73
Girls	.89	.73	.95	.78
Average	.88	.75	.86	.75

Sex and group differences:- The application of a χ^2-analysis (Procedure V) shows that there are significant sex differences within Table 41 ($P \ll .01$). The only significant difference is actually the Zulu Urban difference, in favour of girls, which is significant at well beyond the 1 per cent level.

Urban-rural differences are obviously not significant but there is a highly significant difference, in favour of the Zulu, between the Zulu and Tsonga groups ($P \ll .01$).

Table 42 gives the percentage distribution of reasons why the children of the Bantu groups accepted or rejected the boy in the cartoon as a Bantu.

Table 42 Percentage Distribution of Reasons Given for Accepting or Rejecting Boy in Cartoon as Bantu

Boy seen as Bantu

Group	ZR	TR	ZU	TU
Reasons:				
Don't know	9%	2%	25%	2%
Hair	49%	12%	39%	12%
Eyes	-	-	-	-
Nose	-	-	-	-
Mouth	-	-	-	-
Face	3%	35%	8%	34%
Colour	-	-	-	-
Clothes	-	-	1%	-
Shape of body	4%	1%	2%	3%
Combination of several cues	23%	25%	11%	24%
Total	88%	75%	86%	75%

Boy not seen as Bantu

Group	ZR	TR	ZU	TU
Reasons:				
Don't know	-	1%	2%	4%
Hair	5%	5%	1%	5%
Eyes	-	-	-	-
Nose	-	-	-	-
Mouth	-	-	-	-
Face	1%	6%	-	3%
Colour	-	3%	-	5%
Clothes	-	-	-	-
Shape of body	3%	6%	10%	8%
Combination of several cues	3%	4%	1%	-
Total	12%	25%	14%	25%

Inspection of Table 42 shows that 'hair' was the key detail for the Zulus in identifying the boy as a Bantu, whereas the face (combination of eyes, nose and mouth) was the predominant cue for the Tsongas.

The children who rejected the cartoon as being a Bantu did so for a variety of reasons, a common one being the shape of the legs and body. Some saw the cartoon as a Bushman because of the large head and short body. A small percentage of both Tsonga groups saw the cartoon as a non-Bantu solely because of colour (lack of skin tone).

Picture F-4 (Realistic)

Table 43 shows the proportions within each group who identified the boy in the 'realistic' drawing as a Bantu. It will be seen that, with the exception of the Tsonga Urban, the proportions are higher than they were for the cartoon.

Table 43 Series F. Picture F-4 (Realistic).
Proportions Who Identified Boy as a Bantu

Group	ZR	TR	ZU	TU
Boys	.99	.89	.90	.77
Girls	.99	.83	.94	.72
Average	.99	.86	.92	.74

Sex and group differences:- It will be seen that sex differences are not significant in the case of picture F-4. But again the Zulu groups are superior to the Tsonga groups at a high level of significance. Also the Rural groups would appear to have some superiority over the Urban groups (no statistical test was applied).

An examination of reasons given for accepting or rejecting the boy as a Bantu showed that they followed much the same pattern as for the cartoon.

Summary of findings

The realistic style is easily the most popular with all five ethnic groups and the stick figure by far the most unpopular.

The cartoon is significantly more popular with the European group than with the other Bantu groups. Also the cartoon is more popular with the Tsonga than with the Zulu; and the reverse is the case for the silhouette.

Most of the Bantu children had no difficulty in identifying the boy in both the cartoon and the 'realistic' picture as being a Bantu. It is obvious that skin tone is not a critical factor in such recognition provided other details are present.

CHAPTER 12

THE PERCEPTION OF FORESHORTENING

SERIES G

Test Material:- Two Pictures. The first, G-1, shows a man running and playing with a ball. The left arm and left leg are shown very much foreshortened. The second picture, G-2, shows the rear view of a man standing with his right foot on a box. (Vide Chap. 2, pp.18,28)

View Board

The primary purpose of this test series was to test the hypothesis that the less the acculturation of the ethnic group, the more frequent the group's misinterpretation of foreshortening of the human body as deformity.

After some preliminary experimentation, the following test questions were used:-

Picture G-1

(a) "What do you see?"
(b) "If you were going to redraw this picture, would you draw it the same or differently?"
(c) "If differently, what changes would you make?"
(d) "What is this?" (ankle)
(e) "Do you like the picture?"
(f) "Why not?"

Picture G-2

(a) "What do you see?"
(b) "If you were going to redraw this picture, would you draw it the same or differently?"
(c) "If differently, what changes would you make?"
(d) "What is the man doing?"
(e) "Do you like the picture?"
(f) "Why not?"

Analysis of Responses

1. Picture G-1 (Man running with ball)

Question (a): "What do you see?"

Normally, this question was inserted at the beginning of a picture series mainly as a means of getting the children orientated towards the test situation before the more important questions were presented.

In the case of the present series, it might be argued that this is a particularly important question in that, if the child gives the answer 'a man running with a ball' it is reasonable to suppose that the foreshortening of the man's limbs presents no difficulty. As it was, most children gave the response 'a man' and since the testing procedure did not permit a follow-up of this answer (as with the so-called clinical approach) nothing of any value could be deduced from this response.

The response 'a man' should perhaps have been followed up by the question "What is the man doing?" (as in the case of picture G-2).

Questions (b) and (c)

Table 44 shows the percentage distribution of responses to these questions. Part A gives the reasons of those who would 're-draw' picture' and Part B the reasons of those who would leave it unaltered.

Table 44 Picture G-1. Percentage Distribution of Responses Showing Why and Why Not Picture Would be Re-drawn

A Those Who Would Re-draw Picture

Group	ZR	TR	ZU	TU	E
Reason:					
Don't know, no response irrelevant	-	9%	4%	15%	8%
Legs down	21%	36%	17%	17%	9%
Arms down	-	4%	4%	4%	3%
Straighten arms and legs	10%	-	1%	-	1%
Other body detail	1%	5%	8%	16%	9%
Body action	4%	10%	21%	15%	9%
Change the ball	1%	7%	11%	5%	7%
Arm or leg deformity	7%	-	-	1%	-
Total	44%	71%	66%	73%	46%

B Those Who Would Not Re-draw Picture

Group	ZR	TR	ZU	TU	E
Reason:					
No response, don't know	-	1%	4%	1%	-
Can't draw	1%	10%	1%	12%	9%
Leave it as it is	55%	18%	29%	14%	45%
Total	56%	29%	34%	27%	54%

It will be seen that the number of responses, indicating that 'child saw man as crippled', is small - 7% for the Rural Zulu, 1% for the Urban Tsonga and zero per cent for the other groups. In other words, it would appear that foreshortening did not present difficulty

except for a few cases, particularly among the Rural Zulu.

It is also reasonable to deduce that most of the responses falling under Part A of the Table are forced i.e. the child felt he had to say something. One wonders if the children falling under Part B, in particular those responding 'leave picture as it is', might not have been the more intelligent children within their group.

Question (d): "What is this?" (ankle)

From the standpoint of testing whether some of the children interpreted the foreshortening as a deformity, this question proved of no value. Details of the variation in responses are not reproduced here.

In the light of the responses, the question can be criticised in that the children are being asked to name a piece of anatomy which at best is represented only in part in the drawing. It would be easy for a sophisticated testee to give a response other than that of 'ankle'.

As might be expected, the European group gave a significantly higher proportion of 'ankle' responses than any of the other groups.

Questions (e) and (f): "Do you like the picture?"
"Why not?"

Again a detailed analysis of the responses is not presented. But as with questions (b) and (c), a few responses were obtained indicating that the children concerned saw the man as crippled. The proportions of such responses are almost the same as for (b) and (c), namely, 8% for the Rural Zulu and zero per cent for the other groups. A check showed that, of the 22 children who gave 'crippled' responses, 10 gave 'crippled' responses to both sets of questions and 12 gave such responses only to

the one set.

2. Picture G-2. (Rear view of man standing with right foot on a box)

Questions (b) and (c)

Table 45 gives the percentage distribution of responses to these questions. As with G-1, Part A of the Table gives the reasons of those who would 're-draw picture' and Part B the reasons of those who would leave it as it is.

Table 45 Picture G-2. Percentage Distribution of Responses Showing Why or Why Not Picture Would be Re-drawn

A Those Who Would Re-draw Picture

Group	ZR	TR	ZU	TU	E
Reason:					
Don't know, no response	-	6%	3%	3%	3%
Deformity of boy	9%	3%	1%	11%	2%
Leg to be down and body to face me	12%	7%	15%	1%	2%
Legs together	17%	18%	5%	17%	5%
Turn body around	22%	38%	67%	31%	25%
Others	-	6%	3%	11%	12%
Show knee to indicate bend	-	-	-	-	3%
Total	60%	78%	94%	74%	52%

B Those Who Would Not Re-draw Picture

Group	ZR	TR	ZU	TU	E
Reason:					
Don't know, no response	-	1%	2%	2%	-
Can't draw	22%	7%	1%	12%	1%
Leave as it is	18%	14%	3%	12%	47%
Total	40%	22%	6%	26%	48%

It will be noted that the number of responses, indicating that the children concerned saw the man as crippled, is still small, although somewhat more than is the case for picture G-1. The increase is probably due to the fact that the nature of picture G-2 is such that a 'crippled' response is not unreasonable although highly improbable.

Again most of the responses are obviously forced. Also, as before, it might be argued that the more intelligent or sophisticated child would be inclined to give the response 'leave it as it is'. Certainly the proportion of European children who gave this response is easily the highest of the five groups. It is also somewhat significant that it was only European children (3%) who gave the somewhat intelligent response 'show knee to indicate bend'.

Question (d): "What is the man doing?"

Whereas the inclusion of this question in the set of questions for picture G-1 would probably have been of value, the question was of little value as far as the perception of G-2 was concerned. Most responses gave man as 'stepping on a box' and since this could be said of both a normal and a crippled man, the responses throw no light on the children's perception of the foreshortening of the man's leg.

Questions (e) and (f): "Do you like the picture?"
"Why not?"

The responses to these questions followed much the same pattern as the responses to (c) and (d) and their analysis is therefore not reproduced here.

3. Sex and Standard differences

Since the purpose of the series was to test the children's perception of the foreshortening of limbs as presented in a drawing and since the number of cases, where foreshortening was interpreted as a deformity, was small, there was no point in proceeding with an analysis of sex and standard differences. Obviously they would not be significant statistically.

Summary of findings - Series G

The use of this series on the given ethnic groups produced very few cases where foreshortening of limbs in a drawing was interpreted as a deformity. The numbers were too small to indicate significant differences between groups, sexes and standards.

C H A P T E R 13

THE PERCEPTION OF IMPLIED MOTION CUES

SERIES H

Test Material:- Five pictures. H-1, H-2, --- H-5. H-1 depicts an apple-tree with fruit falling; motion marks are drawn above one of the falling apples. H-2 shows a small dog running and wagging its tail: motion marks are drawn around the tail and behind the paws. There is also a cloud of dust at the rear of the dog. H-3 shows a bird flying with the path of flight indicated by a dotted line. H-4 is a multiple image presentation of a small boy turning his head. H-5 depicts a small man striking a person whose body is outlined with vibration marks. The path of motion of the small man's hand is indicated by curved lines and the impact of the hand shown with explosive marks radiating from the point of impact. In the European version of H-5 the word 'SMACK' is printed near the point of impact: in the Zulu and Tsonga versions the corresponding Zulu and Tsonga words appear. (Vide Chap. 2 pp. 18, 29)

View Board

The questions put to the children with the presentation of each picture were designed to elucidate their understanding of the pictures and in particular their interpretation of the motion cues.

The complete list of questions is not reproduced here but is to be found in Appendix I, pp. 224-225. In the analysis of responses which follows, the analysis of each set of responses is as usual preceded with a statement of the question or questions to which the children responded.

Analysis of Responses

1. Picture H-1 (Apple-tree with fruit falling)

   Question (f): "Where is it?" (the fruit falling with motion marks drawn above)

Table 46 shows the proportions of boys and girls in each ethnic group who identified the fruit with motion marks as falling.

Table 46 Picture H-1. Proportions Identifying Fruit with Motion Marks as Falling: Question (f)

Group	ZR	TR	ZU	TU	E
Boys	.40	.72	.81	.71	.96
Girls	.31	.50	.51	.42	.96
Average	.36	.61	.66	.57	.96

Sex differences:- Table 46 shows considerable sex differences in favour of the boys for the two Urban Bantu groups and the Tsonga Rural ($P<.01$). The Zulu Rural difference is not significant and obviously there is no sex difference for the European group.

Group differences:- The European group is obviously considerably superior to the Bantu groups ($P<<.01$). The Urban Zulu is considerably superior to the Rural Zulu ($P<<.01$) but in the case of the Tsonga, the urban-rural difference is reversed, although non-significant statistically.

Standard differences:- The proportions for standards are not reproduced. It suffices to state that only in the case of the Rural Zulu was a significant increase with standard obtained ($P<.05$).

Question (g): "How do you know?"

In the case of the children who saw the fruit as falling, most of the responses to question (g) referred to position (of the fruit). Some referred to the action (falling) of the fruit and some, mostly Europeans, referred to the motion lines as indicators of action.

Question (h): "What are these?" (Motion marks above falling fruit)

Table 47 shows the proportions who identified the motion marks correctly.

Table 47 Picture H-1. Proportions Identifying Motion Marks Correctly: Question (h)

Group	ZR	TR	ZU	TU	E
Boys	.10	.13	.36	.45	.80
Girls	.02	.03	.11	.10	.74
Average	.06	.08	.24	.27	.77

Perhaps the most striking feature of Table 47 is the smallness of the proportions, particularly in comparison with the proportions obtained for question (f) (Table 46). However, the general pattern of the responses remains more or less the same, European superior to Bantu, Urban Bantu superior to Rural Bantu, and Bantu boys superior to Bantu girls.

Question (i): "Why are they there?" (Motion marks above falling fruit)

Table 48 shows the relevant proportions.

Table 48 Picture H-1. Proportions Giving 'Motion of Fruit' as Reason for Motion Marks: Question (i)

Group	ZR	TR	ZU	TU	E
Boys	.36	.24	.64	.53	.96
Girls	.36	.12	.23	.14	.88
Average	.36	.18	.43	.33	.92

It is to be noted that the investigator inserted question (i) with the purpose of determining how many of the children who gave 'marks' or 'lines' as their responses to question (h) did in fact see the lines or marks as motion

cues. It is obvious from Table 48 that a considerably greater number understood the function of the motion marks than is indicated by the proportions given in Table 47. The latter table is in fact misleading and provides a further example of the need for follow-up questions in an investigation of this kind (the so-called 'clinical approach').

