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THE EFFECT OF PERCEPTUAL SKILL

ON RFT SCORES:

A CROSS-CULTURAL STUDY

Submitted in fulfilment of the requirements

for the Degree of

MASTER OF SOCIAL SCIENCE

Rhodes University

by

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February, 1977.

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ACKNOWLEDGEMENTS

This thesis is the result of initiative and guidance supplied by my supervisor Mr Bill Page; assistance from Mr Ian Holmes, personnel officer of Murray & Stewart; and Mr Johan Keyter, personnel officer of CDA; the prayers of my parents and friends and God's blessings.

I am indebted to Professor Phillip van der Watt and Mrs Sarah Radloff of the Department of Mathematical Statistics for invaluable advice on statistical procedures.

CHAPTER ONE

INTRODUCTION

The increasing need to select individuals for tasks suited to their personality make-up, has added to the challenge psychology faces of developing tests which can be applied to subjects from different cultures and environments.

Many attempts at such designs litter the history of industrial and cross-cultural personality research. Among those to have survived years of reassessment, is the cognitive style approach developed by Herman Witkin.

Fundamental to Witkin's approach are the Gestalt laws of perception and the realisation that perception is not a passive state in which the organism receives all the stimuli impinging on the sense organs. In fact, perception is seen as a highly active state in which the organism selects the stimuli to which it will respond and react, from the range presented to the receptors. The process of filtering and reacting to stimuli is indisputably linked with factors such as the previous experience of the organism, its motivational state, emotional needs, hereditary predispositions, etc.

The processes have been studied by many researchers and from varying points of view in their attempts to unravel the mysteries of human behaviour. Witkin and his collaborators designed standard stimuli in the visual field and presented those to different subjects under standard and controlled conditions. Witkin's work and that of his successors, still stand in the forefront of cross-cultural

personality assessment.

The most commonly used method of personality assessment used by Witkin, is the rod and frame test (RFT), which requires the subject to disregard distracting features from the visual display and to concentrate on a single item within the field. The result of the task is a measure of the degree to which the subject is distracted by or dependent on the overall display and determines whether he is a field-dependent type perceiving globally, or a field-independent type who perceives analytically.

✓ In terms of Witkin's theory, the way an individual perceives the physical world, is linked to his style of interaction developed with the social world. Hence, Witkin sees child-rearing practices as a major variable in producing cross-cultural differences in perceptual style and hence in personality.

Empirical studies supported the view that in cultures where parents demand conformity and dependency from their offspring, individuals are generally more field-dependent than in cultures where autonomy and exploration are encouraged. Politically "tight" societies developed field-dependence through its authoritarian control, opposite to the loosely organised societies which fostered field-independence. Settled pastoral or agricultural societies stressed group norms and fostered dependency while non-sedentary hunting groups fostered individual self-reliant practices, conducive for the development of field-independence.

Witkin's theory has considerable credibility in contemporary psychology and the extension of his theory through empirical work of many researchers has further enhanced its value. However there are still areas of concern where the effect of confounding variables

have not been overcome. One such important area is the confounding effect, if any, of perceptual skill.

✓ The perceptual skill theorists pose the following questions: Does an individual living or working within an environment yielding constant opportunities for developing skills in the perceptual field, have an enhanced ability to perform on the RFT? If this is so, will the individual give an inflated and unreliable response to the RFT? Obviously an improvement in the perceptual skill of an individual will not alter his personality make-up and if improved skill manifests itself in a more field-independent score, changes in skill will invalidate scores on the RFT.

Attempts to solve the controversy have not been successful, so it was decided to investigate the matter further using a novel combination of variables in the cross-cultural setting. It is proposed that such an investigation would result in more precise statements about the relationship between perceptual skill and cognitive style in the Witkin RFT. Consequently, the theoretical framework of this study is within that posed by Witkin, but looks critically at an area of controversy.

✓ Western man has been found to be more field-independent on the RFT, while the African has been more field-dependent. This research sees perceptual skill as being improved by the constant exercise of perceptual judgements in daily life. Western man's culture daily compels such judgements but that of the African usually does not. What will happen to the RFT score of the African when his daily life does compel such judgements?

CHAPTER TWO

A REVIEW OF WITKIN'S FIELD-DEPENDENCE-INDEPENDENCE

THEORY OF PERSONALITY

During the early 1940's, Herman Witkin and his colleagues conducted a series of experiments concerning space orientation. Tests were devised to create experimental situations in which the importance of the visual or postural factors in the orientation of the vertical could be subjected to varied analysis based on the Gestalt laws of perception.

In the tests relevant to this study, subjects were first presented with a tilted scene and had to set a rod within it, to the true vertical and horizontal. After refining the initial display, a test was designed in which the subject viewed a square frame tilted to left or right. His task was to adjust a rod to the true vertical inside the frame. The rod was tilted independently of the frame. Further research led to the development of a rod-in-frame test presented as luminous displays in a completely darkened room. The subject was strapped to a chair and he too was tilted to left and right. A few years later, the body adjustment part of the test was dropped and the rod and frame test (RFT) finally standardised.

Witkin found individual differences in the subjects tested on the RFT. Despite the tilt of the frame, some subjects persistently set the rod close to the true vertical, while others seemed to perceive the tilted frame as upright and aligned the rod with it (Witkin and Asch 1948 (1)). Witkin proposed that these modes of

perceiving the upright were characteristic of individuals and that it was indicated by the substantial correlation obtained among performances under the different conditions of his experimentation.

Having determined individual consistencies in behaviour and individual differences in perception, Witkin's team investigated a variety of other psychological areas for individual differences congruent with those identified in perception. The evidence led to a substantive theory of psychological differentiation based on the clusters of interrelated characteristics indicating extent of psychological differentiation.

Witkin's research indicated that some subjects failed to differentiate between the background of the tilted frame, while at the other extreme, subjects were unaffected by the background display. They could disembed the rod from the remainder of the field and scored on the differentiated side of the continuum.

From this typology emerged the concept of field-dependence and field-independence, names for the poles of poorly and highly differentiated subjects.

Witkin writes in a report in 1967 (2),

"With the accumulated evidence now available, psychological differentiation has come to serve for us as a construct to conceptualize the particular communality we have observed in a person's functioning in different psychological areas; and we conceive of the individual differences we have found in clusters of interrelated characteristics as differences in extent of psychological differentiation."

In the perceptual domain, greater differentiation is manifest in the tendency for parts of the field to be experienced as discreet from the field as a whole. Lesser differentiation shows itself in the tendency to perceive globally; components of the field being fused with, or embedded in the field.

While Witkin and Berry (1975) see the progression in psychological development as from less differentiated to more differentiated, Witkin (1965) finds no relation between differentiation and ineffective integration of the human system, such as in pathology. Progress towards greater differentiation is one involving the organism as a whole, making for self-consistency in development between the various functional domains of the system.

Relating these findings to personality, Witkin corresponds the field-independent mode (or differentiated) mode of perception with an articulate cognitive style and the field-dependent or low differentiation, with a global cognitive style.

Extensive research has been done into these dimensions and there is general agreement that people with an articulated cognitive style show evidence of an articulated body concept and a developed sense of separate identity. It was further shown that these people would manifest a greater differentiation in their tendency to use structured, specialised defences and controls such as intellectualisation, for channelling of impulses and expenditure of energy.

In contrast, persons with a global cognitive style, and with a global body concept and limited sense of separate identity, are likely to use such defences as repression and primitive denial. Because these defences involve a relatively indiscriminate turning away from perception of stimuli and memory for past experiences, they represent relatively non-specific and thus relatively less differentiated ways of functioning.

In a commentary on the development of Witkin's cognitive style approach, Peck and Whitlow (1975) say it is still to the fore among the modern theories which study human behaviour through

perception. The most significant contribution made by this approach is in the field of cross-cultural psychology where the search for cultural universals as well as the associated search for new cultural and behavioural phenomenon was given additional tools for its search.

P.K. Oltman (1968) who worked in the Witkin laboratory, developed a portable version of the RFT (hereafter referred to as the PRFT). It eliminated the need for a dark room and greatly reduced the size of the visual display so that it could be housed inside a conveniently small tube and used under daylight conditions in the field. Although the average size of errors was reduced by the smaller display, Oltman established that the score obtained on his PRFT was reliable and highly correlated to scores from the standard RFT. The PRFT also shows the same pattern of relatedness to other measures of differentiation with which the RFT had been correlated.

Witkin (1967, 3) says the PRFT is uniquely suited to the special demands of cross-cultural research. He adds that the concepts and methods that have come from extensive research on cognitive style, have been applied with profit to cross-cultural studies of psychological development.

In an exhaustive report on the current status and the development of differentiation theory and research on cognitive styles, Witkin and Berry (1974) outline four broad areas which account for the origins of individual and cultural differences in psychological differentiation.

According to Witkin and Berry, socialization, as a universal functional prerequisite for continued human social existence and transmission of culture and its norms, will naturally be a key

factor in such research. The other variables which were implicated in cross-cultural studies of differentiation, are sociocultural "tightness", ecological adaptation and biological effects. They are treated as complementary antecedent variables.

There is a vast body of evidence to support Witkin's formulation that cognitive style and socialization practices are closely linked. Some of the major contributions came from Berry (1966), who compared North American Eskimos with West African Temne; Dawson (1967) who compared two cultural groups Temne and Mende within the same country, Sierra Leone; and Okonji (1969), two groups along the urbanization continuum in West Africa. The workers all found that cultures which encourage parents to instil conformity and social dependency in their children will produce individuals generally more field-dependent in cognitive style than in cultures where the norms encourage early autonomy and exploration in children. It must be remembered, as Minturn and Lambert (1961 see Witkin and Berry 1974) pointed out, that such variation lies as much within cultures as across cultures.