Again the general pattern of responses is more or less the same as for questions (f) and (h). Also an examination of the proportions for standards (not reproduced here) shows a positive increase per standard in the case of most of the groups.

2. Picture H-2 (Small dog running and wagging its tail)

Question (c): "What is this?" (Motion marks around tail)

Table 49 shows the proportions of children giving correct identification of motion marks.

Table 49 Picture H-2. Proportions Correctly Identifying Motion Marks Around Tail: Question (c)

Group	ZR	TR	ZU	TU	E
Boys	.03	.05	.22	.26	.79
Girls	.00	.01	.14	.03	.70
Average	.01	.03	.18	.14	.75

The results shown in Table 49 closely resemble those obtained for Question (h), Picture H-1 (Table 47). In this case, there was no follow-up question "Why are they there?" but it is reasonable to suppose that, as in the previous case, such a question would have produced an increase in the proportions.

3. Picture H-3. (Bird flying with the path of flight indicated by a dotted line)

Question (d): "What does it show?" (Path of flight)

Table 50 shows the proportions in each group identifying the dotted line as the flight path of the bird.

Table 50 Picture H-3. Proportions Giving Correct Identification of Flight Path of Bird: Question (d).

Group	ZR	TR	ZU	TU	E
Boys	.39	.40	.66	.61	.92
Girls	.52	.36	.49	.31	.97
Average	.45	.38	.57	.46	.94

Sex differences:- In the case of the two Urban Bantu groups boys are still superior to girls ($P < .01$). There is no significant difference in the case of the Rural Tsonga and a difference in the reverse direction is obtained for the Rural Zulu which, however, does not reach the 5 per cent level of significance. The sex difference for the European group is not significant.

Group differences:- These follow the usual pattern.

Table 51 gives a detailed analysis of the responses to question (d) for the five groups.

Table 51 Picture H-3. Percentage Distribution of Responses to Question (d) (Flight Path of Bird)

Group	ZR	TR	ZU	TU	E
Correct responses	45%	38%	57%	46%	94%
Incorrect responses					
Snake	4%	10%	-	7%	-
Droppings of blood	15%	2%	5%	2%	1%
Bird trapped	13%	12%	12%	10%	1%
Part of bird	6%	3%	2%	2%	-
Motion of other object (e.g. stone thrown)	-	2%	-	-	-
Bird drinking water	1%	8%	16%	14%	-
Bird grasping object	1%	6%	2%	6%	-
Bird not real	1%	-	-	-	2%
Total (incorrect)	41%	43%	37%	41%	4%
Don't know, no response	14%	19%	6%	13%	2%

4. Picture H-4. (Multiple image presentation of small boy turning head)

Question (d): "What do these heads show?"

Table 52 gives the proportions in each group who interpreted multiple presentation as motion of the boy's head.

Table 52 Picture H-4. Proportions Giving 'Head in Motion' Responses: Question (d)

Group	ZR	TR	ZU	TU	E
Boys	.05	.14	.47	.30	.88
Girls	.02	.13	.23	.19	.84
Average	.03	.14	.35	.24	.86

It will be seen that Table 52 again gives the typical response pattern for the Series.

Table 53 gives a more detailed analysis of the responses to question (d).

Table 53 Picture H-4. Percentage Distribution of Responses to Question (d) (Multiple Presentation of Boy's Head)

Group	ZR	TR	ZU	TU	E
Correct responses	3%	14%	35%	24%	86%
Incorrect responses					
Head deformed	75%	34%	28%	26%	2%
Several people	6%	21%	13%	18%	-
Shadows or reflections in mirror	3%	7%	2%	11%	1%
Boy under water (motion marks ripples)	5%	1%	1%	2%	-
Boy ghost (unreal)	2%	3%	3%	2%	-
Various	3%	4%	11%	11%	7%
Total (incorrect)	94%	70%	58%	70%	10%
Don't know, no response	3%	16%	7%	6%	4%

5. Picture H-5. (Boy striking other person with fist)

Questions (d) and (e): "What is this?" (Path of motion of hand)

"What do these lines show?" (Path of motion of hand)

Table 54 gives the proportions correctly answering these questions.

Table 54 Picture H-5. Proportions Correctly Identifying Path of Motion of Hand: Questions (d) and (e)

Group	ZR	TR	ZU	TU	E
Boys	.07	.11	.69	.46	.95
Girls	.03	.10	.26	.11	.83
Average	.05	.10	.47	.28	.89

Table 54, it will be seen, presents the usual pattern of responses. Perhaps a special feature is the high proportion for Urban Zulu boys in comparison with the proportions for the other Bantu groups. This might have a special significance!

6. Analysis of Composite Scores obtained from the Series

Because of the homogeneity in the responses obtained for the various questions which accompanied this Series, it is useful and informative to obtain a composite or overall score for each child over the Series. This was done in the usual way by giving each child a '1' or '0' for each item depending upon whether he answered the item correctly or incorrectly. Eighteen items in all were involved. Thus the maximum possible composite score that any testee could achieve was 18.

Table 55 shows the mean composite scores for boys and girls in the five ethnic groups.

Table 55 Series H. Mean Composite Scores for Boys and Girls in the Five Ethnic Groups

Group	ZR	TR	ZU	TU	E
Boys	5.24	6.86	11.02	9.56	16.20
Girls	4.44	5.48	6.80	5.46	15.64
Average	4.84	6.17	8.91	7.51	15.92

When an analysis of variance (Procedure I) is applied to these composite scores, the results obtained are shown in Table 56.

Table 56 Series H. Analysis of Variance of Composite Scores for Series.

Variance		d.f.	S.S.	Variance
Groups	(a) European V. Bantu	1	657.03	657.03
	(b) Urban Bantu v. Rural	1	73.17	73.17
	(c) Zulu v. Tsonga	1	.01	.01
	(d) Interaction (b)x(c)	1	18.63	18.63
Sex		1	61.16	61.16
Sex x Groups		4	32.53	8.13
Residual	(Between Schools	20	15.22	.76
	(Within Schools	20	12.32	.61
Total		49	870.08	

Variances (a), (b), (c) and (d) are tested against the Residual between Schools. It will be seen that they are all highly significant except (c). The non-significance of (c), the Zulu v. Tsonga term, means simply that there is no overall difference between Zulu and Tsonga. On the other hand, the hign significance of the Interaction term, together with the almost zero value for the Zulu-Tsonga variance, means that there is a significant difference between the two Urban Bantu groups which is more or less the reverse of the difference (also significant) between the two Rural Bantu groups. This can be seen from Table 55.

Sex and Sex x Groups are both tested against Residual within schools. Both are highly significant. Since the interaction term is significant, it follows that the sex difference varies significantly from group to group as can be seen from Table 55. Boys, however, are superior to girls in the case of all five groups.

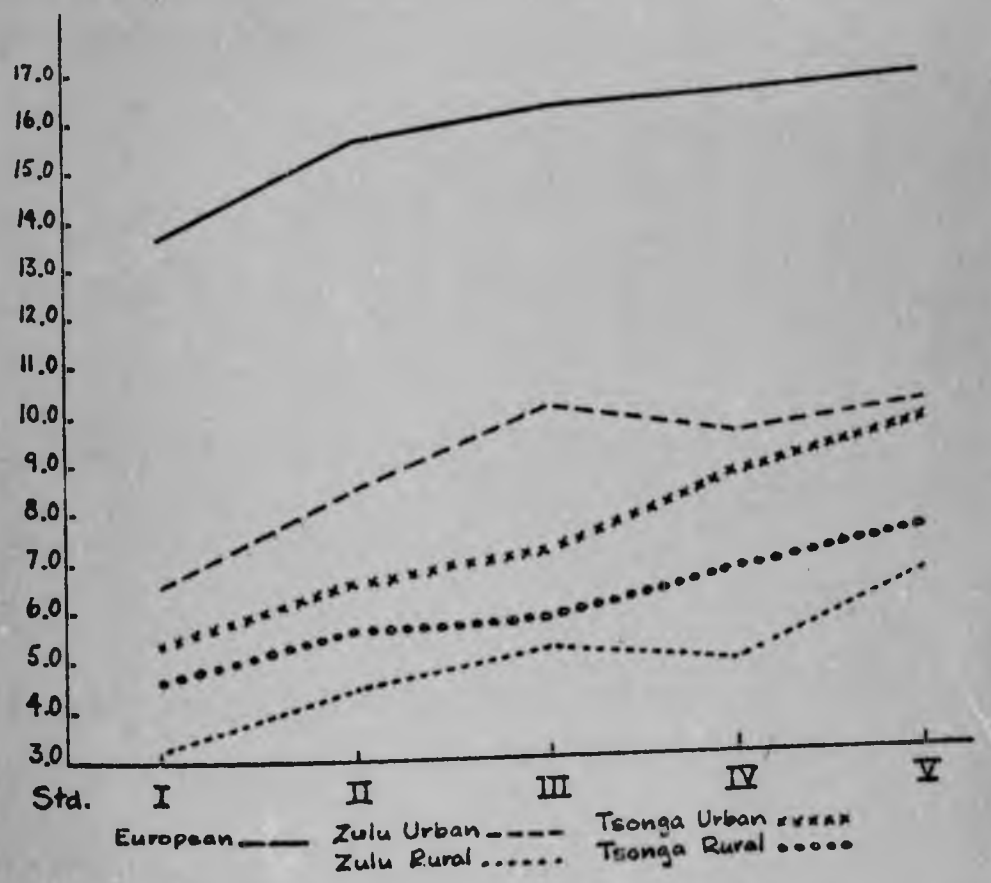
An interesting and important feature of the analysis is that the Residual between Schools which is tested against Residual within Schools is only slightly greater than the latter. As far as this analysis is concerned, it would appear, therefore, that school differences (within an ethnic group) are quite negligible. Other analyses of variance carried out on scores obtained from the other perceptual series confirm this. This is a result which is not only interesting psychologically but which is important for much of the statistical analysis carried out in this study (Vide Chap. 5, pp. 52, 56).

7. Variation of Composite Score with Standard

The use of composite scores provides a much clearer picture of the variation (the increase) in ability to interpret motion cues as one proceeds from Standard I to V.

Fig. 12 shows very clearly the definite improvement which all groups show as one passes from Standard I to Standard V.

Fig. 12 Series H. Variation of Composite Score with Standard for Five Ethnic Groups



A regression analysis (Procedure IV) confirms that the increase per standard is significant for all groups.

Summary of findings: Series H

The results of this Series confirm the hypothesis that ability to interpret or understand implied motion cues is correlated with degree of acculturation, the European group being superior to the Bantu, and the Urban Bantu superior to the Rural Bantu.

Boys are superior to girls for all groups, the difference being particularly significant for the two Urban Bantu groups.

There is a significant increase in ability to interpret motion cues as one passes from Standard I to Standard V.

C H A P T E R 14

THE PERCEPTION OF VIEWS OF THE SAME PERSON DEPICTED IN A PANEL OF DRAWINGS

SERIES I

Test Material:- Three Panels of Pictures, I-1, I-2, I-3. (Vide Chap. 2, pp. 19, 30)

View Board

This test was designed to test the hypothesis that the less the acculturation of the ethnic group, the more frequent the difficulty of interpreting different views of the same person depicted in a panel of drawings as being representative of the same person.

The procedure was the same for each panel of pictures. The tester would first ask the question (a) "What do you see?" Pointing to picture one of the panel, she would give the name of the person in the picture, saying, for example, "His name is Bill". Then pointing to picture two (or three as in the case of I-2) she would ask: (b) "What is his name?" (c) "How do you know?" The same would then be done in respect of the last picture (questions (d) and (e)). Where the child gave the correct answer to both questions (b) and (d) ("What is his name?"), he was regarded as having been able to recognise the same person in each of the pictures of the panel.

Analysis of Responses

1. Group Differences: Responses to Questions (b) and (d)

The proportions of boys and girls in each ethnic group who were able to make the correct identifications

were obtained for each of the panels I-1, I-2 and I-3. A comparison of the results for the three panels showed non-significant differences and it was decided, therefore, to combine the three sets of results.

Table 57 shows the proportions for boys and girls in each group averaged over the three panels.

Table 57 Panels of Pictures I-1, I-2 and I-3. Proportions of Boys and Girls in Each Ethnic Group (Averaged Over the Three Panels) Who Recognised the Same Person in the Panel Pictures.

Group	ZR	TR	ZU	TU	E
Boys	.80	.80	.92	.91	.95
Girls	.77	.77	.91	.83	.97
Average	.79	.79	.92	.87	.96

It will be seen that for the Bantu children the boys have a slight superiority over the girls but, since the difference is not significant statistically, further analysis is confined to boys and girls combined.

An examination of the ethnic group differences shows the usual pattern. The European children are superior to the Urban Bantu and the latter superior to the Rural Bantu. A χ^2-analysis shows both differences to be significant at well beyond the 1 per cent level. The Zulu-Tsonga difference is not significant.

2. Reasons for Making Correct Identifications: Responses to Questions (c) and (e)

The children's responses to questions (c) and (e), i.e. "How do you know?" were rather as one might have expected. The European child tended to say "It is the same person", whereas the Bantu child would say "It is Henry" or "It is Bill", giving the name that had been

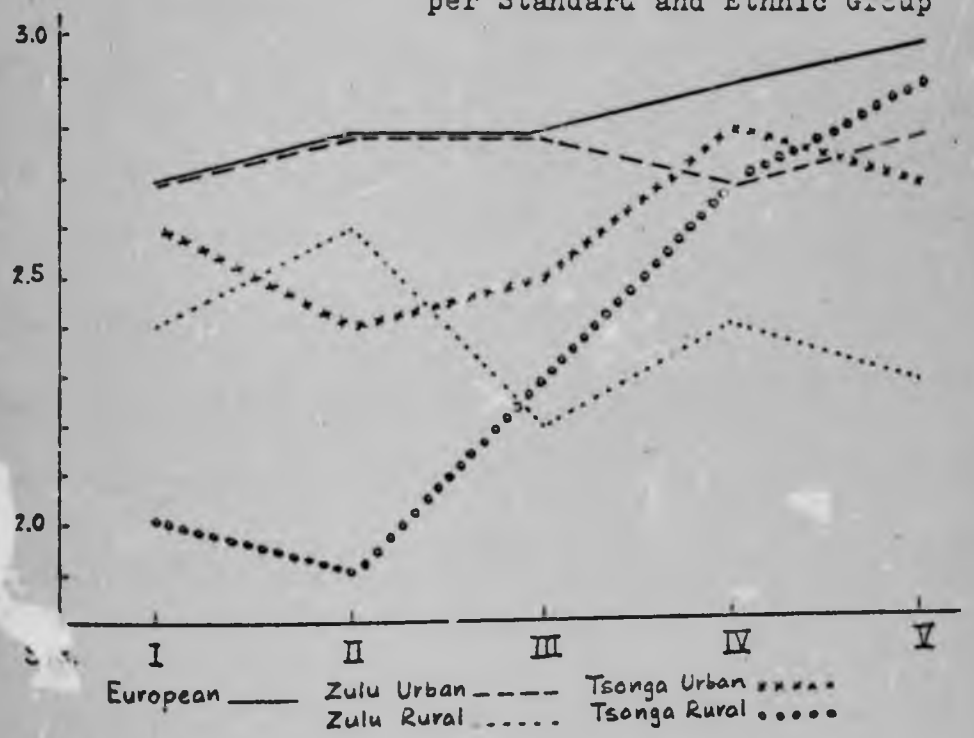
given to the character involved.