The second variable Witkin and Berry discuss, is social "tightness" or sociocultural stratification, which is related to the degree of hierarchical structure among sociocultural elements in a society. At the loose end, a society has very little recognised or permanent political control, and at the other extreme a society will have a theocracy or an aristocracy. A tight society places many forms of constraint on the development of the individual and it maintains an almost continuous socialization on him, pressing for conformity. In a loose society, the individual's development is not so set or controlled.

Berry introduces the third variable, ecological adaptation, by stating that the characteristic relationship between man and the land he occupies may be a major factor in the kind of behaviour he develops. The classical comparison here is between the demands for existence placed on members of a hunting and gathering type society and an agricultural-pastoral group on the other hand. Group pressures are far more advanced in the settled pastoral groups than in the individualistic and self-reliant hunting societies.

Nutrition and diseases such as kwashiorkor, have received particular attention from Dawson (1972 b, 1969 b, 1967 a, 1967 b), one of the pioneers in the biological approach. His finding indicated that a protein deficiency is more common in agricultural societies. Low protein levels are associated with the balance of androgen and estrogen. Reduced androgen (male sex hormone) levels, tend to lead to inadequate male roles provided by the fathers and feminization developing amongst the boys, leading to a field-dependent personality type.

Witkin and Berry draw together the results of research into these four variables fundamental to the genesis of psychological differentiation as follows. Individuals from hunting and collecting type of societies tend to score more field-independent on tasks of perceptual differentiation. They contrast sharply with individuals from a sedentary agricultural type settlement. Hunting groups have a field-independent perceptual style adaptive of their ecology, greater personal autonomy with its consequently higher sense of separate identity. Child rearing practices among hunting groups foster independence, autonomous personal functioning and emphasizes self-reliance and achievement. The social orientation which develops

is somewhat impersonal when compared with that of field-dependents. Because of the mode of living, loose social pressure and authority operates. On the biological side, protein intake is adequate and there is no androgen reduction. Genetic selection favours high differentiation.

In the case of the sedentary agriculturalists and pastoralists, lower differentiation is fostered by all four variables. These societies are typically tight in social pressure and authority. In the close-living communities predominating agricultural or pastoral sedentary settlements, conformity is a valued characteristic. Socialization practices stress obedience and responsibility. These factors foster a field-dependent style and a less developed sense of separate identity. The group exercises more control of the behaviour of the individual and conformity is further stressed by the regulation of the use of accumulated agricultural products essential for survival. Witkin says there is evidence that the protein intake of agricultural societies is often less than that of hunting groups. This could easily lead to a reduction in body androgen levels and the consequent upset of the delicate androgen-estrogen balance could lead to femininity amongst males and associated traits of dependency. Genetic selection will complete the process by favouring selection against differentiation. Dawson (1967 vol 2) postulates that the protein deficiency disease, kwashiorkor affects the liver which in turn results in a hormone disturbance involving in males gynaecomastia, testicular atrophy, and femininisation; all contributing to the development of a field-dependent perceptual style.

It is already obvious from the foregoing, that differentiation theory has its place in the cross-cultural field. Cross-cultural

psychology maintains its claims to existence in that it offers techniques whereby cultural universals can be sought as well as cultural differences identified and proposed for analysis to give clearer insight into the complexities of human behaviour and the origins of differences. Any new technique that extends the reliability of cross-cultural measures has a right to existence if it stands up to the rigid tests of transportation across cultures.

Witkin and Berry (1974) see the value of differentiation theory in cross-cultural psychology as contributing positively in at least three broadly defined areas. In its search for universals, cross-cultural psychology benefits from differentiation theory which refers to structural rather than content properties of the individual. Thus it is ontogenetically more stable, following a typical developmental progression. A search for structure not content, forms the reliable and more feasible elements in the search for universals in human behaviour and here differentiation theory fits well into the standards set by cross-cultural psychology.

The organismic emphasis of differentiation theory, that manifestations of more or less differentiated functioning in various psychological domains are diverse expressions of an underlying organism-wide process of development towards greater psychological complexity, has implications for cross-cultural research. Firstly, the level of differentiation is a key to the identification of the individual's overall level of psychological differentiation. Also, because of the broad context in which the search for sources of a given psychological characteristic is placed, and because the development of differentiation of the perceptual function such as field-dependence is caught up in the differentiation of the organism as a

whole, it becomes necessary to look at experiences quite distant from the perceptual domain to understand sources of individual differences in the cognitive dimension being scrutinised.

Having discussed the role socialization plays in the development of different levels of differentiation, or various cognitive styles, it is evident that the differentiation framework is a convenient one for studying socialization effects across cultures. Differentiation theory offers both a conception and a methodology for scientific inquiry into socialization across cultures. With a given pattern of child rearing, differentiation can produce a reliable indication of the personality type likely to be found in a society while the nature of socialization can be predicted from a knowledge of a culture's cognitive style.

Having cited empirical evidence for the reliability and validity of the cognitive style approach to the study of personality and associated aspects of the ontogeny of particular human behavioural traits, one cannot be scientifically naive and not look critically at the fundamental postulates and methodology employed in the field by researchers using Witkin's methods. Evidence cited seems to argue convincingly for the continued use of this approach in cross-cultural research.

Because of the intricate complexities of human behaviour and the massive areas still unexplored and defiant of understanding by the higher mechanisms of the organism itself, the tests for continued use of an approach in psychology and particularly in cross-cultural psychology, must not be so severe that everything gained and thus far understood, is rejected because of certain violated assumptions in scientific method or because of confounding exceptions

to universal or general rules.

Witkin (1967, 3) makes the succinct point on the dispute about the design and requirement of "culture free" tests by saying that the cognitive style tests are not culture free in a sense as they deliberately seek to assess cultural influences rather than exclude them. As the research task is meaningful to a wide variety of cultural groups and the influences of degrees of verbal development is avoided as a test factor, the field-dependence tests are "culturally appropriate". These tests have been successfully applied in a wide range of cultures, a variety of indigenous groups differing in mental ability, sex and age. Results, especially correlation controls, have been good.

Peck and Whitlow (1975) conclude in their assessment of the tests of field-dependence-independence, that the stability of these tests is amongst the most impressive in the whole of personality research. Retest correlations were frequently higher than 0,85 with short intervals of a few years. Even after 14 years Witkin, Goodenough and Karp (1967) found a retest correlation of 0,66. While the retest reliabilities and consistent demonstration of high correlations attest to the genuine durability of the cognitive styles measured by these tests, the data for correlations between the various tests themselves is less impressive.

Vernon (1972) in a factor analytic study found that RFT in particular may in part be measuring different factors from the other measures of differentiation. Both Vernon and Peck and Whitlow (1975) conclude that an adequate assessment of field-dependence would seem to require a battery of tests.

Peck and Whitlow (1975) however end their discussion of Witkin's measures by concluding that it probably elicits cognitive intellectual

factors, not personality factors. Serpell (1976) says Witkin and his colleagues have developed a set of standardized tests which seem to measure a common underlying psychological factor within Western populations. "How far this factor is an aspect of intelligence, of spatial ability or of cognitive style, remains controversial." (1976: 51). Serpell notes in favour of the Witkin research, that the individual differences seem to persist over time and that they seem to be related to aspects of motivation such as social conformity and projective fantasy. The origins of these differences in Western population may well have to do with modes of parental upbringing. Serpell is further sceptical of the long list of evidence from many studies cited by Witkin to support his findings. He subtly suggests that Witkin might be trying to vindicate a conceptual model developed in the West, by seeking correlations in other cultures. Serpell questions the role of perceptual skill which he feels might be the dominant factor tested in some non-Western societies. He adds, "Further research will be needed before the issue is settled." (1976: 53).

Before elaborating the perceptual skill argument, we look at other criticisms which arose specifically from cross-cultural work in Africa and the most relevant for this study is the "sensotype hypothesis" and the ones which regard cognitive style measures as measures of certain intellectual abilities.

Wober (1966) joins the situational effects of environment with style of living and culture to question the mode of perception stressed by Witkin and associates. Wober notes that the research of Witkin on differentiation, required an analytic approach to visual material. Visual material, he said, is the currency of communication

in an American Western society where these tests were developed.

Wober questions the validity of an assumption that the visual world and transactions therein will be equally important in Africa. Wober linked findings by other researchers that performance in some African cultures on visually specialised tasks was poor and sometimes improved with education, to the theory that in some African cultures considerable emphasis is placed on sensory phenomena other than visual.

This brought him to his concept of sensotypes which is the pattern of relative importance of the different senses by which a child learns to perceive the world and in which pattern he develops his abilities. These patterns may be predominantly visual in one culture, while in another, the auditory or proprioceptive sense may have a much higher relative importance.

Using a number of accepted tests for field-dependence, including the RFT, Wober found amongst his Nigerian subjects, that proprioceptive data were more important in RFT performance, especially with the tilted chair. Chair tilts were proprioceptive variations in the tests and frame tilts were visual variations.

The subjects' proprioceptive skills compensated for the proprioceptive variations in the tilted chair, but they were not nearly so capable of dealing with a visual displacement.

Wober's main attack on Witkin is through the statement by Witkin that analytic style in one sense modality is likely to correlate highly with analytic style in another sense modality. Wober found "striking" interrelationships between EFT, Kohs Blocks, Ravens Matrices and education. These were all indices of demands on analytic ability in a visual field and this ability was evidently strengthened by education. However, he found that the RFT did not

correlate significantly with any of the other tests and it was particularly independent of the effects of formal education.

RFT results showed a correlation with job efficiency ratings made by the managers of the Nigerian subjects. From this Wober drew support for his claim that abilities, not clearly detectable by visual type tests, were elaborated amongst Nigerians. This elaboration was manifest in the RFT results. He quotes in support the result obtained in Ghana by Beveridge who considered an elaboration of the proprioceptive realm over the visual in his subjects.

Wober (1967) extended his research into proprioception by attempting to show that in the sensotype common in certain West African cultures, proprioceptivity is relatively more elaborated with respect to visuality than would be the case in Western cultures. West Africans would score better on tests where proprioception was important relative to scores of Westerners on similar tasks and they would approximate more towards a Western group in whom proprioceptivity was highly trained.

Wober gained support for his hypotheses from the results of RFT scores by his Nigerian subjects compared with scores taken from American samples by Witkin and Asch (1948) and Comali et al (1959) as well as highly trained dancers and normals tested by Gruen (1955). This procedure opened Wober to attack by Witkin and Berry (1974) especially on the prediction that Africans would be more field-independent than Euro-Americans on tasks featuring proprioception. The first criticism of Wober's method was that the RFT apparatus he used on his Nigerian sample, was only one-third the size of the apparatus used with the American samples in the Witkin and Asch (1948) and Gruen (1955) studies. Wober overlooked the findings of Nickel

(1971) and Oltman (1968) that RFT scores were smaller when frame and rod size was diminished even if the angle of regard was kept constant, as the influence of the tilted frame on perception of the position of the rod decreased with size.

Wober also seems to disregard the confounding "E"-effect which led Witkin (1967) to eliminate body tilt from the RFT altogether. It was the "E"-effect, writes Witkin and Berry (1974), which makes the rod appear tilted towards the body. There were individual differences in the "E"-effect unrelated to individual differences in field-dependence-independence. "The presence of the "E"-effect confounds interpretation of test scores for the body tilted condition of RFT. Because of the confounding influence of the "E"-effect, the results Wober reports for the RFT body-tilted condition cannot be taken to speak in any clear fashion on differences in field-dependence between Nigerians and Americans" (Witkin and Berry 1974: 26). They also feel that a more complex conceptualization was required than the one which guided Wober's studies.

Serpell (1976) points out that unless the presentation of tasks was controlled exactly across the two groups (Nigerians and Americans), differences in performance may be due to the tilted body condition being objectively easier in Nigeria and/or the tilted frame condition being objectively easier in America.

Siann (1972) found that Zambians scored considerably better on the proprioceptive part of the RFT, i.e. when body was tilted, than on the body erect trials. However, non-Zambians also scored better on the chair tilted test. Her findings showed no significant difference between the effects of body tilt on Zambians and non-Zambians. However, the low correlations between RFT and EFT add to her concluding

that the concept of field-dependency as underlying performance at RFT and EFT, may not be particularly relevant in Zambia. Her results further did not support Wober's concept that West Africans have a different sensotype to Americans for her sample of Zambians and expatriate children.

In the work of Weiner (1955) there seems to be a measure of support for Wober's contention that a culture could produce a sensotype or mode to the extent that such sensotypes will be acquired either through socialization or as a necessity within the environment. This will make the sensotype a learned response set. Weiner showed that through training he could help subjects to experience their body postures in a new way, a new mode in which body feelings were emphasized. Consequently they were better able to determine their own position in space and this allowed a newly learned feeling of where gravitational upright was in relation to the experienced feelings in his body.

While Weiner concludes that new experiences may play an important role in the development of a new mode of perception and that he found striking individual differences in the degree to which individuals could learn to restructure their preferential modes of orientation in perceiving the upright, his results lose much of their value by not comparing the improvements relative to field-dependent-independent types. It may well be that field-dependents would show less improvements than do field-independents so negating the overall effects of his findings.

Witkin (1948 in M. Weiner 1955) combined intellectual information with demonstrations and practice in becoming better informed about bodily cues. He found that the training procedures did

produce improved spatial orientation, but that it rarely altered the subject's perception of the situation.

The effect of education on spatial perception and the close similarity between features of the Witkin measures with certain tests of intellectual ability, have added to the controversy surrounding the field-dependency measures.

Gerda Siann (1972) sought to correlate EFT with education. She tested Zambian and non-Zambian residents of Zambia to test for correlations between EFT and education and to see whether higher scores in the West obtained by boys on EFT and RFT, related to task specific variables such as differential inter-sexual levels of practice and expectation, rather than global mode of articulation. She said in the West boys are far more likely to attend classes in subjects where spatial ability is involved, such as technical drawing and woodwork. She found the EFT to correlate better with a verbal test than with the RFT on Zambians. This result, Siann says, is more consonant with a general educational ability on the EFT than with a personality mediated account of a basic underlying analytic approach.

As regards sex differences, non-Zambian boys scored far better on both RFT and EFT than non-Zambian girls, but there was no significant difference between the scores of Zambian boys and girls on both tests. A further hypothesis that there would be an interaction between type of stimulus and sex amongst Zambians on the sex significant shapes task, was confirmed.

On the value of the Witkin formulation, Siann concludes, "These considerations indicate that the concept of field dependency as underlying performance at RFT and EFT may not be particularly

relevant in Zambia" (1972:95). To summarise her position: EFT has a high content of general educational ability and in the West, the higher scores of men on tests of field-dependency, may be due to task specific effects.

Taking a critical but objective view of the results of Witkin's pioneering work, Peck and Whitlow (1975) conclude that in the area of personality theory, Witkin and his associates have consistently produced some of the highest correlations with respect to reliability and validity. But they caution as follows, "It is precisely the magnitude of these relations that makes one suspect that we are not dealing with personality factors at all, but cognitive, intellectual factors" (1975:94).

In support of the claim that Witkin's measure might be testing intelligence in some form or other, the authors point inter alia to the rather obvious fact that the RFT is frequently used with the Draw-a-Person Test; the latter developed and still commonly used as a test of intellectual ability. The RFT, EFT and DAP tests have been shown to correlate highly. Vernon (1972) even suggests that in research on the FD-FI dimension, a battery of tests consisting of the RFT, EFT and DAP tests form the most appropriate combination to elicit a series of responses which he terms the Perceptual Index.

Peck and Whitlow (1975) summarise the findings of a number of investigators critical of Witkin. Field dependency measures have shown a most consistent correlation with measures of intelligence, such as DAP. Witkin (1965) recommended the use of the Weschsler Intelligence Scales as an adequate substitute for a field dependency measure if not available, because of the remarkably high correlation between the EFT and some Weschsler subtests.

But still the issue is not clear. Peck and Whitlow cite the research of Minard and Mooney (1969), who studied the relationship between the Perceptual Index and emotionally loaded words and could not contribute their results to intellectual factors. Vernon (1972), found that with the effects of intelligence eliminated, field-dependency measures had little or no relationship with a wide range of other personality measures, but some low to moderate relationship with general interests remained.

"Thus how far many of the findings of the Witkin group can be accounted for simply in terms of intelligence without recourse to concepts, such as differentiation, remains an open question (Peck and Whitlow 1972:93).

Witkin's defence against these criticisms was that his measure correlates highly with only a limited number of intellectual measures. Correlation with verbal items is particularly low and Peck and Whitlow concede that in light of Witkin's defence, it can be said that field-dependency tests do not measure overall intelligence at all, but only one aspect of performance on a limited range of tasks, an aspect which both kinds of tests just happen to have in common.

Wachtel's position (1972) is in conflict with the above concessions. Certain studies have shown high correlation with verbal measures and Wachtel said even if field-dependent and field-independent subjects do differ only on non-verbal tests, then the greater total stockpile of intellectual resources could still account for any differences observed. (Peck and Whitlow 1975:93).

Peck and Whitlow feel it most useful to regard Witkin's measures as intellectual measures. If so, they say, many of the findings on

field-dependence and related constructs fall into place. "In particular, the findings of Witkin et al. (1967), on the sequence of developmental stages of field-dependence from infancy, and the suggested constitutional determinants, are entirely consistent with viewing the Perceptual Index measures as indirect measures of intellectual ability" (1975:95).

The cognitive skill argument, which seeks to oppose Witkin's theory, placed great value on the enhancement of certain skills, such as spatial ability, identification of and familiarity with geometric shapes. Such skill, it is proposed, is developed by processes of manipulation of objects or figures which will allow the subject an increased sensitivity in his cognitive style. Certain forms of education such as mathematics, architecture, and practical subjects such as woodwork and other aspects of exposure to the carpentered environment, could be conducive to developing skills which would manifest themselves in a field-independent response on tests, but not have such an effect on the individual's personality.

Thus certain forms of Western education and employment could mature perceptual skills which by comparison would remain more or less "dormant" in the non-Western man and be less developed in the type of educational setting where spatial and geometric skills (and others) are not subject to specific training. The matured powers of discrimination will manifest themselves in the area of extracting an item from a field and the discrimination will reduce the confounding effect of the field in tests such as the RFT, EFT and Kohs blocks.

Berry (1966) in his much quoted study of Temne and Eskimo perceptual skills, is one with Biesheuvel (1959) who said through the medium of educational practices and other social pressures, a

culture produces the kind of personalities that are adapted to its requirements. Already one can see filtering through this thinking, the possibility that a combination of culturally specific practices and environmental adaptive requirements are crucial in the process of maturing levels of perceptual skill. Although Berry would not necessarily agree, one could here depart to suggest that such factors would differentially mature the perceptual skills of which the organism is capable and that they might therefore not be related to personality or to cognitive style. The question is then whether RFT, EFT and associated measures test cognitive style in such a way that the different levels of matured perceptual skill does not become a confounding factor in the tests when it is used cross-culturally or even within groups in the same culture.

Berry concludes his paper with the statement that it seems ecological demands and cultural practices are significantly related to the development of perceptual skills. It has been shown he says, that perceptual skills vary predictably as the demands of the land and the cultural characteristics vary. By this statement, Berry is not arguing in favour of the perceptual skill theory which is in opposition to that put forward by Witkin and collaborated in by Berry. Implicit in his statement is the fact that such skills and associated psychological factors are developed congruently and that the resultant cognitive style is a product of the culture and a reliable index of personality. He writes,

"We are not arguing for the environmental determination of all perceptual skills: the factors discussed are not considered to be either necessary or sufficient for the production of the observed differences. It is, however, considered that these cultural and ecological factors played a significant role in their determination."
(Berry 1966:228).