3. Standard Differences: Questions (b) and (d)

The proportions of children for each standard in each ethnic group, who made the correct identifications, were worked out and averaged over the three panels of pictures.

Fig. 13 shows graphically the overall mean proportions per standard for each of the five ethnic groups.

Fig. 13. Series I. Overall Mean Proportions per Standard and Ethnic Group



An analysis of variance (Procedure III) shows that the improvement per standard averaged over the five ethnic groups, although small, is significant at the 1 per cent level.

Summary of findings - Series I

The ability to identify the same person in a panel of drawings is correlated with the degree of acculturation of the ethnic group, the European children being superior to the Urban Bantu and the latter superior to the Rural Bantu.

The ability also improves significantly with the age (standard) of the children.

C H A P T E R 15

THE PERCEPTION OF A COMPLEX PICTURE INVOLVING A NUMBER OF ARTISTIC CONVENTIONS

SERIES J

Test Material:- A picture of a Bantu family scene was selected for this part of the investigation. The original was in full colour and in poster form. It is used in the Bantu classrooms for the promotion of road safety. This particular picture was chosen because it contained many of the conventions already studied in this research. (Vide Chap. 2, pp.19,31)

The full colour picture was traced, rendered in ink and reduced photographically to textbook page size. The ink technique employed was very similar to the line drawing art employed in most current Bantu textbooks.

The View Board was again used.

The primary purpose of this section of the investigation was to test the hypothesis that the results already obtained for the perception of an isolated artistic convention will be reproduced when the same convention is used in an illustration combining many design conventions.

A considerable number of questions were asked of the children in respect of the Series J picture. These are given in Appendix I p. 227.

Analysis of Responses

Analysis of the responses to individual items or questions confirms the hypothesis that the findings already obtained for the perception of isolated artistic conventions, as presented in the earlier picture series, are maintained when these conventions are combined in the one

picture. In the presentation of the results for the Series J picture, it is therefore perhaps sufficient to present the detailed analysis of the responses to one or two items, simply by way of illustration of the general finding. Actually two such analyses will be presented. However, in addition to this, a composite score was obtained for each testee from a representative sample of ten items and an analysis of these composite scores not only accords with the general hypothesis but also provides further useful information.

1. Question (f): "What is this?" (Shadow under boy in centre)

Table 58 shows the proportions of boys and girls in each group who correctly identified the shadow of the boy in the picture.

Table 58 Series J Picture. Proportions Correctly Identifying Boy's Shadow: Question (f)

Group	ZR	TR	ZU	TU	E
Boys	.37	.63	.69	.70	.92
Girls	.33	.47	.74	.56	.92
Average	.35	.55	.72	.63	.92

An examination of the proportions given in Table 58 shows that the general pattern is similar to that obtained with the Shadow Series E pictures, somewhat less than those obtained for pictures E-1 and E-2 but more than those obtained for E-3 and E-4 which involved face shadows. This is obviously an indication of the relative difficulty of these different shadow items.

2. Questions (l) and (m): "Is the man touching his wife's arm?" "How do you know?"

These questions may be regarded as a test of

depth perception, the factors of overlap and foreshortening being particularly important.

Table 59 gives the proportions who perceived that the man is not touching his wife's arm.

Table 59 Series J Picture. Proportions Who Perceived that Man is Not Touching his Wife's Arm: Questions (l) and (m)

Group	ZR	TR	ZU	TU	E
Boys	.18	.28	.59	.54	.81
Girls	.17	.14	.39	.36	.75
Average	.18	.21	.49	.45	.78

Again the proportions presented in Table 59 follow the pattern of earlier scores and, in particular, Series B which deals with depth perception. There would appear to be one difference between the results for Series J and Series B, namely, that the differences between European and Bantu and between Urban Bantu and Rural Bantu are more accentuated for Series J than they are for Series B.

3. Analysis of Composite Scores Derived from Series J

A composite score was obtained for each child by omitting one or two items of the Series and combining one or two others and then allotting each testee a '1' where he gave the correct response to an item (or combination of items) and a '0' where he gave the wrong response. In this way it was possible for each child to obtain a maximum score of 8, which was made up as follows:

(i) Question (c): "Why has the artist not drawn all of it (the bicycle)?" A question on 'cut-off'. 1 pt.

(ii) Questions (d) and (e): "Can this boy (boy in lower R.H. corner) touch the bike?" "How do you know?" 1 pt.
These two questions test 'depth' perception.

(iii) Question (f): "What is this?" (Shadow under boy in centre). 1 pt.

(iv) Question (g): "Why is the girl's face black?" (Girl in fore-ground). Another shadow question. 1 pt.

(v) Question (i): "What is this?" (Shadow of bicycle on house). 1 pt.

(vi) Question (j): "Is the cart broken?" A 'cut-off' question. 1 pt.

(vii) Questions (l) and (m): "Is the man touching his wife's arm?" "How do you know?" A test of depth perception. 1 pt.

(viii) Question (n): "Where is the little boy's left hand?" (Small boy walking with girl). 1 pt.
A test of depth perception. (Main factor overlap).

TOTAL: 8 pts.

It will be seen that two of the items involve 'cut-off', three shadows, and three depth perception, and that the composite score can therefore be regarded as giving an omnibus measure of the ability to perceive most of the earlier conventions studied. The only serious omission is that of implied motion cues. (It is to be remembered that Series C and F are studies of taste rather than perceptual ability).

Table 60 presents the mean composite scores for boys and girls in the five groups.

Table 60 Series J Picture. Mean Composite Scores for Boys and Girls in Five Ethnic Groups

Group	ZR	TR	ZU	TU	E
Boys	4.44	5.42	6.06	5.84	6.60
Girls	4.42	4.66	5.44	5.22	6.42
Average	4.43	5.04	5.75	5.53	6.51

When an analysis of variance (Procedure I) is applied to these composite scores, the results obtained are shown in Table 61.

Table 61 Series J Picture. Analysis of Variance of Composite Scores

Variance		d.f.	S.S.	Variance
Groups	(a) European v Bantu	1	13.99	13.99
	(b) Urban Bantu v Rural Bantu	1	8.19	8.19
	(c) Zulu v Tsonga	1	.38	.38
	(d) (b) x (c)	1	1.72	1.72
Sex		1	2.42	2.42
Sex x Groups		4	1.03	.26
Residual	between Schools	20	2.39	.12
	within Schools	20	2.78	.14
Total		49		

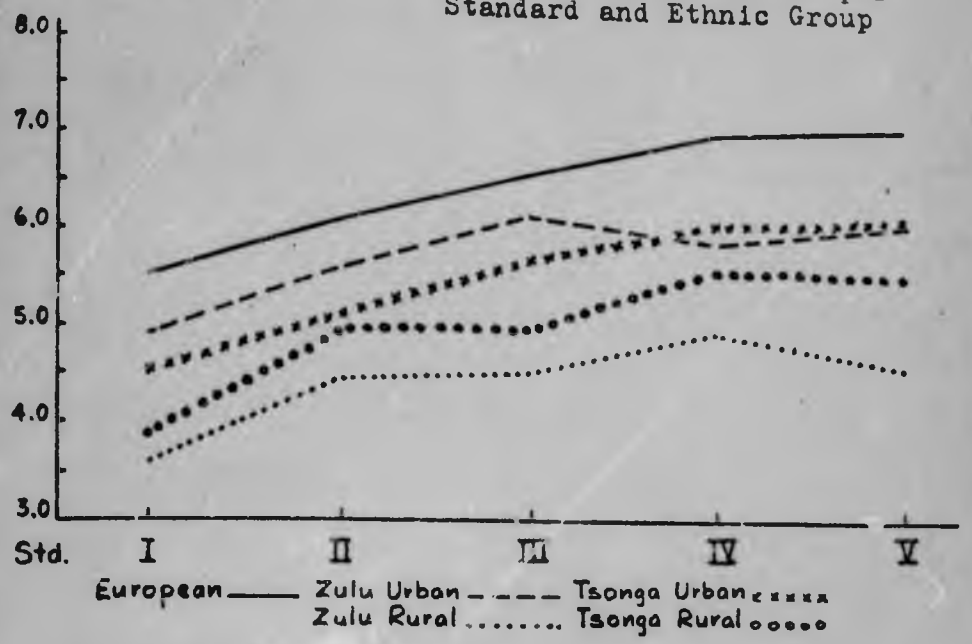
It is obvious that variances (a), (b) and (d) are highly significant. The Zulu v Tsonga variance is small and not significant. The highly significant interacting variance implies that the difference between Urban Zulu and Tsonga groups is significantly different from the difference between the two Rural groups. Inspection of Table 60 shows that, whereas the Urban Zulu have a slight advantage over the Urban Tsonga, the Rural Zulu mean composite score is considerably below that of the Rural Tsonga.

The Sex variance, tested against Residual within Schools, is highly significant. On the other hand, the Sex x Groups variance, tested against the same error variance, falls considerably below the 5 per cent level of significance; nor is the 5 per cent level reached by adding the Residuals between Schools and within Schools together to form the error variance. However, in the light of the results obtained for other series, it would be reasonable to assume that the sex difference varies from group to group; and an examination of the means given in Table 60 shows that boys are superior to girls for the two Urban Bantu groups and the Rural Tsonga, whereas there is no sex difference for the Rural Zulu and only a slight difference in favour of boys for the European group.

4. Variation of Composite Score with Standard

Mean composite scores for each standard in each ethnic group were calculated. The results obtained are shown in Fig. 14.

Fig. 14. Series J. Average Overall Scores per Standard and Ethnic Group



An analysis of variance was applied to the mean Standard scores for the four Bantu groups. The results are shown in Table 62.

Table 62 Series J Picture. Analysis of Variance of Mean Standard Scores for Four Bantu Groups

Variance		d.f.	S.S.	Variance
Standards	Regression	1	2.16	2.16
	Residual	3	3.60	1.20
Groups		3	5.35	1.78
Error Variance (Standards x Groups)		12	.522	.0435

The Regression term is highly significant, showing that the increase in score with standard is unlikely to be a matter of chance. The mean increase per standard is actually 0.23 on the average.

Furthermore, the Residual Standards variance is highly significant, showing that the flattening-off of the growth curves at the level of the upper standards is unlikely to be a matter of chance.

An examination of Fig. 14 shows also that by Standard V the Urban Bantu are approaching the level of the European Standard I, although the flattening-off of the growth curve would suggest that they are not likely to improve much on this in subsequent years. The Rural Bantu, and in particular the Rural Zulu, are obviously considerably behind not only the European but also the two Urban Bantu groups.

Summary of findings - Series J

The results obtained from the Series J picture confirm the hypothesis that the findings previously obtained for the perception of isolated artistic conventions which are combined in a more complex picture, the same differences are revealed, the European being superior to the Bantu, and the Urban Bantu superior to the Rural Bantu. The fact that the Rural Zulu came last is really further evidence that the perception of pictures using Western conventions depends on the degree of acculturation of the group being considered.

Furthermore, by using composite scores derived from the responses made to the different questions that accompanied the Series J picture, it was possible to study more exactly the variation in perceptual ability with standard. All groups showed a significant increase in score with standard. In the case of the Urban Bantu, the score reached at Standard V is little different from that

of the European Standard I. The Rural Bantu are rather less. But there was also a significant flattening-off of the Bantu scores at the upper standard levels (to some extent also with the European) which suggests that the development of pictorial perceptual ability beyond Standard V might be rather limited.

CHAPTER 16

THE RELIABILITY OF THE TESTS USED IN THE INVESTIGATION

It is standard practice in any investigation which employs a new type of test, to obtain some measure of the reliability of the test or tests used. Various methods for testing reliability are available to the investigator. All take the form of some measure of correlation. It might be a matter of applying the test on two different occasions and inter-correlating the two sets of results to give what is known as the test-retest reliability. Or, it might be a matter of inter-correlating the results obtained from the application of two parallel forms of the test. There are also other variations.

In the present investigation, practical considerations did not permit testing and re-testing of the subjects. A test-retest reliability coefficient could not therefore be obtained. But, while it could be said that parallel forms of the test series were not available and therefore a parallel-forms reliability coefficient could not be calculated, it is also the case that the test items within a series often resemble each other sufficiently for their inter-correlations to give a fair indication of their reliability. And this was the method actually adopted in the present study. A representative sample of tests were taken and their inter-correlations were calculated for three or more of the five ethnic groups. (In some cases it was not considered necessary to obtain the correlations for all five ethnic groups).

In the case of Series C and F, which are tests of

taste rather than ability and which involved the method of paired comparisons, a different approach is required in order to measure reliability. The application of this method to the data for Series C is described in the second half of the chapter.

The Inter-correlations of Selected Test Items

Since each item permitted only two-category response - a 'correct' or 'incorrect' response - the calculation of inter-correlations involved the setting up of 2 x 2 contingency tables for each pair of items and then deriving some measure of correlation for each table. In all cases the measure of correlation used was that of a tetrachoric correlation coefficient. Strictly speaking, the use of this coefficient depends on the assumption that the abilities underlying the responses to any two items conform to a normal bivariate distribution, a condition which may or may not be satisfied in the present study. But this is not a serious matter, since, when one comes to examine the 2 x 2 contingency tables, it is obvious that most of the correlations are high, and since our main purpose in calculating a correlation statistic is simply to give an indication of the relative magnitudes of the correlations.

Illustration of method:-

We shall illustrate the method by calculating the tetrachoric correlation coefficients between the responses to pictures A-1 and A-2 for the Rural Zulu, the Urban Zulu and the European samples (boys and girls combined). Two of these correlations are not high which would suggest a considerable degree of unreliability, a conclusion which

was drawn on other evidence in Chapter 6.

(It is to be remembered that each of these pictures displays four huts. In A-1, they are of the same size, two being at the top and two at the bottom of the picture. In A-2, the huts are staggered, the hut at the top being larger than the other three which are of the same size. In each case the child is asked, "Which (hut) is the nearest to you?"

(i) Rural Zulu sample

The 2 x 2 table is as follows:-

		Picture A-1	
		Lowest hut not nearest	Lowest hut nearest
Picture A-2	Lowest hut nearest	17	124
	Lowest hut not nearest	41	18

The pattern of the cell frequencies indicates a considerable measure of correlation. Converting all frequencies to proportions and using the Computing Diagrams of Chesire, Saffir and Thurstone[1], we obtain a tetrachoric correlation of 0.81 which is fairly high when the two pictures.

(ii) Urban Zulu sample

The 2 x 2 table is as follows:-

(ii) Urban Zulu sample

The 2 x 2 table is as follows:-

		Picture A-1	
		Lowest hut not nearest	Lowest hut nearest
Picture A-2	Lowest hut nearest	25	98
	Lowest hut not nearest	43	34

[1] Chesire, L., Saffir, M., Thurstone, L.L. Computing Diagrams for the Tetrachoric Correlation Coefficient, University of Chicago Bookstore, 1933.

In this case the tetrachoric correlation is approximately 0.56, which is rather lower than that obtained for the Rural Zulu.

(iii) European sample

The 2 x 2 table in this case reads:-

		Picture A-1	
		Lowest hut not nearest	Lowest hut nearest
Picture A-2	Lowest hut nearest	30	46
	Lowest hut not nearest	73	51

And, as one can see from the pattern of responses in the table, the tetrachoric correlation is low - approximately 0.30.

These results confirm the conclusion drawn in Chapter 6, that the European sample, and obviously to some extent the Urban Zulu sample, ha. difficulty in answering the question "Which (hut) is the nearest to you?", (particularly in respect of A-1 and to some extent in respect of A-2, if we follow the argument given in Chapter 6). In other words, for the European group and to a lesser extent the Urban Bantu groups, the test of depth perception presented by pictures A-1 and A-2 does not possess any high degree of reliability.

The results for other pairs of test questions are presented in Table 63. It will be seen that on the whole the correlations are high. It is only where comparatively disparate test questions are presented, as in the case of Series H, that the correlations are on the low side.

Table 63 Tetrachoric Correlations for Selected Pairs of Test Questions (In some cases not given for all groups)

Test Questions Correlated		Ethnic Group ZR	TR	ZU	TU	E
Series B	Qu. "Which hill is nearest to the man?"					
Responses to picture B-1 v responses to picture B-6		>.9	.83	.87	>.9	.74
Series E	E-1, questions (b) and (c) (shadow of ball) v E-2, question (d) (shadow of house)	>.9	>.9	-	>.9	-
Series E	E-3, questions (d) and (e) (cheek in shadow) v E-4, questions (b) and (c) (forehead in shadow)	1	>.9	>.9	-	-
Series H	H-1, question (i) (motion marks above falling fruit) v H-4, question (d) (multiple presentation of boy's head)	.37	-	.61	.67	.73
Series I	Identification of Person in Panel of Drawings.					
Responses to picture I-2 v responses to picture I-3		>.9	-	>.9	-	>.9

It is reasonable to conclude that, with the exception of one or two of the test questions in Series A, the test series show a high measure of reliability.

The Consistency and Concordance of the Responses to Series C

In the case of Series C and F, where the method of paired comparisons was used, it is necessary, as stated above, to employ different techniques in testing for reliability. The application of these procedures to Series C (Position preferences) will now be presented. It is most likely that similar results would have been obtained in the case of Series F (Art style preferences).

There are two aspects to the analysis of the responses obtained from the application of a paired comparisons technique, namely (i) the consistency of the responses of any one subject and (ii) the concordance or agreement between the responses of the different subjects. We shall consider these in turn for Series C.

1. The Consistency of the Responses to Series C

In a paired comparisons test, involving five positions of a drawing in pictorial space, the ten choices which any one subject can make can be represented by a 5 x 5 preference matrix. (We shall ignore cases where the subjects made no choice between two positions).

Matrix A

Position	C-1	C-2	C-3	C-4	C-5	R
C-1		1				1
C-2						0
C-3	1	1		1	1	4
C-4	1	1				2
C-5	1	1		1		3

In the above matrix, a '1' in any one cell means that the position corresponding to the row of that cell

is preferred to the position corresponding to the column of the cell, e.g. the '1' in the second cell of the first row means that C-1 is preferred to C-2. The given matrix actually presents a perfectly consistent set of choices, the order of preference for the five positions being C-3, C-5, C-4, C-1 and C-2, as is indicated by the row sums which are given under the letter R.

Now consider the following matrix, a slightly different matrix from matrix A above.

Matrix B

		Position					
		C-1	C-2	C-3	C-4	C-5	R
	C-1		1				1
	C-2						0
Position	C-3	1	1			1	3
	C-4	1	1	1			3
	C-5	1	1		1		3

In the case of this matrix, it is possible to extract the information that while position C-4 is preferred to C-3 and C-3 is preferred to C-5, C-5 is preferred to C-4. This is known as an inconsistent triad. There is only one such triad in Matrix B and none in Matrix A.

The number of triads altogether in a 5 x 5 matrix is ${}^5C_3 = 10$ and the maximum possible number of inconsistent triads is 5. In the case of a 5 x 5 matrix, the number of inconsistent triads is easily found. The formula is

$$d = \frac{1}{2}\left\{10 - \sum_{5} (R - 2)^2\right\}$$

where R is defined as above.

Thus in the case of Matrix B

$$d = \frac{1}{2}\left\{10 - (1 + 4 + 1 + 1 + 1)\right\} = 1$$

The number of inconsistent triads in the preference matrix for any one subject is therefore a measure of his or her consistency or inconsistency.

In order to obtain some indication of the consistency of the boys and girls in the five ethnic groups, two boys and two girls were chosen at random from each of the five standards for each ethnic group. (Cases giving no choices had of course to be rejected). In the case of each group the number of inconsistent triads for each child was calculated using the above formula. The distribution of the numbers of inconsistent triads for the ten boys and ten girls in the Rural Zulu group is shown in Table 64.

Table 64.

Table 64 The Frequency Distribution of Numbers of Inconsistent Triads for the 10 Boys and 10 Girls in the Rural Zulu Group

No. of Inconsistent Triads		5	4	3	2	1	0
Frequency Distribution	Boys	0	0	2	4	1	3
	Girls	0	1	2	1	4	2

By something of a coincidence, the tables for the other four groups are very similar and are not reproduced here.

There remains the question of the significance of the data given in Table 64. This is easily calculated. Combining the data for boys and girls and grouping them into two classes (a) those with 2 inconsistent triads or less and (b) those with 3 or more, and using tables to be

found in most statistical text-books, we obtain the following contingency table.

	3 inconsistent triads or more	2 inconsistent triads or less
Obse[illegible] fr[illegible]	5	15
E[illegible] [illegible]uencies ([illegible]sis)	10.62	9.38

The null hypothesis in this case is the hypothesis that there is no consistency in the responses of the children i.e. their responses are entirely random. To test the null hypothesis, we apply a χ^2-test, obtaining a value of 6.34, which for 1 d.f. is almost significant at the 1 per cent level.

Very similar results are obtained for the data derived from the other four ethnic groups. It may therefore be concluded that overall there is a highly significant measure of consistency in the preferences the children make in respect of the five positions although obviously the responses of some children are quite inconsistent.

2. The Concordance of the Responses to the Series

Various methods are recorded in the statistical text-books for measuring the concordance of preferences in a paired comparisons test. A simple but effective procedure was adopted in the present case.

Table 65 presents the mean position preference scores of the five schools for each of the five ethnic groups (data for boys and girls again combined).

Table 65 Mean Position Preference Scores for the Five Schools in Each of the Five Ethnic Groups (The numbers 1-5 in brackets following each mean shows the order of preference for each school)

ZR

Position / School	1	2	3	4	5
1	.88(5)	1.76(4)	2.62(1)	2.40(2)	2.36(3)
2	1.19(5)	1.75(4)	2.39(2)	2.11(3)	2.57(1)
3	.99(5)	1.79(4)	2.66(1)	2.19(3)	2.35(2)
4	1.35(5)	1.87(4)	2.08(3)	2.33(2)	2.35(1)
5	1.12(5)	1.68(4)	1.92(3)	2.66(1)	2.60(2)

TR

Position / School	1	2	3	4	5
1	1.36(5)	1.64(4)	2.42(1)	2.36(2)	2.20(3)
2	1.26(5)	1.76(4)	2.09(3)	2.54(1)	2.34(2)
3	1.77(4)	1.57(5)	2.37(1)	1.95(3)	2.35(2)
4	1.79(4)	1.67(5)	2.02(1)	1.89(3)	2.03(2)
5	1.99(2)	1.59(5)	2.80(1)	1.89(3)	1.73(4)

ZU

Position / School	1	2	3	4	5
1	1.49(5)	2.20(2)	2.34(1)	1.96(4)	2.01(3)
2	1.14(5)	1.45(4)	2.67(1)	2.13(3)	2.61(2)
3	.58(5)	1.46(4)	2.35(3)	2.84(1)	2.74(2)
4	.66(5)	1.68(4)	2.28(3)	2.72(1)	2.62(2)
5	.86(5)	1.51(4)	2.48(2)	2.72(1)	2.45(3)

TU

Position / School	1	2	3	4	5
1	1.48(5)	1.72(4)	2.67(1)	1.92(3)	2.22(2)
2	1.95(3.5)	1.95(3.5)	2.33(1)	1.77(5)	1.99(2)
3	1.51(5)	1.73(4)	2.81(1)	1.97(2.5)	1.97(2.5)
4	2.07(2)	1.31(4)	2.36(1)	1.73(5)	1.93(3)
5	1.87(3.5)	1.87(3.5)	2.48(1)	1.67(5)	2.09(2)

E

Position / School	1	2	3	4	5
1	1.37(4)	1.31(5)	2.69(1)	2.43(2)	2.21(3)
2	1.52(4)	1.26(5)	2.65(1)	2.32(2)	2.24(3)
3	1.64(4)	1.38(5)	2.75(1)	2.22(2)	2.00(3)
4	1.68(4)	1.34(5)	2.93(1)	2.10(2)	1.96(3)
5	1.34(5)	1.46(4)	2.72(1)	2.22(3)	2.42(2)

The five means for each school were ranked and the rank order for each mean is given in brackets immediately after it. A coefficient of concordance was then worked out, using the rank orders, for each of the ethnic groups. The formula is

$$W = \frac{\text{sum of squares between columns}}{\text{total sum of squares}}$$

Table 66 shows the values of W for each of the five ethnic groups.

Table 66 Coefficient of Concordance W (Position Preference) for each of the Five Ethnic Groups

Group	ZR	TR	ZU	TU	E
W	.81	.66	.67	.72	.94

All of these values are significant at the 1 per cent level. It is to be concluded that the children of each group do not only show consistency in their choices but they also show some measure of agreement with one another. It is of interest to note that the largest measure of agreement was obtained for the European group.

Summary of findings

The analyses presented in this chapter would appear to indicate that the pictorial perceptual tests used in this study possess a considerable measure of reliability. Also, in the case of Series C (and F), which involved the method of paired comparisons, the children showed a considerable measure of self-consistency and also concordance with the other members of their group.

CHAPTER 17

THE RELATIONSHIP BETWEEN PICTORIAL PERCEPTUAL ABILITY AND GENERAL ABILITY

At the planning stage of this research, it was realised that it would be of some interest to determine to what extent ability in pictorial perception is correlated with intelligence or scholastic ability. For practical reasons it was not possible to include an intelligence test in the testing programme. But it was thought that some attempt could be made to determine the correlation with general scholastic ability.

The procedure adopted was comparatively simple, but despite that, it did not operate without mishap. Included as an item in the Biographical Questionnaire, completed for each pupil, was the class standing of the pupil (his or her position scholastically in class). The class standings were supplied by the teachers of the pupils who made up the experimental samples. Knowing the numbers in each class, it was impossible for one to pick out the boys and girls in each ethnic group sample who fell into the top 30 per cent or bottom 30 per cent of their class as rated by their teachers.

With 100 boys and 100 girls in each ethnic sample, chosen at random from their classes, one would expect on the average 30 boys and 30 girls of each sample to fall in the upper 30 per cent of their classes and the same numbers in the lower 30 per cent. When, however, the pupils falling in the top and bottom sections were picked out, their numbers were found to be distributed as shown in Table 67.

Table 67 Number of Boys and Girls in Each Ethnic Group Sample Falling in Top 30% and Bottom 30% of their Classes

Group	Boys		Girls	
	Top 30%	Bottom 30%	Top 30%	Bottom 30%
ZR	34	19	29	15
TR	34	16	34	18
ZU	39	19	34	21
TU	44	15	30	15
E	26	32	40	17

It is obvious from Table 67 that the numbers depart considerably from the expected figures of 30 boys and 30 girls for both the top and bottom sections. In all cases, with the exception of the European Boys, the number of pupils falling in the top 30% is greater than that for pupils falling in the bottom 30% - in most cases considerably greater. The only possible explanation is that the teachers, who did the rating, for some reason or other tended to give the children, picked out for the experiment, rather higher class standings than they should have received. Probably the Bantu teachers were rather more guilty of this than the European teachers - a conclusion one might draw on closer examination of the data. Obviously, too, this outcome could have been avoided if the teachers had been made to rate all their pupils before the experimental sample was drawn but this would not have been easy to carry out in practice.

Despite the bias in the class standings given by the teachers, it is still possible to test for some measure of correlation between general scholastic ability and performance in the tests on pictorial perception, provided

the class standings given by the teachers are themselves correlated with the scholastic ability of the pupils. For, if the latter is the case and if there is a correlation between pictorial perceptual ability and scholastic ability, the pictorial test performance of the pupils in the top 30% group should be better than that of the pupils in the bottom 30% group. The application of this statistical test to the results for individual items in the pictorial test series shows only a tendency towards a positive correlation. But if we use the composite scores derived from the Series J picture, these scores being something of an overall measure of pictorial perceptual ability, significant results are obtained. Table 68 shows the mean composite scores (Series J) for boys and girls in the top and bottom 30% groups for each of the five ethnic samples.

Table 68 Mean Composite Scores (Series J) Boys and Girls in Top and Bottom 30 per cent Groups for Class Standing

Group	Boys		Girls	
	Top 30%	Bottom 30%	Top 30%	Bottom 30%
ZR	4.51	3.76	4.94	3.94
TR	5.16	5.39	5.22	4.50
ZU	6.26	5.43	5.81	5.22
TU	5.98	5.63	5.61	5.00
E	7.14	6.23	6.46	6.37

It will be seen from Table 68 that only in the case of the Rural Tsonga boys is the mean score for the top 30% less than that for the bottom 30%. In all other cases it is greater. And, using the Binomial Expansion, it can be shown that this result is significant at almost the 2 per cent level (two-tailed test). Probably with a more

refined test, such as an analysis of variance, a much higher level of significance could be obtained.