The whole question of perceptual skill confounding the close association, cross-culturally at least, between cognitive style and personality, rests largely on the extent to which perceptual skill in its development is culture linked and to what extent 'learning-training' can improve such skill beyond the constraints of culture.

The question of age and especially sex difference in relation to the level of psychological differentiation, has been subjected to extensive research.

Witkin, Goodenough and Karp (1967) found a progressive increase in field-independence up to the age of 17, whereafter there was marked stability. Witkin, Dyk, Faterson, Goodenough and Karp (1962) noted several reports of sex differences on tasks measuring the analytical cognitive approach. In short, men were said to be far more field-independent than women. Sherman (1967) points out however, that sex differences were not commonly found until the early school years as also reported by Macoby (1966 in Sherman). An increment in the sex difference she says, apparently occurs in adolescence.

This seems to be a significant finding and one which has not been adequately explained. Witkin et al (1954 in Sherman), concluded that sex differences in their findings were cultural in origin. Other attempts refer to greater dependency and conformity in women. After a review of literature on the sex difference in mathematical and other abilities, Sherman says the sex difference in spatial perception might be traced in part to differential learning. It is, she adds, difficult to know whether the sexes in fact receive differential practice. But, the increased disparity during adolescence in field-independence and presumably performance on spatial tasks found by Witkin and co-workers (Witkin et al 1954) occurs at a time of increasing sex-role differentiation. Sex typed activities

in males might well be sources of differential practices. She says differential learning by virtue of sex-typed activities is consistent with the findings of Macoby (1966) that cross-sex-typing is associated with optimal intellectual development in women.

Sherman (1967) concludes that the evidence cited in her report tends to cast doubt on the adequacy of the construct of analytical cognitive approach. The question of the degree to which spatial skill can be learned has a potential significance beyond explaining results of studies in analytical cognitive approach.

Serpell (1974) undertook a study of the sensotype hypothesis and compared the performance of eight-year-olds in Manchester and in Zambia on a number of copying tasks in various media. Zambian boys were better at reproducing a model in wire, a skill similar to a game they played, but Manchester children were superior in copying with paper and pencil. He notes,

"Contrary to sensotype theory, wire modelling appears to be a specifically African skill which is primarily guided by visual cues. Thus it appears from this study that the effect on Western culture of that great invention by Gutenberg, the printing process, has been rather more limited than Wober (1966) supposed. It is the specific medium of patterns on paper that proves difficult to interpret and use in non-Western cultures, rather than visual media as a whole." (Serpell, 1976: 93-94).

Even as regards illusions, Serpell (1976) says it might be expected that people whose normal experience is based on different physical environments will differ in susceptibility to the pictorial illusions. There is good evidence, he proposes, that certain more elaborate illusions are dependent for their effect on experience of a 'carpentered world' in which straight lines and right-angles are often viewed from various vantage points. In fact, Segall, Campbell and Herskovitz (1966 in Serpell) proposed that the ecological validity

of various cues in their illusion figures may vary independently across different physical environments. Discussing sensotypes and the skill argument, Serpell notes, "...those cultural groups which favour the socialization techniques theoretically calculated to promote field-independence are generally more similar to the West in the perceptual skills which their physical habitat and artistic traditions promote" (Serpell 1976:46). Later, after further discussion on illusion, he says the impact of the environment on the individual's perceptual development must be supposed to occur in the very early years of life.

Serpell then quotes Weaver (1974:21) who said, "...that it would be inappropriate to rank subjects carpenteredness on the basis of their current geographical residence in that it was quite possible that they had spent their early childhood in another locality or had travelled to other localities, where the visual ecologies were different."

Already it seems that the effective developmental period for cognitive style is being systematically confined to a short period early in the life of the individual and if such cognitive style is related to personality, further measured changes in "style" ought not to be taken as changes in personality or perhaps not even as real changes in that style. This means that if measured style as indicated on the Witkin measures of field-independence could be altered by training in perceptual skill, the question immediately arises whether a change in skill or style is being measured.

Siann (1972) states her criticism of Witkin's formulations more concretely than Sherman. She accepts the fact that correlations between RFT and EFT scores in the West support the idea of an under-

lying variable predicting performance at these tasks, but the non-correlations shown in Africa by certain studies, including her own, did not support this approach. She suggested that in the West the higher observed scores obtained by boys at tasks such as RFT and EFT may be related to task specific variables such as differential intersexual levels of practice and expectation, rather than global mode of articulation. In the West, boys are far more likely to attend classes in subjects where spatial ability is involved, such as technical drawing and woodwork. While Witkin in effect states that the ability at spatial tasks is intimately related to the personality of the subject, Siann considers that her findings indicate that the concept of field-dependency as underlying performance at the RFT and EFT, may not be particularly relevant in Zambia, where her research was conducted.

Serpell's (1976) statement on the role of skill in cross-cultural research is suitable here to resolve the argument. He says in the USA, where the urban samples studied have experienced a relatively homogeneous physical and educational environment, there will be little variation from one individual to another in the level of perceptual skill required by EFT (and I would suggest RFT). Hence any individual differences within the population, says Serpell, are more likely to reflect differences in cognitive style than differences in perceptual skill. In African samples, other than highly select, educated groups, the perceptual skill required by EFT (and RFT) will tend to be much more unevenly distributed. "Thus by comparison with USA studies we should expect to find individual differences in Africa on EFT arising relatively more from differences in perceptual skill" (Serpell 1976:53).

We have thus two main thoughts on the issue of skill. The Witkinian idea that skill is a function of the environment which in turn is related to socialization patterns in such a close way that it produces a predictable cognitive style which in turn is a reliable measure of field-dependency, a dimension of personality. Any differences in skill due to changes in the environment will be too slight to alter cognitive style or a subject's perception of the situation presented in his field-dependency measures.

The skill approach postulated an enhancement of perceptual skill through differential training which transcends the limitations set by socialization or culture as determining features. Such training could well enhance performance on field dependency measures with consequent adverse effects on the reliability of these measures in eliciting durable cognitive style values to be indexes of personality dimensions.

The standpoint adopted by the present writer is an extension of the skill approach.

South Africa provides an ideal situation for testing the skill hypothesis across three cultures, Whites, Coloureds, and Africans. It is possible to test members of these three groups who have contrasting cultures and have yet been exposed to the same environment and therefore degree of carpenteredness. The Coloured group does not, strictly speaking, represent a third culture as its culture is really made up of components of both the White and African cultures. It fits the description of a deprived group both socially, economically and culturally as they identify culturally with the Whites, yet live and work with the Africans, under similar restrictions and domination by Whites.

In terms of Witkin's field-dependency theory, the Africans, who still to a large degree cling to tribal values even though they might be urban-born and job-skilled people, will test more field-dependent than Whites who are fully Westernised. The prediction would also be that Coloureds having more Western values than Africans, would test more field-independent than Africans, but more field-dependent than Whites.

In terms of Wober's sensotype hypothesis, the Africans would test better on a test of proprioception than Whites and Coloureds and the Coloureds may be better than Whites. It was decided to effect some measure of control over intellectual factors by selecting job categories where the intellectual level would be relatively constant and also to have a degree of sampling bias in standard of education so that a further degree of control over this variable is exercised. With the large discrepancies in the standards of education received by the three race groups, this control in sampling is only relative.

Following the skill argument, it is proposed to select three groups of highly skilled artisans, White, African and Coloured and compare their responses on the RFT. A fourth group, unsophisticated, unskilled urban-born Africans, will be included as a control. Certain modifications will be made to the standard RFT apparatus to include tests for proprioception and for perceptual skill so that meaningful comparisons can be made.

It is surprising to note from literature, the dearth of comparative studies between controls and people from jobs where a high degree of perceptual skill is fostered. This research sought its sample from Africans and Coloureds in the building trade where keenness of the eye is a highly significant skill in masonry and carpentry

and the Whites from a motor assembly plant where inspection of surfaces and body parts required a high degree of practice in the visual field. The control group will be drawn from unskilled labourers who however conform to the rest of the sample in being urban-born.

Drawing together the Witkinian and Woberian hypotheses, the Whites ought to test more field-independent than the other groups, the Coloureds slightly more field-independent than the Africans and the two African groups would be equally field-dependent. On tests of proprioception the two African groups would be equal and would score better than Coloureds and Whites with Coloureds perhaps better than Whites.

This study attempts to investigate whether the perceptual skill trained in the building trade would not enhance to such an extent, a subject's ability to set the vertical, that Africans and Coloureds would test as field-independent as Whites drawn from a motor assembly plant. This would reflect on the reliability of the RFT and indicate that it in fact tested perceptual skill and not field dependency on this sample. The groups will further be tested and compared on measures of perceptual skill and proprioception developed as modifications of the standard RFT apparatus.

HYPOTHESES

The following hypotheses will guide the research:

- H_{o1} - there will be no significant difference between scores of the four groups on task 1;
- H_{r1} - there will be no significant difference between scores of groups 1, 2 and 3, but they will differ significantly from scores of group 4 which will yield a higher (more field-dependent) score on task 1.

- H_{O_2} - there will be no significant difference between scores of the four groups on task 2;
- H_{r_2} - there will be no significant difference between the scores of groups 1, 2 and 3 on task 2, but they will differ significantly from scores of group 4. The latter group will have a higher score, reflecting less perceptual skill.
- H_{O_3} - there will be no significant difference between the scores of the four groups on task 3;
- H_{r_3} - because this is a test of proprioception, group 4 will have the lowest score (field-independent) and it will differ significantly from the scores of groups 1, 2 and 3. The scores of these three groups will not differ significantly from one another.
- H_{O_4} - there will be no significant difference between the scores of the four groups on task 4;
- H_{r_4} - there will not be a significant difference between the scores of groups 1, 2 and 3, but they will differ significantly from group 4.