It is therefore reasonable to conclude that there is a positive correlation between pictorial perceptual ability and general scholastic ability. It is not possible to obtain an estimate of the magnitude of this correlation because of the bias in the class standings awarded by the teachers. The probability is that the correlation is not high.

Summary of findings

There is a positive correlation between pictorial perceptual ability and general scholastic ability. The magnitude of the correlation is probably small.

CHAPTER 18

RELEVANT CULTURAL CHARACTERISTICS OF THE ETHNIC GROUPS

So far, in this investigation, it has been accepted that the Bantu groups have less opportunities than the European to acquire the knowledge and skills necessary to interpret Western-style pictorial art. It is also reasonable to assume that it is these differences in opportunities that produce the differences in pictorial perceptual ability which are revealed in the preceding chapters. No other hypothesis is tenable.

It might be claimed that the account of the general background of the experimental samples, presented in Chapter 3, is sufficient to substantiate the thesis that there are considerable differences between the groups in respect of their opportunities to acquire the relevant knowledge and skills. But a more precise statement of these differences is obviously desirable. It was for this purpose that the Biographical and Educational Questionnaires, described in Chapter 2, were included in the investigation.

The questionnaires cover a number of factors which are likely determinants of differences in pictorial perception. These are age, residential mobility, religious affiliation, pictorial experience outside the school, persons designated by pupils as helping them to understand pictorial material, formal pictorial exposure in school, graphic art classes in the schools and the educational background of the teachers. In the present chapter, data provided by the questionnaires are presented under these

headings. Considerable use is made of tables in order to facilitate rapid overall comparisons between the ethnic groups.

It is to be noted that it was not possible to determine the relative importance of these factors in producing differences in pictorial perception, although, as is mentioned later in the chapter, some attempt was made to measure the effect of having graphic art classes in the schools. Also the reader will remember that in the last chapter the attempt was made to correlate pictorial perceptual ability with scholastic ability on the basis of data provided by the Biographical Questionnaire.

1. Age

Table 69 shows the mean ages of the ethnic groups investigated.

Table 69 Mean Ages of the Ethnic Groups

Group	ZR		TR		ZU		TU		E	
	Yrs	Mths	Yrs	Mths	Yrs	Mths	Yrs	Mths	Yrs	Mths
Boys	14	3	14	0	13	2	12	10	10	2
Girls	12	9	13	2	12	6	11	9	10	1
Average	13	6	13	7	12	10	12	3½	10	1½

Table 69 shows that the European mean age is considerably lower than those of the Bantu groups and the Rural Bantu mean age is about one year higher than that of the Urban Bantu. The difference in mean ages is largely explained by the fact that Bantu children begin primary school at a later age than the European. Also there is a greater tendency for the Bantu child's education, particularly that of the boys, to be interrupted for financial

reasons. The investigator sometimes observed Bantu boys of eighteen years of age or above as pupils in Standards IV and V.

2. Residential Mobility

Table 70 shows the residential mobility of the ethnic groups.

Table 70 Mobility of the Ethnic Groups: Percentage Distribution of Pupils according to Proportion of Life Spent in Urban and Rural Areas.

	Rural		Urban		
Group	ZR	TR	ZU	TU	E
Time Lived in Area:					
All life	90%	72%	82%	64%	100%
Up to 20% of life outside	7%	26%	11%	11%	-
Above 20% of life outside	3%	2%	7%	25%	-

Inspection of the table shows the Tsonga pupils to be the most mobile, particularly the Urban. The pupils in the European group indicated no mobility of residence, having lived all their life in the city. The Rural Zulu are the most isolated from European culture, 90% having never left their homeland.

The fact that a greater proportion of the Rural Tsonga had spent part of their life in the urban area must account in some measure for their superiority over the Rural Zulu in many of the pictorial tests. A similar remark applies to the Urban Zulu and Urban Tsonga except that the greater mobility of the Tsonga should be in this case to their disadvantage and on the whole the test scores of the Urban Zulu were found to be superior to those of the Urban Tsonga.

3. Religious Affiliation

Table 71 shows the proportions within the ethnic groups who identified themselves with particular church denominations.

Table 71 Religious Affiliation of the Ethnic Groups

Group	ZR	TR	ZU	TU	E
African Separatist Church	-	4%	41%	11%	-
European Church/ Mission	77%	89%	54%	70%	89%
No Church Affiliation	23%	7%	5%	16%	9%
Uncertain	-	-	-	3%	2%

Table 71 suggests that the European Missions do have considerable influence in the Rural Zulu and both Tsonga areas, particularly the Tsonga Rural where the great majority identify with the Swiss Presbyterian Mission. The African Separatist Churches appear very much stronger within the Urban Zulu than within the other groups. Of particular interest is the fact that almost one fourth of the Rural Zulu indicated no church identity. Probably most of them practice the tribal religion. However, from previous work, the investigator has found that although the Bantu often identify with a particular Christian faith, there is a considerable proportion who actually practice a syncretistic religion which combines traditional Bantu with European religious concepts. Contact with European churches suggests greater opportunity for exposure to such pictorial materials as picture posters, flannelgraph and projected visuals.

4. Pictorial Exposure Outside the School as Reported by the Pupil

Table 72 shows the informal pictorial exposure of all ethnic groups to illustrated books, newspapers, magazines and projected pictorial material.

Table 72 Informal Pictorial Exposure (Outside School as Reported by the Pupils).

Group	ZR	TR	ZU	TU	E
Picture Books (other than school books)	49%	63%	73%	50%	91%
Pictorial Magazines and Newspapers (Home)	41%	57%	84%	67%	100%
Pictorial Magazines and Newspapers (Outside Home)					
Frequently	-	7%	20%	22%	17%
Occasionally	33%	56%	40%	46%	6%
Seldom	-	-	-	-	33%
Never	67%	37%	33%	28%	35%
Indefinite	-	-	7%	4%	9%
Projected Slides and Filmstrips					
Monthly	7%	1%	4%	-	23%
Occasionally	29%	2%	12%	77%	12%
1-2 times per year	41%	33%	13%	19%	24%
Never	19%	63%	47%	2%	38%
Indefinite	4%	1%	24%	2%	3%
Cinema					
Weekly	-	5%	18%	17%	39%
2-3 times per month	-	-	-	-	49%
Monthly	2%	10%	9%	17%	-
1-2 times per year	40%	46%	22%	.	8%
About every 4 months	35%	35%	5%	42%	-
Never	18%	4%	42%	23%	1%
Indefinite	5%	-	4%	1%	3%

Inspection of Table 72 shows that the Rural Zulu (compared with the other ethnic groups) has considerably less exposure to books, pictorial magazines and newspapers within and outside the home. This emphasises the cultural isolation of the group. All of the European group

reported having magazines and newspapers in the home. The Zulu Urban has a far higher proportion of pictorial material in the home than the other Bantu groups.

As regards projected pictorial material, the European has far greater exposure than the Bantu. 88% of the European group see two or three films monthly outside the school. Slides and filmstrips appear to be seen more frequently in Zululand and the Urban Tsonga schools than in the other Bantu areas where the tests were given. The Tsonga Urban group attends the cinema more frequently than the other Bantu groups. Filmstrips in the Bantu areas are occasionally shown by church and missionary groups. There are no cinema houses in the rural areas but occasionally a film may be shown at a community centre or Christian mission, while the Urban Bantu and European groups have local cinemas they may attend any evening during the week.

5. Persons Designated by the Pupils as Helping them Understand Pictorial Materials

Table 73 shows the percentages of pupils within the ethnic groups who designated particular persons as assisting them in understanding pictures.

Table 73 Persons Designated by Pupils as Helping Them Understand Pictorial Materials (Percentages indicate number of times each person was named by pupils).

Group	ZR	TR	ZU	TU	E
The Persons Named:					
School Teacher	93%	98%	76%	95%	96%
Guardian/Parent	72%	56%	82%	-	74%
Classmates	61%	76%	83%	72%	62%
Church/Mission Worker	3%	80%	1%	62%	24%
Others (Relatives, Visitors)	10%	64%	-	71%	10%

Inspection of Table 73 shows that the school teacher is named most frequently as a source of help in pictorial perception by all groups with the exception of the Urban Zulu, who rate their guardian/parent and classmates higher. Of particular note is the fact that none of the Urban Tsonga reported going to their guardian/parents for assistance. The Rural Tsonga rely more on the missionaries and church workers than their guardian/parents. Both Tsonga groups have considerable assistance from relatives and visitors.

It is obvious that if children receive their information from persons who do not perceive graphic art conventions in the Western manner, their misperceptions will continue. It is also reasonable to assume that the Urban groups have far larger proportions of educated 'Westernised' people who help the children with their problems in pictorial perception.

5. Formal Pictorial Exposure in the School

Table 74 presents the frequency of exposure to both projected a i non-projected pictorial teaching aids in the classroom. This information was supplied by the teachers of the pupils tested.

Table 74 Formal Pictorial Exposure in the School (as reported by the teachers)

Group	ZR	TR	ZU	TU	E
Pictorial Textbooks					
Daily	92%	84%	57%	87%	84%
Several times	8%	16%	24%	9%	16%
Weekly	-	-	2%	4%	-
Monthly	-	-	17%	-	-
Seldom					

Table 74 continued:

Group	ZR	TR	ZU	TU	E
Picture Posters					
Daily	37%	54%	42%	33%	15%
Weekly	8%	22%	41%	39%	47%
Monthly	8%	12%	-	-	14%
Never	47%	11%	13%	20%	9%
Indefinite	-	1%	4%	8%	15%
Blackboard Drawings by Teacher					
Daily	53%	71%	86%	60%	64%
Weekly	30%	17%	14%	38%	29%
Monthly	11%	12%	-	2%	7%
Flannelgraph					
Daily	8%	5%	-	7%	4%
Weekly	9%	12%	4%	19%	26%
Monthly	-	-	-	-	4%
Occasionally during year	-	14%	-	4%	13%
Never	83%	69%	96%	70%	53%
Maps					
Daily	80%	30%	19%	27%	13%
Weekly	-	33%	33%	44%	61%
Occasionally during year	20%	-	-	10%	19%
Never	-	37%	48%	19%	7%
Diagrams					
Daily	66%	47%	51%	67%	19%
Weekly	22%	7%	38%	21%	35%
Monthly	-	5%	-	-	17%
Occasionally during year	12%	9%	-	-	15%
Never	-	32%	11%	12%	14%
Projected Slides and Filmstrips in the Classroom					
Weekly	-	-	-	-	9%
Monthly	-	-	-	-	20%
Occasionally during year	-	-	-	-	31%
Never	100%	100%	100%	100%	40%
Cinema in the Classroom					
Weekly	-	-	-	-	42%
Monthly	-	-	-	-	8%
Less than 6 times per year	-	-	4%	-	28%
Never	100%	100%	96%	100%	22%

Inspection of Table 74 shows the following:-

Pictorial textbooks are used frequently each week by pupils in all groups. One exception is the small proportion of Urban Zulus reported as seldom using such books. This is probably accounted for by a temporary shortage of books in a few of the Urban Zulu classes at the time of testing.

Almost half of the Rural Zulu are not exposed to picture posters in the classroom. The Rural Tsonga appear to use them more frequently than the other groups in their daily lessons. The Urban Bantu and European groups see picture posters more on a weekly basis than the Rural Bantu.

The blackboard drawing by the teacher is used more in the Urban Zulu schools than in the others. Small proportions, about one tenth, of the Rural Bantu groups see blackboard art monthly. In the majority of classes where such drawings are used, the sketches are often extremely simple and depict isolated objects. This applies to all groups.

The European has the highest exposure to flannelgraph pictures than of all the groups. The flannelgraph is quite unique as a teaching aid as it allows the manual manipulation of cut-out figures in the construction of a pictorial scene on a board covered with flannel. The Zulus are the least exposed to it. Religious instruction in which European mission and church flannel[illegible] materials are used probably accounts for the higher proportion of the Tsonga exposed to this pictorial teaching aid. Table 71 shows the Urban Zulu to have a far greater proportion of African Separatists who would probably not have flannelgraph materials for their particular religious teachings.

Maps are used by some classes in all ethnic groups. However, the investigator feels that the Rural Zulu proportions are doubtful because maps were found to be used primarily in teaching Standards III, IV and V in each group. The European has a higher weekly exposure than the Bantu groups to this visual aid. Of particular interest is the fact that almost half the Urban Zulu were reported as not being exposed to maps in the classroom.

A more difficult pictorial aid for many children to understand is the diagram. Diagrams are often printed and furnished by commercial firms or educational departments. Some are drawn by the teacher on large pieces of paper or cardboard. The investigator observed them to be used primarily in lessons on personal hygiene and community health. The Rural Tsonga (about one third) are the least exposed to this pictorial aid. About 89% of both Zulu groups and the Urban Tsonga see diagrams weekly.

Projected aids such as filmstrips, slides and films are not shown in the Bantu schools - with one exception. A very small proportion of the Urban Zulu group see a film at school but this is only on special occasions, usually evening meetings, since none of the Bantu schools tested in this investigation had electricity and electrical equipment must therefore be provided. Half of the European group view an educational film at least monthly in the classroom with most of these pupils seeing one weekly.

Comparison of the frequency and type of exposure to visual aids in the schools shows that the degree of exposure to most of the non-projected materials was about the same for the Urban and Rural Bantu groups.

Table 74 gives no indication of the amount of variety that exists among types of teaching aids available

to the groups. In the field investigation, it was apparent that, as one moves from the more acculturated to the less acculturated groups, such variety diminishes. This not only applies to classroom teaching aids but also to pictorial material available outside school. The investigator believes that where there is a lack of such variety, frequently repeated use of the same pictorial aid with the same pupil audience may eventually numb visual stimulation and interest, thus limiting the ability to develop pictorial perception in the Western manner. He suspects that this happens to a considerable extent in the Rural Bantu schools and to a somewhat lesser extent in the Urban Bantu schools.

7. Graphic Art Instruction in the Schools

Table 75 shows the proportions of pupils tested who, according to their teachers, receive graphic art instruction (drawing with pencil, crayon or paints).