CHAPTER THREE

THE PRESENT STUDY

Having stated the aims of this study and the variables involved, it is necessary in order to fulfil the aims, to add tests of perceptual skill and of proprioception to the standard PRFT task so that useful comparisons can be drawn between performance on these tasks. It would be useful at the end of testing to retest each subject on the PRFT to see whether there were effects due to practice or training and even as a check on whether the subject understood the initial PRFT instructions.

DESIGN

A modification of the portable rod and frame test (PRFT) such as the one developed by Oltman (1968) and manufactured for the personnel division of Anglo American Corporation, was used. The apparatus consists of a 90cm long cylinder, 19cm in diameter. At the end closest to the subject is a rubber eye-piece which fits snugly against the subject's face, directing his vision along the tube towards the display at its furthest end. The background of the display consists of green stained glass fitting tightly into the tube. The glass is evenly illuminated from behind. A square black frame is printed on the glass. The sides of the frame measure 7cm. Inside the frame is a black rod, slightly shorter than the frame, so that it moves within the frame. The rod and frame are clearly visible against the illuminated glass.

The rod and frame are pivoted on the same centre, but are mounted on separate shafts so that they can be rotated independently.

The experimenter sits behind the apparatus at the display end, facing a protractor fitted to the outside of the cylinder. A pointer is fitted through the protractor to the same axis as the rod and allows for direct readings of the deviation of the rod in degrees from the true vertical.

The frame is adjusted by the experimenter by shifting a control lever on the top of the cylinder, to its maximum towards left or right. The maximum shift represents movements of the frame by 28 degrees off vertical to either side.

Oltman (1968) found the PRFT to correlate 0,89 with the standard darkroom apparatus, even though the error score was smaller as a result of the reduced size of both rod and frame. Silverman (1964) found the subject and experimenter operated versions of the PRFT to correlate 0,92 and Adevai et al. (1968), found the correlation to be 0,83 and found a twenty per cent reduction in error size.

The second task was a test of perceptual skill. Using the standard PRFT display, the frame was set vertical by the experimenter for all eight trials but the rod was tilted each time. The subject's task was to set the rod to the vertical as in the standard test.

In the third task, the display was altered to become a test of proprioception. A long cardboard cylinder was moved into the apparatus and set on footrests so that it masked out the frame and only the rod was visible. The subject had no visual standard of reference against which to set the rod vertical or to distract him from his task. Thus it was considered a test of proprioception, following Wober (1966, 1967). Again the experimenter tilted the rod before each trial.

The final task consisted of a repeat of the standard PRFT.

SUBJECTS

Testing was conducted on four groups, each consisting of 20 male volunteers. An attempt was made to match the three experimental groups according to intellectual ability, age, and years of formal education.

The subjects in group one were skilled operators from a construction site in central East London. Their mean age was 33,15 years with a range of from 21 to 49 years. Their mean education was 5,55 years formal schooling and its range was 2 to 8 years. All members of this group were urban-born Xhosa speakers and were employed as carpenters, boss boys, scaffold erectors, plasterers, masons, crane drivers, kerb layers and surveyors assistants. They all worked within the concept of verticality and qualified to their positions with the company through several years of on-the-job training. In fact, they had reached the highest levels of skilled employment open to them within the strictures of job reservation applicable in the building trade.

Group two consisted of 20 Coloured subjects drawn from the same construction site as subjects in group one. They were all skilled artisans, employed in the categories of carpenters, masons and plasterers. They served several years of apprenticeship before employment to the categories they reached at the time the research was conducted. All were East London born and were educated there. Their mean age was 29,55 years with a range of 20 to 49 and their mean for formal education was 8,50 years with a range of 4 to 10 years.

Twenty White employees of a motor assembly plant in East London made up group three. Volunteers were asked for by the personnel officer and he experienced great difficulty in getting the required

number. At the time of testing, cut-backs in staff had been announced at all motor assembly plants in the Eastern Cape and Border, except at this plant. The workers were very suspicious of the test and it was possible that they suspected that it might be an employee evaluation being conducted for the personnel department. They feared that such information could be used in taking decisions on retrenchment of staff. No such difficulties were experienced with subjects in the other three groups.

The subjects in group three worked on the assembly line as welders, rectifiers and inspectors. There were a few storemen. They applied the concept of verticality as part of their job. Their daily tasks required a perceptual skill developed over several years on the job. Their mean age was 24,25 years with a range from 19 to 36 and the mean for formal education was 9,00 years with a range from 8 to 11 years. All these subjects were born and educated in East London.

The subjects in group four, representing the group who have not been exposed to an environment in which perceptual skill is developed, were 20 unskilled labourers employed as gardeners at Rhodes University in Grahamstown. They were all born in Grahamstown and ranged from illiterates to a maximum of eight years formal education. There were seven illiterates in this group and their mean education was 3,30 years. The mean age was 31,85 years and the range from 22 to 52 years. They were all Xhosa speakers from the same tribes as those in group one. Groups one and four were culturally equivalent with members of both groups still practicing the traditional rites such as circumcision and with firm beliefs in witchcraft.

While the two African groups had lower means for formal education than Coloureds and Whites, it must be borne in mind that education at

that time was not compulsory for Africans. For an African to have undergone two or more years of formal education, is quite an achievement and shows in favour of high levels of motivation and associated factors. Whites cannot leave school before successfully completing eight years of formal education. Coloureds in the Border area do not generally pursue schooling beyond eight years. Considering the relative difficulty in gaining education, these Whites do not figure as an intellectually superior group just because they have a higher mean education. They represent the lower educated bracket of their race group and are intellectually probably close to the skilled Africans and Coloureds on this sample.

METHOD

During trials the subject's head is covered with a black cotton hood fitted to the cylinder and over the eye-piece. The apparatus is subject controlled by turning a knob fitted to a servo-motor system placed conveniently to the right or left of the subject, depending on his hand of preference.

There were eight trials on each of the four tasks.

In tasks one and four, the sequence of presentation of the frame was as follows: L L R R L L R R and in all four tasks, the sequence of presentation of the rod was: L R R L L R R L, as used by Oltman (1968) and Handel (1972). This sequence was designed to eliminate the problems of set. All adjustments in both rod and frame were to 28 degrees from vertical, left and right. Subjects' scores were calculated in degrees from the vertical, irrespective of direction.

The Africans and Coloureds in groups one and two were tested in an unused office of the personnel department of the construction company near the site where they were employed. Whites in group

three were tested in a consulting room attached to the medical centre at the motor assembly plant. African subjects in group four were tested in an office in the psychology department at Rhodes University. All these centres offered highly satisfactory testing conditions.

PROCEDURE

The test instructions were the same for all four groups. Subjects were tested individually and an interpreter was used in groups one and four (Africans). To test the acceptability of the test instructions once translated into Xhosa, they were retranslated into English by an independent linguist and found to be the same as the original English text. The concept of verticality and all other test instructions were easily translated, even though more frequent use was made of the English word 'straight' with the appropriate gesticulation, to refer to the vertical.

Subjects were told that the experimenter came from Rhodes University and was interested in seeing how well people in his trade could set the vertical. The PRFT was developed to measure this ability. Subjects were carefully assured that their participation was required on a volunteer basis and that their employers would have no access to the results. If a subject did not volunteer his name during the introduction at the start of the test, his name was not asked for until completion of the test battery. An assurance was given that performance on the test would not lead to retrenchment or to promotion and they were asked to co-operate with the experimenter for the sake of the validity of his research.

Subjects had to complete eight trials on each of the four tasks. At the commencement of each trial, the subject moved his head against the eye-piece and then the black hood was placed over his head by the

translator (in groups one and four) and by the experimenter in groups two and three. The experimenter then said 'right', and the subject's hand was guided to the adjustment wheel. His free hand rested on his lap and was not allowed to touch the table or its leg as it might assist him in establishing the vertical. The subject's height relative to the PRFT was altered by raising or lowering the level of the seat of the chair. Subjects were told to indicate verbally when they had completed each trial and then the hood was removed while the experimenter set the apparatus for the next trial. There was no time limit and no knowledge of results was given.

Before each task commenced, the subject was allowed to look into the cylinder while the parts of the display, already set for the first trial, was explained.

In the first task, the standard PRFT, the experimenter set both the rod and frame according to the sequence already noted and the subject had to align the rod to vertical while the frame remained at tilt. The subject was shown a string hanging from the ceiling, the angle of the walls of the room as well as a cardboard cylinder used in task three and standing erect on the table alongside the PRFT, to demonstrate the true vertical to which the rod must be placed. In addition, subjects were told to put the rod straight like a plumbline, an instrument well known by subjects in all four groups.

If it was obvious from the reading on the protractor, that a subject had aligned the rod parallel with the frame or set it from one corner of the frame to the other, the test instructions were repeated and the trial recommenced. If necessary, a drawing of the display and the test was made. This problem was encountered in all four groups with the most problems in the skilled African group.

No reasons are proposed for this occurrence and should have no bearing on the validity of the scores. If a subject's scores were very erratic, the test instructions were also repeated in case he did not understand them well.

In task two, the subjects were told that the frame would remain erect during the eight trials. Their task was still to set the rod to the true vertical. The string, walls, cardboard cylinder and plumb line, were again pointed out as standards of reference for the true vertical.

In task three, the subjects were told that the frame would be masked out or taken away. Again they had to set the rod to the true vertical and the same reference was made to the string, walls and plumb line as before.

At the commencement of task four, it was explained that the task was the same as task one with the frame and rod moved by the experimenter and the rod having to be realigned with the vertical by the subject. The same explanation of the standards of vertical as before, were offered.

After completion of the four tasks, subjects were questioned on the cues they used to arrive at the vertical. The questions included: "How did you get the rod straight?"; "What tricks (techniques) did you use to set the rod?"; "What told you when the rod was upright?"; "What senses did you make use of if any?"; etc. The responses will be discussed in the section on results and their types and frequency of occurrence are listed in the appendix.

All subjects in group four, the unskilled Africans, were given a task to set their concept of the vertical. This test follows the concept of verticality tests designed by Piaget (Piaget and Inhelder,

1956) and required the subject to 'plant' a 20cm cardboard cut-out of a tree on a 45 degree slope as well as the crest of a hill drawn on a blackboard. The 'planting' was done at a spot pointed out by the experimenter. It was hypothesised that a subject with no 'normal' concept of the vertical, would 'plant' the tree with the slope, i.e. pointing outwards at 45 degrees instead of upwards at 90 degrees. Only one subject made this mistake.

RESULTS

Group one Africans completed all four tasks within 30 minutes, the Coloureds in 20 minutes, Whites took between 15 to 20 minutes, and group four Africans took about 25 minutes. The time between each trial or task, while the apparatus was being prepared for the next trial or task, was considered to be sufficient rest period. No subjects complained of tiredness or strain.

The skilled operators in group one found the tasks very interesting and they were very co-operative and relaxed in the test situation. Much of this ease was due to testing being carried out in the personnel department where they had frequently been tested. The act of testing was to a degree associated with promotion, and despite assurances that no promotion would follow on testing, subjects might well have been highly motivated in the belief that their future conditions might be improved by a good performance. They took great care in aligning the rod each time and sometimes pondered long over a decision. All subjects knew the interpreter, a personnel department clerk, well, and relations were amicable.

Subjects in group two showed a keen interest in the test and in their results. No knowledge of results was given. These subjects were highly motivated and very responsive to questions about

their mode of judgement. Selections were done with an expression of pride and according to site managers, the Coloureds took far greater pride in their work than members of the other race groups. This pride and care was evident and often subjects asked how they had performed relative to previous subjects. The tasks appeared to present a challenge and this ensured high motivation for good and consistent performance.

Members of the White group were very suspicious of the tests and considerable care was taken to explain the bona fides of the experimenter and the fact that employers would have no access to the results. In the current economic climate, it was understandable that White motor assembly workers would fear retrenchment and this accounted for their mistrust and hesitance to volunteer. However, if those who volunteered still feared that the test was an employee evaluation for their personnel department, that in itself would guarantee high levels of motivation throughout trials. They nevertheless showed sufficient interest in the tasks to appear motivated on that factor alone. No difficulties were experienced in communication and subjects were addressed in either Afrikaans or English as they preferred.

Much of the mistrust was overcome after the second subject set his co-workers at ease. When he completed the last task, he said, "Well, it was quite fun. I must tell the others it's O.K. They are all worried out there. I will reassure them. You won't have any trouble now." This comment was not elicited by the experimenter, thus adding to its validity.

Questions put to subsequent subjects still confirmed an underlying mistrust. One worker came to the test room to tell the

experimenter that he wanted "nothing to do with psychological things". He was not asked to change his attitude. Much use was made of small talk about sport and motor cars before testing to relax subjects and win a degree of confidence. No difficulties were experienced in communicating the instructions and subjects were addressed in either English or Afrikaans, as they preferred.

Interest in the tasks kept motivation high with group four African subjects as well as their desire to co-operate with the experimenter and the interpreter who is employed in the psychology department. Both men are well known to the subjects and this assisted with acceptability of the test situation and tasks. They responded freely to questions and showed no fear or mistrust of the PRFT and its variations. Although instructions were repeated more often than with other groups, they seemed to understand the task equally well.

Interesting responses were obtained to questions about the way in which subjects arrived at the vertical. The skilled Africans in group one as well as those in group four, used intuitive judgements. They would say, "My eyes tell me the rod is straight" (group one) or, "The rod looks straight" (group four) for task one judgements. Quite a few unskilled Africans in group four said they "just knew" it was vertical, also an intuitive response. There were a few more analytical responses coming from group one subjects but even so, it seemed that the two groups of Africans expressed their judgements in similar verbal terms, indicating that their actual mode of perception was at least very similar, even if their PRFT score was not.

As could be expected, Coloureds used far more analytical procedures than the two African groups, indicating that their culture predisposed them to a different mode than that of the African. A similar claim can be made from the responses made by Whites.

On task two, the perceptual skill test, it was surprising to note how many skilled Africans gave the intuitive response, "I judge with my eyes", instead of saying that they merely divided the upright square into two. The ratio of this response to the dividing or making the rod parallel to the sides of the frame, is similar in both groups of Africans, further indicating a similar mode of judgement. Coloureds and Whites predominantly divided the frame into two equal parts.

In task three responses, a slightly more analytical judgement emerged amongst the skilled African group, but many of them still used the intuitive approach. The unskilled group were as intuitive in their judgement as before. Coloureds and Whites again divided the circle into two and a few used other methods not worthy of comment.

From these responses emerge an indication that Africans, both skilled and unskilled, used intuitive modes of judgement of the vertical, whereas Coloureds and Whites on the sample used more analytical modes of judgement.

The raw scores obtained by all 80 subjects on the four tasks, is contained in the appendix.

CHAPTER FOUR

RESULTS AND DISCUSSION OF RESULTS

The means of the scores for the four groups is presented in Fig. 1 and Table 1.

FIG. 1.

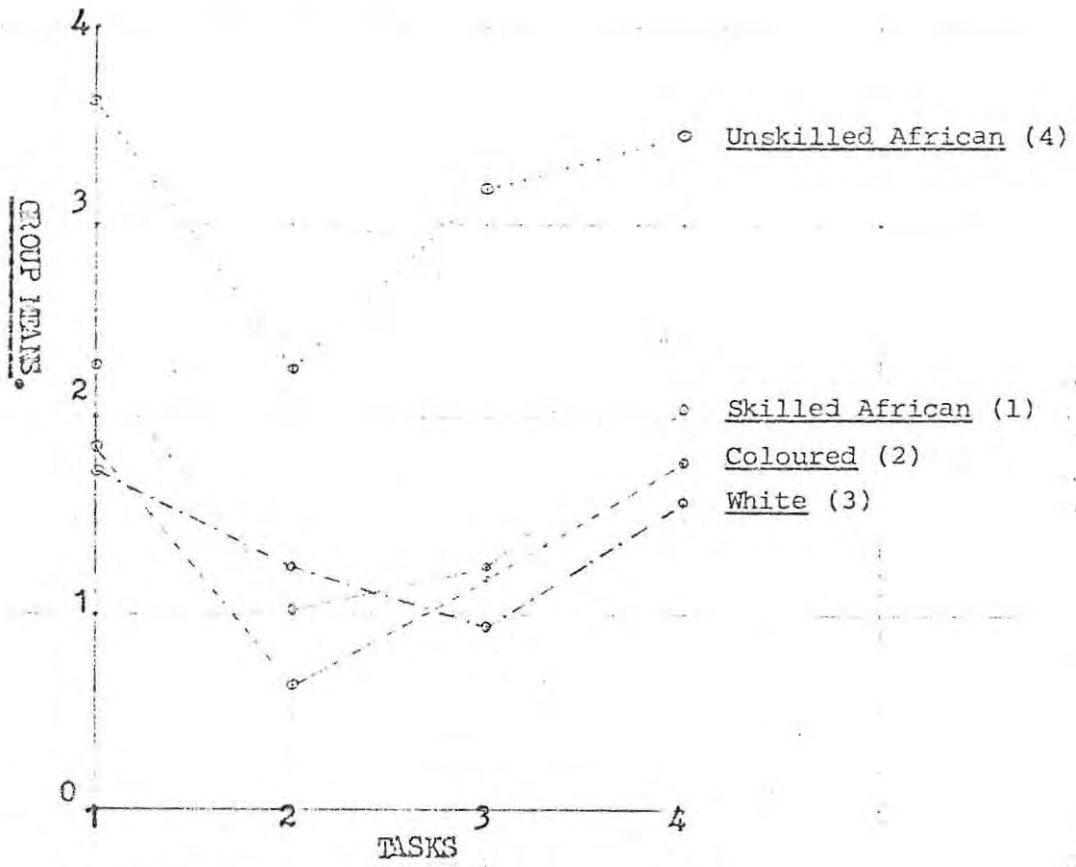


FIGURE ONE. Mean scores on the four tasks.

TABLE 1. MEANS OF SCORES

GROUPS	TASK			
	1	2	3	4
AFRICAN SKILLED	2,27	1,01	1,21	2,05
COLOURED	1,85	0,65	1,16	1,76
WHITE	1,74	1,25	0,96	1,55
AFRICAN UNSKILLED	3,62	2,52	3,18	3,45

From an inspection of the means, there appear to be no real difference between the members of the three skilled groups, but the skilled subjects seem to be very different from the unskilled subjects. From the data, one would be tempted to infer that performance on all the tasks are similar for those subjects who exercise skilled perceptual judgements in their daily lives, irrespective of their culture. However, the unskilled group seems to be substantially different from the rest.

Looking more closely at the scores with the aid of statistical analysis* to assist in the interpretation of the outcome, we begin by considering the three skilled groups only.

The one-way analysis of variance was first applied to groups 1-3 for each task and is detailed in Tables 2-5.

TABLE 2. TASK ONE. GROUPS 1-3

SOURCE	Sum of Squares	D.F.	Mean Square	Mean Square ratio
Between groups	3,1317	2	1,5659	0,9528
Within groups	92,9875	57	1,6314	
TOTAL	96,1192	59		

* The statistical procedures chosen, resulted from collaboration both with the research supervisor and a consultant mathematical statistician whose assistance is acknowledged in the preface.