Table 75 Proportions of Pupils Tested, Who Receive Graphic Art Instruction in the Schools (as Reported by the Teachers)

Group	ZR	TR	ZU	TU	E
Graphic Art	21%	47%	65%	80%	100%
No Graphic Art	79%	53%	35%	20%	-

Table 75 shows that as the Bantu groups become more urbanised, the proportion of pupils receiving graphic art instruction in school increases. The field investigation revealed that the Rural Bantu groups concentrate more on basketry, modelling and the making of articles for the home. One of the Rural Zulu schools was observed to have classes in wood carving.

The Urban Bantu who do no graphic art in school, however, generally have classes in weaving, basketry and other handwork.

The schools teaching graphic art within the ethnic groups tested follow no set pattern as far as allocation of time to the teaching of the subject is concerned. Thus, 4% of the Urban Zulu teachers reported that they taught graphic art daily throughout the school year whereas 40% of the same group stated that they gave drawing or painting once per week for only one term in the year (about two and a half months).

The investigator noted that the Urban Bantu and European pupils who study graphic art in school concentrate more on the making of pictures which often involve the use of linear perspective and tonal effects. The Rural Bantu who have graphic art in school are more concerned with the design of patterns for woven or carved articles to be used in the home.

The investigator observed that the extent to which picture making (i.e., the organisation of objects and human figures in a pictorial composition) was employed as a class assignment largely depended on the interests and drawing ability of the teacher. It was noted that in art classes where pictures were drawn by the pupils, the teacher usually had exceptional artistic ability.

A comparison of scores on several pictorial test items was made for Bantu children who receive g. nic art training and those who do not. (No such comparison was made within the European group because all pupils receive such training in the schools.) The differences between the two groups of pupils were quite non-significant. Thus the type and frequency of graphic art instruction

as taught in the Bantu schools appears to have no signi- effect on the development of pictorial perception as measured by the tests used in this investigation.

8. Educational Background of the Teachers

Table 76 shows the educational backgrounds of the teachers of the pupils in the ethnic groups tested.

Table 76 Educational Background of the Teachers (as Reported by the Teachers)

Group	ZR	TR	ZU	TU	E
Training Course:					
Lower Primary	55%	49%	48%	28%	25%
Higher Primary	33%	49%	46%	61%	55%
Both Lower and Higher Primary	8%	-	5%	4%	14%
Above Higher Primary	-	-	-	2%	2%
No Teacher Training	4%	2%	1%	5%	4%

It will be seen that the general level of the qualifications of the teachers in the different groups corresponds to the pictorial perceptual ability of their pupils.

Inspection of Table 76 also shows that very small proportions of teachers in all groups have no teacher training. Since instruction in the use of visual teaching aids is part of teacher training atall the levels tested, it follows that very few of the teachers of the children in the experimental samples had not been exposed to pictorial methods of instruction. However, this is not to say that the teachers are aware of the problems of pictorial perception which beset their pupils.

Summary of findings

An analysis of the data derived from the Biographical and Educational Questionnaires reveals differences between the groups in respect of a number of factors which are likely to affect the development of pictorial perceptual ability. Most important among these is probably the extent to which the children within the groups are exposed to pictorial material both outside and inside the classroom. This exposure is greatest for the European, greater for the Urban Bantu than for the Rural Bantu, and greater for the Rural Tsonga than for the Rural Zulu. These differences correspond to the differences between the groups obtained on the pictorial tests.

There are also differences between the groups in respect of such factors as residential mobility, religious affiliation and educational qualifications of teachers which probably play a part in producing the differences in pictorial perception between the pupils in these groups.

Among the Bantu groups, some schools provide graphic art classes and some do not; but no difference in pictorial test performance was found between the pupils in these two groups of schools. This would suggest that graphic art training as provided in the Bantu schools does not promote pictorial perceptual ability at least as measured by the tests used in this investigation.

PART III

DISCUSSION OF THE FINDINGS

AND THEIR EDUCATIONAL IMPLICATIONS

CHAPTER 19

MODAL RESPONSES: GROUP AND SEX

In this chapter and the following chapter, the intention is to present an overall review of the results of Part II, which will not just be a summary but, where possible, will attempt to interpret these results. Some attempts at interpretation do appear in the earlier section but in these two chapters it is hoped that the interpretations offered will be more integrated and therefore more comprehensive.

The present chapter deals with the modal responses of the five ethnic groups. It will also discuss sex differences. Chapter 20 will be concerned with the developmental pattern in pictorial perception.

Group Modal Responses

It is to be remembered that one of the objects of the present study was to test the hypothesis that, since Western-style artistic conventions are being used as perceptual stimuli, there will be a direct relationship between perceptual response and degree of acculturation to the Western mode. We should expect the modal response of the white sample to reflect greater pictorial exposure and, therefore, to show greater facility in the interpretation of pictorial material. On the other hand, we should expect the modal responses of the black samples to conform less to the Western norm on account of their lesser familiarity with Western pictorial conventions.

Most of the results presented in Part II confirm the hypothesis. In general, not only does the white sample show considerable superiority in the interpretation

of the pictures over the Bantu groups, but the Urban Bantu are superior also to the Rural Bantu. In other words, there is a definite correlation between the ability to interpret Western-style pictorial material and degree of acculturation to the Western mode.

Notwithstanding the general confirmation of this primary hypothesis of the investigation, a closer examination of the results in Part II shows that not all the pictorial material used produced data that supported the hypothesis. In fact, in some cases it might be thought that the results are at variance with the general hypothesis. An attempt will be made to explain these irregularities. We shall proceed by considering the series either singly or in groups (i.e., where two or more series deal with the same or similar aspects of pictorial perception, they will be considered together.)

1. Perception of Pictorial Depth: Series A, B, and G

Series B:- We shall begin with Series B which deals with the factors of position, size, overlap, tone and also involves the use of a horizon line. The results for this series are in accordance with the general hypothesis. In the case of this particular series, we might express the hypothesis more specifically by stating that, the less the degree of acculturation of the group, the more it will interpret the pictures two-dimensionally and not three-dimensionally. It will assist the later discussion of the results for other series if we try to interpret this finding for Series B more fully.

First of all, it may be assumed that all the children, Bantu as well as European, recognized the objects within the pictures - the man, the huts, the hills. An

exception perhaps is the horizon, represented by the horizon line. The difficulty is the integration of these elements so that the child sees the picture as the representation of an outdoor scene in which the objects have certain spatial relations to one another in three-dimensional space.

In Western Art, at least as presented in this investigation, it might be said that the spatial relations between the objects depicted in the pictures are revealed by certain cues, namely position, size, overlap and tone. In this study we often use the alternative term 'conventions' which tends to carry with it the connotation of a certain measure of artificiality. But, in the case of the Series B pictures, the 'conventions' used are of a highly realistic nature. The positions and sizes of the drawings of the objects are made to correspond exactly to what they would be on the photographic plate of a camera directed towards the scene at the position of the viewer (i.e. the child, not the man in the picture). And, just as there would be overlap of objects on the plate of the camera, so the drawing reproduces the same degree of overlap. The main difference - a big one - between the drawing and the actual scene is the depth factor. In the case of the drawing, the child has to add the depth factor, if he is to interpret the picture properly and deduce the proper spatial relations between the objects depicted in the pictures. Somehow, the child from an unacculturated group tends not to be able to make the necessary jump and so the only spatial relations that he tends to see are the spatial relations between the drawings of the objects and not between the 'real' objects depicted by the drawings.

Series A:- The results for Series A are more difficult to interpret. The first picture, A-1, with a hut drawn in each of the four corners of the picture, presents especial difficulties. When he designed the series, the investigator had in mind the presentation of highly simplified drawings with minimal depth cues, so that the effects of the latter could be studied more or less separately. Thus, picture A-1, it was thought, would involve only the 'position' cue, since all huts were drawn the same size. It was further thought that the greater the degree of acculturation, the more likely it was that the members of a group would choose one of the lower huts as nearest to the viewer. However, as we now know, the tendency to choose one of the lower huts was greater, the more unacculturated the group to which the child belonged.

In Chapter 6, it might be claimed some progress was made towards an explanation of the results for A-1 and indeed the other pictures in the A series. But more requires to be done.

It is most likely that for the European group, position is not a depth cue for picture A-1 - in fact, as stated in Chapter 6, the picture is 'cueless'. This is reflected in the data. More or less half of the group chose one of the lower huts as nearest and half chose one of the upper huts. The members of the sample could not really say which hut is nearest but, being forced to make a choice, they 'tossed a coin', metaphorically speaking, and the result was a 50-50 distribution of choices. Further confirmation of this explanation is to be seen in the data on the reliability of the pictorial tests presented in Chapter 16. The reliability of the data for picture A-1 is probably very low indeed for the European group.

"How do we explain the strong tendency for the Bantu, and the Rural Bantu in particular, to choose one of the lower huts as nearest?" It would appear that they are rather happier in a situation employing minimal cues (in the case of A-1, position only). Certainly the data on reliability in Chapter 16 would suggest a considerable measure of consistency on the part of the Bantu, in particular the Rural Bantu, in choosing one of the lower huts as nearest.

The likelihood is that the Bantu children who chose one of the lower huts as nearest did not all do so for the same reasons. Some indication of this is provided by the variety of responses given to the follow-up question "Why?", although such data cannot always be taken at its face value. (Thus, in the case of the European group, the writer favours the hypothesis that the pupils, in being forced to choose in what was for them a 'cueless' situation, chose at random and, when asked to state "Why?", gave reasons which again were forced and therefore gave no indication of the true situation.)

The writer is inclined to the view that the Bantu children choosing the lower huts as nearest fall into two groups. First, there were those who tended to see the pictures as drawings and not as depicting 'real' huts (see explanation under Series B above); and, if we assume that the Bantu child regards his body as the centre of his physical being, then it would be true that for them the lower huts (the lower drawings) are nearest to them. In other words, although the view box was used with Series A in order to remove the possibility of this type of response, the latter still persisted. It is likely that the same explanation applies to some of the Bantu responses in

respect of the other pictures in Series A.

Secondly, there were those who, unlike most if not all of the European children, did use position as a depth cue. One could imagine that the Bantu child, especially the Rural Bantu, might see the huts as stretching out on a plain, an implied plain, as a result of which the lower huts in the picture would be seen as nearest.

It is perhaps relevant to note that Urban-Rural Bantu differences in A-1 are negligible - a result which does not conform with the general hypothesis of the investigation. Also the proportion of Bantu children choosing the lower huts in A-1 as nearest increases significantly from Standard I to Standard V. In other words, the developmental trend was to move still further away from the Western norm. The results for A-1 are therefore something of an anomaly.

The results for picture A-4 are particularly interesting in that there was no difference between the five groups in their seeing of the lowest hut as nearest. All groups, European and Bantu, did equally well, as many as 92 per cent in each group giving the correct response. It will be remembered that A-4 involves linear perspective as well as position and size cues and it is the theory of the writer that the four huts in this case truly convey the impression of depth to the Bantu (with few exceptions) as well as the European (again with few exceptions). To use the language of Gestalt psychology, the four huts become organised into a very strong gestalt (whole) which possesses the property of depth. The wonder is that as many as 8 per cent of each group, including the European,

should not give the correct response. +

It must be admitted, however, that these explanations are still tentative. They could only be substantiated by a much fuller questioning of the children which the design of the present investigation did not permit.

Series G:- As stated elsewhere, this series on Foreshortening may be regarded as a test in depth perception in that it is largely a matter of testing the child's ability to deal with the overlap factor - in this case not between one object and another but between one part of the body and another part of the same body.

Chapter 12 shows that the pictures and questions used in Series G uncovered very few cases of children interpreting foreshortening as an actual deformity of the human figure - certainly not enough to establish significant differences between the groups in accordance with our primary hypothesis (that difficulty with pictorial perception is correlated with degree of acculturation.) It has probably to be admitted that the test series was not designed effectively enough to answer properly the question

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+ In Chapter 16, it was suggested that some of the 8 per cent are those who saw the huts as drawings only and therefore chose the huts nearest to their eyes, i.e. the huts in the middle, as nearest to them. This explanation would appear to be at variance with the explanation given above in respect of A-1, where it was suggested that many of the Bantu children chose the lower huts as nearest, because as 'drawings', they are nearer to his body. However, it could still be the case that the children viewing the huts as 'drawings' fall into two groups - a fairly large group using the body as the reference point and a smaller group using the eyes as the reference point. In any case, the four huts in A-1, taken as 'drawings', are equidistant from the pupil's eyes and therefore something other than the eyes has to be taken as the reference point.

at issue. As in one or two other series, further questioning was obviously required.

2. The Perception of Pictorial Objects Overlapped by Drawn or Implied Borders: Series D

As shown in Chapter 9, the interpretation of the results for this series encountered even greater semantic difficulties than occurred with Series G, on Foreshortening. On the face of it, a small proportion of Zulu and a markedly large proportion of Tsonga candidates responded in a manner which indicated that they did perceive the figures cut off by the borders in the pictures as being maimed, an interpretation which resembles the 'deformity' response found for foreshortening.

The writer feels that consideration must be given to the argument presented at the end of Chapter 9 which depends on the distinction, already made in this chapter, between objects as drawn and the 'real' objects they represent. If we have a picture of a boy with his hands 'cut off' by a border, then simply as a drawing he is 'crippled' in that his hands are 'cut off'. But, to be very exact, we cannot tell whether the 'real' boy is crippled because there is no representation in the picture of the space where his hands would be if not 'in reality' cut off.

The questioning was not designed to deal with such subtleties and it is doubtful whether the testers used could have carried out an elaborate testing programme designed to produce a final answer to such questions.

3. The Perception of Shadows: Series E

Again it can be said that the relevant Western artistic conventions are 'realistic', i.e., as far as

possible the Western artist depicts shadows so that they closely resemble the 'real' shadows.

Nevertheless, it is apparent from Chapter 10 that a shadow cast on an object (as for example the shadows on the man's face in pictures E-3 and E-4) are more difficult for children to identify than a shadow cast by an object on the ground or a flat surface (as for example the shadows cast by the house, tree and man in picture E-2). The reason is fairly obvious, namely that in the second case there is a much closer relationship between the object and the shadow which it throws than in the first case. Consequently, while the differences between the ethnic groups follow in both cases the pattern predicted by our basic hypothesis, these differences are much more accentuated in the first case than in the second case. The identification of a shadow on the face as dirt, sickness, etc., is much more common among the Bantu than the European.

4. The Perception of Implied Motion Cues: Series H

The cues used in Western Art to imply motion possess an artificiality which makes them unique among the other conventions studied in this investigation. It is easy to see how the artificiality arises. If motion (really a series of events) is to be indicated in one picture or diagram, this can only be done artificially. For example, in the case of the boy turning his head round quickly, the head is drawn in three positions, accompanied by other lines to indicate rapid motion.