Using F-Tables with 2 and 57 df, we find:

$$F_{2,57} \text{ at } 5\% = 3,16$$

$$\text{at } 1\% = 5,005$$

Since 0,9598 $\not>$ 3,16 or 5,005 we accept the hypothesis H_0 that there is no difference between the groups at the 5% and 1% levels of significance.

TABLE 3. TASK TWO. GROUPS 1-3

SOURCE	Sum of Squares	D.F.	Mean Square	Mean Square ratio
Between groups	3,7296	2	1,8648	5,0815
Within groups	20,9175	57	0,3670	
TOTAL	24,6471	59		

$$F_{2,57} \text{ at } 5\% = 3,16$$

$$\text{at } 1\% = 5,005$$

Since 5,0815 $>$ 3,16 and 5,005 we reject the hypothesis H_0 that there is no difference between the groups at the 5% and 1% levels of significance. There is thus a significant difference between the groups. We need to apply Scheffe's Method (Scheffe 1959:68-75) of determining where the difference lies. Scheffe's Method shows that at the 10% level of significance, a difference exists between groups 2 and 3, that is between Coloureds and Whites.

TABLE 4. TASK THREE. GROUPS 1-3

SOURCE	Sum of Squares	D.F.	Mean Square	Mean Square ratio
Between groups	0,6606	2	0,3303	0,5804
Within groups	32,4378	57	0,5691	
TOTAL	33,0984	59		

$$F_{2,57} \text{ at } 5\% = 3,16$$

$$\text{at } 1\% = 5,005$$

Since 0,5804 \nless 3,16 or 5,005 we accept the null hypothesis H_0 that there is no difference between the groups at the 5% and 1% levels of significance.

TABLE 5. TASK FOUR. GROUPS 1-3

SOURCE	Sum of Squares	D.F.	Mean Square	Mean Square ratio
Between groups	2,5032	2	1,2516	0,8393
Within groups	84,9980	57	1,4912	
TOTAL	87,5013	59		

$$F_{2,57} \text{ at } 5\% = 3,16$$

$$\text{at } 1\% = 5,005$$

Since 0,8393 \nless 3,16 and 5,005 we accept the null hypothesis H_0 that there is no difference between the groups at the 5% and 1% levels of significance.

From the one-way analysis of variance with Scheffe's Test, we conclude that the only difference which needs to be considered further is the one observed between Coloureds and Whites on task 2.

In order to test the interaction of tasks with groups, an analysis of variance (Kirk 1968) was performed. A summary of this analysis is presented in Table 6.

TABLE 6.

	SOURCE	Sum of Squares	D.F.	Mean Square	F
1	Between subjects	130,277	59		
2	A	3,878	2	1,939	0,87
3	Subjects within groups	126,399	57	2,218	
4	Within subjects	153,733	180		
2	B	42,644	3	14,215	23,16
2	AB	6,147	6	1,025	1,67
7	B subjects within groups	104,942	171	0,614	
8	TOTAL	284,010	239		

Where: A represents the groups, African Skilled, Coloured and White,

B represents the tasks, 1, 2, 3, and 4,

AB represents the interaction of A with B.

$F_{3,171}$ at 1% = 3,80

$F_{6,171}$ at 1% = 2,80

at 5% = 2,10

Thus we find there is: no significant difference between the groups;

no significant interaction of groups with tasks;

and there is a significant difference between the tests at

the 5% and 1% levels of significance.

It is important to note also that the conservative nature of the analysis has obscured the difference found earlier between groups 2 and 3 on task 2 (Table 3).

The results of further analysis along the same lines, but with all four groups, is summarised below in Table 7. This is a split plot analysis of variance with two factors (Kirk 1968: 245-251).

TABLE 7. SPLIT PLOT Groups 1-4

SOURCE	Sum of Square	D.F.	Mean Square	F
Between subjects	378,509	79		
A	184,699	3	61,566	24,143
Subjects within groups	193,809	76	2,550	
Within subjects	213,048	240		
B	54,325	3	18,108	27,495
AB	8,561	9	0,951	1,444
B subjects within groups	150,162	228	0,659	
TOTAL	591,557	319		

where: A represents the groups,

B represents the tasks,

AB represents interaction of A with B.

$F_{3,171}$ at 1% = 3,80 which is smaller than the mean square ratios 24,143 and 27,495.

- Therefore we find: 1) the difference between the tasks as already detected;
- 2) the fact of no interaction between tasks and groups is confirmed;
- 3) a difference between the groups is evident at the 1% level of significance.

Closer analysis of the difference between groups can be made by means of pairwise comparisons of means using Scheffe's Method. It is well known however, that the method is rather conservative and where differences between means appear to be just not significant with this method, it is often advisable to use the less conservative results of Tukey (Scheffe 1959: 73-82).

Noting the difference which emerges once group four is added to the analysis, a further one-way analysis of variance was done on tasks 1 and 2 to act as a check on the apparent effect of group four as being the group different from the other three. The results are presented in Tables 8 and 9.

TABLE 8. ANOV Task 1. All four groups

SOURCE	Sum of Squares	D.F.	Mean sum of Squares	Mean sq. / ratio
Between groups	48,4075	3	16,1358	8,6898
Within groups	141,1219	76	1,8569	
TOTAL	189,5294	79		

With $F_{3,76}$ at 1% = 4,10 we find a significant difference between the groups at the 1% level of significance. Application of Scheffe's Method with a level of significance of 10%, yields a difference

between the means of $\pm 1,3600$. Therefore we find that the difference lies between groups two and four (Coloured and unskilled Africans) and between groups three and four (White and unskilled Africans), on Task 1.

It appears that the difference between groups one and four is just not significant (difference between means is equal to 1,3500), and this could be due to the conservative nature of Scheffe's Method. Using Tukey's Method, the least significant difference between means is 0,8745 at the 5% level of significance. Hence the means of groups one and four are in fact significantly different at the 5% level.

TABLE 9. ANOV Task 2. All four groups

SOURCE	Sum of Squares	D.F.	Mean sum of squares	Mean sq. ratio
Between groups	39,7398	3	13,2466	31,0959
Within groups	32,3754	76	0,4260	
TOTAL	72,1152	79		

A significant difference is shown at the 1% level of significance. Application of Scheffe's Method with a level of significance of 10%, yields a difference between means of $\pm 0,6514$. This shows that group four (unskilled Africans) differs significantly from all the other groups (one, two, three), on task 2.

Inspecting the order of variances within groups in the calculations done for the multivariate t-test, it is clear from the least significant difference in means obtained on task 2 with Scheffe's Method, that the least significant difference in means for task 3 with Scheffe's Method will not exceed $\sqrt{2} \times 0,6514 = 0,92$. Hence there will be a significant difference in the means of groups one and four on task 3 (as well as group four with groups two and three) at the 10% level of significance.

Inspecting the order of the variances within groups in the calculations done for the multivariate t-test, it is clear that an even smaller least significant difference in means will be obtained than is obtained for task 1 (between groups one and four), and hence we can conclude that group four differs significantly from all the other groups on task 4 at the 5% level of significance (or even less).

Thus we:

- 1) reject H_{o_1} in favour of H_{r_1} (see p.30), that group four differs significantly from groups one, two and three on task 1 at the 5% level of significance (Tukey's Method);
- 2) reject H_{o_2} in favour of H_{r_2} in so far as concluding that group four differs significantly from groups one, two and three at the 10% level of significance (Scheffe's Method) on task 2. The results also show that group two differs significantly from group three at the 10% level of significance (Scheffe's Method);
- 3) reject H_{o_3} and reject H_{r_3} . Although group four differs significantly at the 10% level (Scheffe's Method) from groups one, two and three on task 3 as predicted in H_{r_3} , the direction of difference is opposite to the prediction for task 3.
- 4) reject H_{o_4} in favour of H_{r_4} , that group four differs significantly from groups one, two and three at the 5% level of significance (Tukey's Method) on task 4.

Using a different approach to analysing the data, and taking into account the dependence between the various test results for a given subject, the multivariate t-test can be used to test for differences between tasks.



The following results were obtained:

- 1) Group one - skilled Africans.

$T^2 = 20,7883$ with $F_{3,17}$ at $1\% = 5,18$; we conclude that there is a significant difference between tasks at the 1% level.

- 2) Group two - Coloureds.

$T^2 = 17,4852$ With $F_{3,17}$ at $1\% = 5,18$; at $5\% = 3,20$ and at $2\frac{1}{2}\% = 4,01$; we conclude that there is just a significant difference between tasks at the 1% level and a clear difference at the $2\frac{1}{2}\%$ and 5% levels.

- 3) Group three - Whites.

$T^2 = 24,1791$ with $F_{3,17}$ at 1% level. = $5,18$; we conclude that there is a significant difference between the tasks at the 1% level of significance.

- 4) Group four - unskilled Africans.

$T^2 = 23,7083$ with $F_{3,17} = 5,18$ at the 1% level, we conclude that there is a significant difference between tasks at the 1% level of significance.

We are now able to conclude that the differences which appear interesting are:

- 1) a difference between Coloureds and Whites on task 2;
- 2) unskilled Africans differ significantly from skilled Africans, Coloureds and Whites on all four tasks;
- 3) a significant difference between all tasks within each of the four groups.

CORRELATION BETWEEN TASKS

It could also be considered of interest to discover the degree of correlation that existed between the tasks. In terms of the usual t-test for non-zero correlation, all correlations with an absolute

value greater than 0,44 will be significant at the 5% level. The four groups are considered separately below:

TABLE 10. Group one. Skilled Africans.