It is not surprising, therefore, that differences between the ethnic groups are most significant for this type of convention. The unnaturalness of the convention makes interpretation for the unacculturated almost impossible unless he has experienced some exposure to it.

5. The Perception of Views of the Same Person Depicted in a Panel of Drawings: Series I

This is a recognition test rather than a test of ability to interpret artistic conventions. No more need be said except to note that the responses made by the groups follow the pattern of the primary hypothesis.

6. The Perception of a Complex Picture Involving a Number of Artistic Conventions: Series J

As stated in Chapter 15, this series (really one item) was included to confirm that the responses to artistic conventions, when combined with many other conventions, are of the same pattern as when the conventions are presented in comparative isolation. Confirmation was obtained.

7. Position and Art Style Preferences: Series C and F

There is little point in restating the results obtained for these series. They are presented in Chapters 8 and 11. Also an analysis of the reliability of the responses to Series C is presented in Chapter 16.

From a practical point of view, perhaps the results for Series F (Art Style Preferences) are the more important. Thus it is commonly held by illustrators and teachers that the stick figure style is most suitable for unacculturated viewers because of its simplicity or that the cartoon strip is best understood by them.

The modal responses obtained refute this view. Both white and black pupils prefer the realistic style of presenting the human figure. The cartoon style is more popular with the white sample than with the black and the black urban group in turn prefer it more than the black rural group. Zulus have some preference for the silhouette but all groups reject the stick figure style.

Sex Differences

There are numerous instances of significant sex differences throughout the test data. These were all in respect of cognitive aspects of pictorial perception. No sex differences were obtained in respect of Position and Art Style Preferences (Series C and F).

The remarkable feature is that these differences all occurred in the three Bantu groups, the Rural Tsonga, the Urban Zulu and the Urban Tsonga. And, in all cases, the differences were in favour of the boys. There were no sex differences for the Rural Zulu and only negligible differences for the European group. The position is well summarized in Table 77 which is a reproduction of Table 60 in Chapter 15 and gives the mean composite scores of boys and girls in the five ethnic groups for Series J.

Table 77 Series J Picture. Mean Composite Scores for Boys and Girls in Five Ethnic Groups

Group	ZR	TR	ZU	TU	E
Boys	4.44	5.42	6.06	5.84	6.60
Girls	4.42	4.66	5.44	5.22	6.42
Average	4.43	5.04	5.75	5.53	6.51

The explanation of these results presents a certain amount of difficulty. At first sight, it might appear that age is a relevant factor, Bantu boys being on the average 12 months older than Bantu girls (vide Table 69, Chapter 18). But since the biggest mean age difference occurs in the case of the Rural Zulu (18 months in favour of boys), this is obviously no explanation of the sex differences in the tests. Also, even if we were to ignore the Rural Zulu group and try to explain sex differences for

the other three Bantu groups in terms of the age factor, we would not succeed. For, it is to be remembered, from Chapter 15, that the mean gain in composite score per standard (for the Bantu) is 0.23; and therefore the allowance for one year's age difference can be no more than this figure, which is quite inadequate to explain the sex differences obtained.

The explanation must be found in differences between the cultural environment of the boys and girls in the four Bantu groups. In the case of the Rural Zulu it might be argued that there is a general impoverishment of the environment of both the boys and the girls from the point of view of exposure to Western culture; and this produces little difference between the two sexes as far as pictorial perception is concerned, despite the 18 months mean difference in age. The school will be the main cultural agency and since we have compared boys and girls at the same educational level, their performance on the tests will be the same.

On the other hand, there is evidence that with the other Bantu groups, in particular the Urban Bantu, the boys enjoy a certain amount of freedom as a result of which they get around more than the girls and so become more exposed to Western culture.

These explanations, however, can only be tentative.

CHAPTER 20

THE DEVELOPMENTAL PATTERN IN PICTORIAL PERCEPTION

In this chapter only the cognitive aspects of the development of pictorial perception will be considered. It is suggested that there is little point in trying to add to the discussions of the development of Position and Art Style Preferences which are presented in Chapters 8 and 11 respectively.

For a given ethnic group, the variation in test performance from standard to standard gives an indication of the developmental pattern of the group in respect of the ability measured by the test. Part II of this study presents numerous examples of such data. In all cases where the data suggested a significant development in test performance over the five standards, a regression analysis was applied to measure the level of significance.

A reasonable summary of the results of these analyses is that the general developmental pattern of all groups in respect of most of the test items is one of increasing level of performance from standard to standard. But there are exceptions to this general finding. Also, where the general result holds, there can be variation in pattern from test item to test item and from group to group. However, before we examine these exceptions and variations, there is a more general but rather important question to be considered.

What is the significance of an increase in test performance with standard (or age) for any one group? More specifically - to what extent is it the product of

learning acquired at school and to what extent is it due to influences outside school (general cultural influences)?

It must be emphasized that the present study cannot give an answer to this question. All that can be said is that the development of pictorial perceptual ability will be due either to the influence of the school or to extra-school cultural factors or to both. It is highly probable that both school and extra-school factors play an important part but it is impossible, on the basis of the data presented by the present study, to decide the relative importance of the two. Certainly there would be no point in proceeding to discuss the educational implications of this study, as is done in the next chapter, if the school does not or could not make a sizeable contribution to the development of ability in pictorial perception. The assumption that it can is basic to the general purpose of this investigation.

With this preamble, let us consider now in more detail the developmental pattern. Again we shall deal with the series singly or in groups, without following the alphabetical order.

1. Series J. It will be remembered that Series J consists of one complex picture which incorporates most of the artistic conventions that appear in the other series. As we have already discovered, Series J has the advantage that it provides a composite score for each pupil which can be regarded as an overall measure of his or her ability to deal with Western art. Fig. 14 in Chapter 15 (p.145) shows the variation in mean composite score with standard for each of the five ethnic groups. In all cases, the developmental pattern is one of increasing score, the rate

of increase falling off at the Standard IV and V levels. The relative positions of the five growth curves follow the general pattern of the modal responses for the groups. The European is highest and then follow the Urban Zulu, the Urban Tsonga, the Rural Tsonga and the Rural Zulu in that order.

It is of particular interest that there should be a falling off in the rate of increase of overall performance at the Standard IV and V levels. There is, of course, the distinct possibility that the falling-off is to some extent indicative of what is known as 'a ceiling effect'. In other words, it could be that in the case of one or two of the items, most of the pupils are passing the items before reaching the Standard V level and, as a result, the test items are producing very little discrimination at the Standard IV and V levels. There is evidence of this in earlier chapters as, for example, with some of the shadow items dealt with in Chapter 10. On the other hand, an examination of the growth curves presented in Fig. 14 of Chapter 15 would suggest that the flattening off is not wholly an artefact but is to some extent an indication of a genuine slowing down in the development of perceptual ability. In particular, as is pointed out in Chapter 15, although the score of the Urban Bantu at the Standard V level is the same as that of the European at the Standard I level, the growth curves would suggest that the Bantu performance is not going to rise much higher and certainly will never reach the level of the Standard V European.

This, however, is a generalisation and as was stated earlier, there can be considerable variation in the developmental patterns when we turn to a consideration of individual pictorial test items.

2. The Perception of Depth: Series A, B and G

Series A:- As was obvious when we discussed the modal responses for Series A in the last chapter, it is picture A-1 that presents by far the greatest difficulty. And just as the modal responses to A-1 are anomalous in the sense that Urban-Rural Bantu differences are quite non-significant although European-Bantu differences are highly significant, so there is an anomaly when we consider the developmental patterns of the five groups in respect of this picture. For, whereas the European group, as has been argued in Chapter 19, makes little use of position as a depth cue and would appear to give almost random responses, a considerable number of the Bantu children, 78 per cent on the average, seem to apply the position cue and, what is more, the percentage of children who do this increases from 69 per cent at the Standard I level to 87 per cent at the Standard V level. In other words, with increase in age or standard, the Bantu move further away from the European modal response of a 50-50 distribution of choices (between the upper and lower huts).

When we consider the other pictures, where the cues of size, tone and linear perspective are introduced in addition to the position cue, the normal pattern of differences between the groups is obtained. All groups show that they are influenced by these cues. The differences between the groups are less than for A-1, disappearing completely in the case of A-4 which incorporates the cue of linear perspective. Also the developmental patterns are consistent with the thesis that there is an increasing use made of these cues by all groups as one passes from Standard I to Standard V.

Series B:- This series is a more complex test of the children's ability to use depth cues, involving as it does the additional cue of overlap and the use of a horizon line. The Series B pictures, however, are more typical of the pictures, diagrams or illustrations that a child might meet in an educational textbook.

As far as developmental pattern is concerned, the Series B results are remarkable in that they present only two cases of a significant increase in test performance over the five standards. In the one case, the Urban Tsonga group show a significant increase per standard in the number of successful responses to the question "Which house is nearest to the man?" (It is unfortunate that, owing to a mishap described in Chapter 7, data for the Zulu on the same item are not available). In the other case, the European group show a significant increase per standard in the number of successful responses to the question "What is this?" (the horizon).

It seems reasonable to deduce from these results that, over the five standards of the primary school, the Rural Bantu show no improvement in their ability to see depth in the typical Western diagram or picture. Both school and extra-school factors are exerting no influence at all. In the case of the Urban Bantu, development would appear to be limited in that there was only one case of a significant improvement over standards, namely that of the Urban Tsonga in respect of one of the three items presented (four if we include the horizon).

The high level of the modal responses of the European group at the lower as well as the upper standards would suggest that, for most of the European children

(more than 90 per cent), the ability to perceive depth in pictures is already developed by the time they enter Standard I of the primary school - if not before. The only exception would appear to be their ability, or rather their inability, to interpret the horizon line. Quite apart from the misunderstanding which seemed to arise over this question (see Chapter 7), it is possible that this item was as much a test o. language as of perception.

Series G:- As stated in Chapter 12, no developmental pattern emerged from this series. (The same applied to Series D on Borders).

3. Shadows: Series E

The series on Shadows provided numerous examples of a rapidly rising level of performance in respect of this type of item over the five standards. Variation in developmental pattern for any one item obviously depended on the general level of difficulty of the item for each of the groups. Thus, where the item was comparatively easy for all groups (for example, the recognition of the shadow of the ball), only the Rural Zulu group showed a significant improvement in performance over the standards. But in the case of the more difficult items (the recognition of shadows on the face), all groups, including the European, showed a significant improvement over the standards.

4. Implied Motion: Series H

As was seen in Chapter 13, it was possible to derive a composite score for each child in respect of this series. A regression analysis showed that the ability to interpret implied motion cues improved significantly for all five groups over the five standards. However, as with

the Shadow items, there were inter-group variations on individual items which obviously depended on the general level of difficulty of the items.

5. Person Recognition in Panel of Drawings: Series I

The developmental trend was only slight in the case of this series. A regression analysis applied to all five groups did, however, give a significant result.

As stated at the beginning of the chapter, it is impossible to estimate the contribution of the school in those instances where improvement in pictorial perceptual ability over the five standards was established. Only in those cases, where no improvement took place, can one state the negative result that the contribution of the school must have been nil.

Nevertheless, where improvement took place it is reasonable to assume that the contribution of the school was not inconsiderable. Also, if efforts specifically directed towards the development of pictorial perception were made in the classroom, one might hope not only to accelerate the development process in those cases where improvement over the standards already exists, but also to bring about a substantial measure of improvement in respect of those aspects where at the moment no development exists.

It is on this assumption and with this hope that the following chapter is presented.

CHAPTER 21

EDUCATIONAL IMPLICATIONS OF THE INVESTIGATION

The present investigation has provided numerous examples of gross disparity between the Bantu and the European child in their ability to interpret Western pictorial material. It is the writer's opinion, based on his own and others' experience, that the same disparity is to be found when other African groups are considered. This has important educational implications.

It is universally accepted that, if the material and social conditions of the African are to be improved, this can only be done through education. Also there is general agreement that the best results will be achieved if African education follows the pattern of Western education.

An important feature of Western education is the use of visual aids. Ever since Rousseau, educationists have stressed the importance of first-hand experience, but there are obviously many occasions when this is not possible. Modern technology, however, has produced such wonderful visual aids for use in our schools and higher educational institutions that the second-hand experience they provide proves a very good substitute for the real thing.

Pictorial material, such as one finds in educational text-books, is one form of visual aid. It is obviously not so close to first-hand experience as the film or television and lacks the spectacular appeal of these media. On the other hand, while films and television

remain too expensive for ordinary usage (and at the present stage this certainly applies to African education), ordinary pictorial material will continue to be the primary form of visual aid to be used in the classroom. In fact, there is no doubt that pictures, illustrations and diagrams will still be used in text-books and in the classroom generally, even when films and television have become mundane in educational practice.

If the use of pictorial material is an essential part of the educational process and if many Africans have difficulty in interpreting Western pictorial material (as this investigation has established), it will be seen that two alternatives face the specialist in African education. Either he must design pictorial material to suit the ethnic group or groups with which he is concerned. Or, he must use Western material and ensure that the African children, for whom he is responsible, are trained to understand such material.

Even if the first alternative were theoretically possible, it is not a practical proposition. The expense of providing each ethnic group with its own special pictorial material - both in its text-books and as used generally - would be prohibitive, as many African countries have discovered and as was experienced by the writer in the Congo.

The second alternative, therefore, would appear to offer the only practical solution to the problem. And for the rest of this chapter, the investigator proposes to offer his own ideas on what this approach would involve.

Following standard educational practice, the investigator would claim that there are two parts to the solution of the problem. First, before the African educationist could proceed with any training programme at

all, it would be necessary to obtain some indication of the level of functioning of his pupils. As the present study has shown, this varies with the socio-economic background of the pupils and the stage they have reached in school. The writer would suggest that the tests of pictorial perception, used in this investigation, might prove to be suitable material for this purpose. But obviously, with further experimentation, something better could be devised. (Chapter 22, which follows, deals with some of the inadequacies of the tests used in this study). Secondly, having diagnosed the difficulties of the various groups in his school population, the educationist would arrange training programmes appropriate to the levels of these groups.

Before presenting his own ideas on the items that might be included in such programmes, the investigator should like to make one or two general suggestions for the practical implementation of the scheme as a whole.

Obviously, the support of top-level administrators would have to be gained first if the scheme is to operate successfully. This might come about as a result of the efforts of individuals but is more likely to be achieved if the idea were taken up and promoted by one of the many educational bodies and organisations interested in African education.

Then it is clear that the teachers themselves must be convinced of the importance of this problem and trained to carry out the two main steps involved in its solution, (i) the testing of their pupils to determine their level of pictorial perception and (ii) the giving of lessons directed towards the improvement of their pupils' abilities in this sphere. Such training could be given to student

teachers in the training colleges but there would also be a need for special training courses for the older teachers.

At the same time it would be necessary to prepare not only testing material but also any equipment necessary for the training of the children. Some suggestions for the form such equipment might take will be offered presently. There would also be a need for a booklet setting out the problem of pictorial perception, describing the testing procedures and explaining how the training material should be used.

The investigator will now proceed to give an account of the apparatus and the procedures which he would advocate for training Bantu and other African children in the interpretation of Western pictorial art. Though most of the suggestions relate to line drawings, several may be used when teaching children to understand photographs. The investigator would like to add that he has already experimented with these methods on Congolese adults with successful results.

A. <u>The Portable View Window Method</u>

The problem of explaining how three-dimensional objects are represented on a two-dimensional plane is best approached by having the pupils observe three-dimensional objects through a small portable framed pane of plastic. The details of its construction and a photographic demonstration of its use are given in Appendix II pp. 233-234. After the object or objects have been selected, adjusted (if necessary) for position and observed, the outlines of the object or objects are traced using a china marking or grease pencil on the surface of the window. It is necessary that all observations are made from a fixed position and

this is done by having a peephole in the centre of an arc of heavy cardboard which extends out from the pane toward the pupil.

Once the tracing has been made, a piece of white paper cardboard is inserted in the frame behind the tracing. This gives the appearance of a framed drawing on a white non-transparent surface. The pupils and the teacher then discuss the three-dimensional object or objects and how they appear as a line drawing on a two-dimensional surface.

The portable view window is an excellent teaching aid because it can be moved about easily to suit the nature of the object or scene which is being observed and drawn. A plastic pane is preferable but glass is often more readily available in the rural areas and may be substituted for it. If this device cannot be made or is unavailable, windows in the school room can be used. Dawson (1967a) reports using this latter method in Sierra Leone.

The investigator strongly emphasises that the portable view window is to be used solely to help children understand how depth and other Western conventions of pictorial design are represented on a two-dimensional plane. It is not designed for teaching children how to draw.

Detailed Suggestions for Use of the Portable View Window

The teacher must first evaluate the relative difficulty of the various problems presented by pictorial perception and make a plan that will enable the children to learn in a step-by-step fashion. Once the principle of a particular artistic convention has been demonstrated, with the children participating in various stages of the demonstration, then practice periods should follow The practice periods could be highly instructive as well as entertaining for the

children because they could manipulate the objects in front of the view window and then observe how they appear as line drawings on the transparent pane.

1. The Teaching of Position and Size Concepts and their Significance as Depth Cues

Take two small identical objects and place them on a flat surface, level with the bottom of the frame, so that the one object is a few inches from it and the other at a distance of two or three feet. Next, have the pupils look through the peephole at the objects. Point out how one appears to be bigger than the other, although both are known to be the same size.

Help the child trace the outline of the objects on to the surface of the view frame by looking through the peephole. It will be necessary for the teacher and pupils to exchange positions several times so that the pupils can see how the drawn outlines coincide with the outlines of the objects as they appear on the surface of the view window pane. For younger children, the teacher will have to do most of the drawing.

Next, place a piece of white cardboard or paper behind the pane. This enables the tracings of the objects to appear as a drawing on a flat surface of paper. The children observe the two objects and see that the one lower in the picture is larger and that the one further back is smaller and higher up.

The children then walk around the table observing the distances of the objects from the view window. They observe that they are the same size in their three-dimensional form, yet appear different sizes in the drawing on the pane, the larger being seen as the closer.

Next, the children place the objects at various positions and trace their outlines as they appear on the surface of the pane in order to observe the size and positional relationships of the objects after each manipulation.

2. The Teaching of Overlap of Objects as Depth Cues

In this teaching situation, the teacher uses several small models such as two hills, a house and a man. It is best not to use more than four objects because too many objects confuse the pupils. It is preferable that these models be made three-dimensionally out of clay and placed on sheets of paper enabling one to slide them easily into the required positions. The objects are arranged so that they overlap when viewed by the pupil through the window.

The teacher demonstrates how the overlapping of one object by another signifies that the overlapped object is further away from the pupil.

3. The Teaching of Shadow and Texture as Depth Cues

The pupil should be taught that the closer the object is to the pane of the portable view window, the more discernible and detailed is the texture of the object. For example, the teacher could take two pieces of bark and place them vertically, one within six inches of the window pane and the other some six feet away. The teacher then traces around both objects adding in the texture as it appears superimposed on the two-dimensional plane. The pupil will see that the closer the object, the more detailed and darker its texture appears.

In order to explain shadows and how their shapes and textures are depicted in a line drawing, the teacher fixes a lighted torch (flashlight) in such a position that

the shadow cast by an object can be viewed through the window pane. The object is then placed on various surfaces such as textured cloths or a layer of gravel. For each surface texture the teacher makes a drawing of the texture of the shadow on the window pane. The pupils observe that the closer the viewer is to the object, the more detailed the shadow appears.

The same technique can be used to teach pupils how to identify shadows cast on the human face. A pupil is seated facing the portable window pane through which his entire face can be seen. The torch is affixed to a pole or chair in such a way as to illuminate the pupil's face from a side overhead angle, preferably from the upper right in front of the pupil. The class observes the pupil's face through the portable view window, after which the teacher makes a very simple sketch of the pupil's face, being careful to include the shadow areas. The teacher then demonstrates how shadows alter in shape and colour (grays since we are dealing with line drawings) depending on the intensity and angle of the light source.

4. <u>The Teaching of the Perception of Foreshortening</u>

The teacher places a pupil facing the front of the portable view window and standing in such a position that his body can be viewed in its entirety through the portable view window. The teacher then has the pupil adopt various positions (such as that of standing with one foot upon a chair) so that the parts of the body or limbs overlap each other. Outlines of the poses are traced on the flat surface of the pane and the pupils, by inspection of the tracings as well as observing the model, see the relationship of foreshortening and overlap in linear art.

5. Aerial Perspective

Occasionally pupils look at pictures which present views of objects as seen from above. The perspective involved is what artists refer to as three-point or aerial perspective in that not only do the horizontal perspective lines converge to points on a horizon line but also the vertical lines converge to another point outside the horizon line.

By placing objects on the floor and having the pupils view them from above through the portable view window, the teacher can demonstrate aerial perspective to the pupils. The contours are drawn in the usual way. The demonstration is more suited to Standard V and VI pupils.

6. Further Teaching Experiments Using the Portable View Window

Once the children have become familiar with the process involved in abstracting three-dimensional reality from a simple linear graphic form on a two-dimensional plane, the window pane can be taken out-of-doors and placed on a table; and through the pane the pupils can observe people and objects at various distances. Also a landscape with hills in the distance can be observed for studying depth cues.

It has been suggested that some teachers may prefer to use a school room window for demonstrations. If so, the investigator recommends that a thick poster paint, preferably black, is ideal for tracing the outline of objects on windows as it can be easily washed off. The use of school windows does enable more pupils to participate in the demonstration but has severe limitations because of their fixed positions, height and fragility.

In conclusion, where the pupil has difficulty in perceiving an object overlapped by a border as being 'complete', an object can be positioned in front of the portable view window in such a way that part of it is out of sight, being outside the view frame limits. The image of the part that can be seen is traced off on to the surface of the pane. The child can then observe the drawing within the border of the frame and see that the three-dimensional object could only be partially represented within the frame because the rest of it was hidden from view.

B. The Use of Photography in Teaching an Understanding of Pictorial Cues

1. A Photographic Method for Teaching Depth in Photographs

In experimental work in Zambia, the investigator has experienced some success with the use of the polaroid camera. Students were taken out to observe objects in the distance. They were instructed to point out the objects which appeared closest to them and to give reasons for their answers. The texture, size and position of the objects were also discussed. Photographs of the scene were then taken and a comparison was made between the three-dimensional scene and the photographs.

One particular experiment involved photographing two people and a hut. The hut was over one hundred feet from the camera. One person was positioned standing to the right of the hut at a distance of ten feet. The other person was placed in the foreground, a few feet from the camera, so that his entire body could be seen in the camera view-finder and so that the horizontal distance between him and the hut was only a small fraction of the horizontal distance observed between the hut and the other person.

It was then demonstrated to students that they could not judge which man was closest to the hut by using the cue of horizontal distance, but rather that they had to judge depth in terms of size and position (from the bottom of the picture) of the people in the picture. The students began to perceive that the person nearer to the hut was actually further back in the picture.

This type of methodology can be adapted in many ways when there is a problem involving the understanding of depth in photographs.

2. A Simple Photographic Method for Teaching the Conventions of Design in Line Drawings

The methodology is quite simple but the teacher requires to have access to photographic development and printing equipment. However, this equipment can be of the simplest kind involving only that which is required for contact prints.

The teacher arranges objects on the flat surface of a table and places his camera at a fixed position. He then proceeds to photograph the objects from this fixed position, manipulating the positions of the objects to illustrate the conventions of pictorial depth, texture, etc. The teacher is also careful to mark on the table the exact positions of the objects after each manipulation, so that he may replace them in these positions when he wants to compare them with their two-dimensional representations.

The teacher then makes two prints of each photograph. Taking one of the prints he carefully traces around the objects in the photo with black India ink. Next, using a chemical bleach process (Appendix IV, p.244) he washes out the halftone photograph, leaving only the drawing in India ink. The teacher now has a photograph and an exact

line drawing of each manipulation of the objects used in the demonstration.

The next step is for the teacher to have the pupils observe the objects from the point where the camera took the pictures. Then the photographs of the objects are shown and the teacher demonstrates how photography represents the three-dimensional world on a two-dimensional tonal textured plane. He then proceeds to show how the same objects are represented in terms of line drawings by showing the line drawings he has made from the additional prints of each manipulation of objects.

Some teachers may want to eliminate the step of making line drawings from additional prints. This can be done by placing a sheet of tracing paper over each photograph of the different manipulations and tracing around the objects. If he wishes he can add details of tone and texture using varieties of linear treatment.

C. Field Trips to Observe Three-dimensional Perspective

The writer has found that, in the training of Bantu nurses, one hospital instructed its nurses in pictorial perception through such training methods as walking around the grounds comparing the appearance of rectangular buildings and gardens with sketches of these scenes. The horizon line, whether it could be actually viewed or implied, was pointed out. The instructor demonstrated how the horizon line governs the angles at which objects appear in pictures.

D. The Teaching of Implied Motion Cues

The teacher demonstrates that the direction of motion of objects within a picture can be shown in many ways. Straight lines behind an object are drawn to show

that the object is moving in the same unchanging direction. Curved irregular lines are demonstrated to indicate changing paths of motion. The teacher can find many examples, primarily in cartoon strip. It will be pointed out that implied motion cues attempt to indicate where the object has been and where it is going with in the picture frame.

One very practical method which illustrates implied motion is to roll a ball in a sand tray so that it rebounds from one or two of the sides. The path the ball has followed will leave an imprint in the sand. The pupils watch this demonstration which is followed by the teacher duplicating the observed path of motion with a thin or dotted line on the blackboard.

Another method is following the footprints of a person in the sand outside the school and showing how the path of motion could be represented in a drawing by lines or footprints.

Lastly, the teacher will be careful to explain how words are often used in contemporary cartoon art to express the various sounds one hears when objects are in motion.

CHAPTER 22

CRITIQUE OF THE INVESTIGATION

It would be reasonable to claim that this study has gone a long way towards realising its primary objectives. Nevertheless, it has certain shortcomings, some of which have been indicated in earlier chapters. In this final chapter, the intention is to examine some of the more serious weaknesses of the study and at the same time to put forward some suggestions for future research.

Defects in the present study fall into two categories. First, there are what might be termed inadequacies in the testing procedure and secondly, there are one or two criticisms which might be made of the pictorial material selected for the investigation. It is not always possible to discuss these two kinds of defect separately but we shall begin by considering the testing procedure.

A general criticism of the testing procedure is that it was too rigid or, to use another expression, too highly standardised. It might be argued, by way of justification of the procedure adopted, that a highly standardised procedure was necessary if a valid comparison was to be made of the responses of the groups to the tests. This is undoubtedly true. Also, it is to be remembered that, in addition to the test questions which provided the data for the statistical analysis proper, a considerable number of follow-up questions were put to the children which were intended to provide additional information on the children's interpretation of the pictures. Nevertheless, there is no gainsaying the fact that, in the case of one or two of the picture series,

the results of the testing showed that the time was not yet ripe for using a rigidly standardised procedure

Two series, for which the testing procedure was largely a failure, were Series D on Borders and Series G on Foreshortening. As was pointed out in earlier chapters, the questions asked in respect of these series did not produce responses that clearly showed what the pictures meant for the children. The suggestion was also made in these chapters that something like the 'clinical approach' of Piaget was required. With this apprcach, the tester would have continued to ask questions of each child until it was quite clear how each picture appeared to the child. As one can imagine, it requires a highly skilled tester to employ this method successfully.

Obviously the Piagetian procedure could not have been applied in the present study. Time did not permit it and, with all due respect to the esters, it must be admitted that they were not skilled enough. Clearly in any future investigation of Borders and Foreshortening, it would be desirable - if trained testers were available - to attempt the Piagetian approach. One would hope that, after experimentation along these lines, it might be possible to discover one or two questions for each picture which, when put to the children, would be sufficient to reveal how they understood the picture. One could then revert to a standardised procedure in which these questions would be used on all occasions. Certainly, some standardised procedure is necessary if pictorial perceptual tests are to be devised for use by the teachers in the schools, as was suggested in Chapter 21.

Other minor inadequacies in the testing procedure

occurred, such as the questioning of the children about the 'horizon line' in the Series B pictures and the implied motion cues in Series H. But it might be argued that a more serious failure in the questioning happened with Series A. However, since this might be attributed as much to the nature of the pictures constituting this series, let us begin now to consider criticisms of the actual test material.

It is to be remembered that the picture series were designed with the purpose of presenting the more common Western pictorial conventions as far as possible in isolation, the idea being that the responses of the ethnic groups to each convention or set of conventions could be studied more effectively in this way. Only in the case of the last series were the conventions, at least the majority of them, presented together in order to check that the results obtained for a complex picture were not at variance with the results obtained for the pictures in the other series.

A possible criticism of Series A is that, in the design of its pictures, the guiding principle of presenting the conventions in isolation was carried too far. It might be contended that none of the pictures contained in this series was such as would normally appear in an educational text-book. Picture A-1 could be described as 'a child's drawing' in that no normal adult would draw a picture in this way. And the same could be said of the other pictures in this series.

From the standpoint, therefore, of studying the children's interpretations of the type of drawings to be found in Western text-books, Series A could be regarded as unsuitable. Nevertheless, the reader who has read the

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