TASK	2	3	4
1	-0,14	0,52	0,55
2		-0,01	

TABLE 11. Group two. Coloureds.

TASK	2	3	4
1	0,00	0,41	0,74
2		0,37	

TABLE 12. Group three. Whites.

TASK	2	3	4
1	0,00	0,50	0,73
2		0,59	

TABLE 13. Group four. Unskilled Africans.

TASK	2	3	4
1	0,63	0,27	0,69
2		0,26	

From the tables it can be seen that:

For skilled Africans, task 1 correlates significantly with tasks 3 and 4;

For Coloureds task 1 correlates significantly with tasks 3 and 4;

For Whites task 1 correlates significantly with tasks 3 and 4;

task 2 correlates significantly with task 3;

For unskilled Africans, task 1 correlates significantly with tasks 2 and 4.

DISCUSSION OF RESULTS

As predicted, groups one, two and three, that is skilled Africans, Coloureds and Whites, did not differ significantly on their PRFT score. This finding is of importance and is strengthened and extended by the significant difference shown between these three groups and the unskilled Africans. This finding does not support Witkin and Berry's but supports the perceptual skill argument put forward in Chapter Three.

The results clearly indicate the large extent to which on-the-job training amongst these subjects has developed in them a perceptual skill which affected their response on the PRFT to the degree that it tested their perceptual skill and not their field-dependence. A combination of these two elements might even have been tested, but in any event, it casts serious doubt on the validity of the PRFT as a personality measure on this sample.

Because of the statistically significant difference which was found to obtain between the two African samples, it is necessary to discuss the degree of cultural equivalence between them before a valid statement regarding the effect of their job environment is made. Both groups are urban-born and have low standards of education. The unskilled group does come from a less industrialized centre and

has a lower mean for education, but it is suggested that neither difference is great enough to have a major confounding effect on the PRFT score.

Members of both groups are strongly bound to tribal traditions. They are all Xhosa speakers and belong to the same tribes within the Xhosa-speaking nations. Both groups wear only Western dress and are mostly literate, but their cosmology remains strongly tied to the ancestor cult, dominated by witchcraft and classical rites practiced by their forebears. Among both groups homeland ties were strong and it was particularly reinforced among the skilled group because of their proximity to the Transkei and residence within Mdantsane location which falls within the Ciskei homeland. From a cultural point of view, it is very striking to find such a large difference between PRFT scores in two groups who share the same cultural make-up and approximate degree of Westernization. It is as significant to note that the skilled group showed no difference with Whites and Coloureds on the sample, even though it was culturally very different from them. The common factor obviously, was the degree of perceptual skill.

The Coloured group shares cultural factors with both Whites and Africans. They identify culturally with Whites but live and work with Africans. Most of them were Afrikaans-speaking. Yet the Coloured subjects showed the most motivation. They seemed to take more pride in their task performance and were keenly competitive with other subjects. Their responses to questions about the mode of selecting the vertical, displayed a keen analytic approach to life, consistent with a field-independent personality type. While the Whites were culturally more inclined towards this type of analytical thinking process, they did not display it as actively as the Coloureds,

yet were not significantly different from the Coloureds, except on task 2. Again this points towards a degree of skill being picked up on the PRFT, instead of personality. Culturally, the skilled Africans and Coloureds would be biased toward a more field-dependent type of personality by comparison with the Whites and this ought to be further brought about by the political system. Yet these three groups were equivalent on the PRFT, again indicating that it was the similarity in degree of skill which was detected, perhaps on all four tasks, not only the PRFT.

Whites were better educated than the Coloureds and skilled Africans but that does not indicate that they were of a higher intellectual level. They would have had more opportunity to succeed at school and their higher mean for education reflects a combination of opportunity and privileged circumstances rather than intellectual level. It is therefore reasonable to assume that at least Whites and Coloureds on this test were of similar level of intelligence.

Culturally, however, there is a difference between Coloureds and Whites and a more obvious difference between the Whites and both African groups. The Coloureds identify culturally and linguistically with the Whites but are a deprived group which is prevented from enjoying full social intercourse and job opportunities with the Whites. Legislation forces them into more direct contact with the less Westernized Africans and this promotes some degree of cultural dissonance and therefore difference between Coloureds and Whites in this sample.

It is difficult to speculate about the levels of intelligence of the two African groups. The possibility is strong that the skilled group, by virtue of having acquired the skills as masons, bricklayers, etc., would be a sample of a higher intelligence than the unskilled group of gardeners. However, the mobility of Africans from one town

to another to seek work is virtually nil and the opportunities for acquiring jobs in Grahamstown where skills can be learnt, are limited.

Differences on RFT scores due to level of education have not come to light in any reliable manner in contemporary research on the RFT. Witkin and Berry (1974: 71) note, "The general function of formal education, one of the major acculturative influences, is not well understood cross-culturally, nor are we able to disentangle its role from other acculturative influences." So, while we cannot speculate with any reliability on differences in intelligence, discussion of differences in levels of education would be equally unfruitful.

Interesting differences appeared in the subjects' mode of judgement. In view of Wober's theory of sensotypes, it was surprising how few people mentioned sitting straight, or using the erect line of the body. Even when asked specifically whether the body line was considered, subjects were adamant that it was not used. It seems from these responses that only with the tilted chair apparatus would proprioception feature on the RFT.

In fact, responses to the mode of judgement on task 3, considered as a test of proprioception because of the absence of frame or any visual standard of reference (or distraction), indicated that it was not a test of proprioception at all. Subjects became more analytical (less intuitive) on this test, most of them dividing the circle (represented by the outer walls of the cylinder) into two equal sections. Body responses were even less frequently given. The unskilled Africans had difficulty in explaining how they set the rod in task 3. It seemed as if they relied on feelings which made their judgement more intuitive. If such intuitive judgements were proprioceptive cues as Wober might suggest, one would have expected this group to excel on task 3. If it was a test of proprioception, and

if Wober's results are valid, then unskilled Africans should have been significantly better than the other groups in this task. This was not found statistically.

It seems that all four tasks were tests of perceptual skill, not field-dependence (1 and 4), and proprioception (3), as considered at the outset. Task 2 was intended as a test of skill. The fact that Coloureds performed best on this task is in keeping with the observation that they showed considerable pride in their work. In addition, their jobs require a higher degree of perceptual skill than that required by the Whites in the sample. Coloureds were significantly better than the Whites on this task. The fact that unskilled Africans scored fairly well on task 2 even though they have little job opportunity to develop perceptual skill, showed that this task was too easy to be a reliable measure of perceptual skill. The poor correlation between tasks 1 and 2 are probably due to the field-dependence factor which is still picked up on the PRFT (task 1).

Task 3 cannot be said to have tested proprioception and the scores indicate that it might have tested perceptual skill. The extent to which the verbal responses of the subjects indicate this conclusion, have been discussed. The task correlations indicate that tasks 1 and 3 correlate significantly for skilled Africans and Whites, and almost for Coloureds. It has been proposed that the PRFT tested perceptual skill and not field-dependence. It is to be expected that the unskilled Africans will have a poor perceptual skill so the low correlation between task 1 and task 3 is to be expected. In addition, the unskilled subjects show a significant correlation on tasks 1 and 2, the latter already dismissed as a very easy skill test. Task 3 would be a far more difficult skill test and as expected therefore, the three skilled groups were significantly better on this task than the unskilled

group.

As expected, tasks 1 and 4, being a repeat of the same test, correlate highly for all groups, and in addition the scores do not differ significantly. The high correlations indicate that all the groups, and especially the unskilled Africans, understood their instructions on the first set of trials on the PRFT. The consistency of performance by all four groups, indicate that there was no significant training or practice effect.

The improvement in task 4 responses as indicated graphically in figure one, are statistically non-significant, with the result that it might be due to chance or familiarity with the apparatus, not practice or training. By training, in any event, is meant an alteration of the perceptual responses in such a way that discrimination is changed. The nature of training referred to earlier in regard to perceptual skill is of the order which progresses over several years and with a considerable amount of exposure to the training situation.

CONCLUSION

This research has indicated an area where perceptual skill has been developed in individuals to the extent that it improved their score on the PRFT so that the expected differences in field-dependence their cultures predisposed them to, were no longer evident.

Non-Western Africans, semi-Western Coloureds and Western Whites who perform certain skilled tasks which compel more judgements of skill in the visual field than are encountered in normal daily life, all scored similarly on the PRFT, a modification of the standard Witkin rod and frame test of field-dependence.

It has been suggested that cognitive style is developed early in life as the individual relates to and is moulded by his environment.

Witkin has related cognitive style to personality. If cognitive style as measured on the PRFT improves later in life due to the regular exercise of special visual skills, it would be ludicrous to suppose that personality has similarly been altered by improved skill.

This research has provided evidence of the confounding effect of perceptual skill on the PRFT, a result with possible implications for the standard RFT as well. The results of this work is particular to the effects of industrial training, but similar results could possibly be obtained in other domains of perceptual skill. The research findings are also particular to South African Whites, Coloureds and Xhosas.

Certain environments which compel continual judgements of perceptual skill beyond the type encountered in the normal Western environment, have the potential to sharpen an individual's ability to disembed an item from the surrounding context. As highlighted here, such skill manifests itself in a more field-independent response for skilled Xhosa males to the extent that they tested as field-independent as skilled Coloureds and Whites in a matched sample.

Further research is indicated to answer the question whether such effect would also be found on the embedded figures test and the Koh's Block test which had high correlations with the RFT. Another question is at what level of improvement does perceptual skill become a confounding factor on the RFT response of a non-Western subject and is such skill also a confounding variable within a Western society. Research should therefore explore the possibility of confounded RFT responses from subjects in any situation where their daily routine compels unusually skilled judgement.

Finally, this research has not found any evidence to support Wober's sensotype hypothesis but has uncovered evidence which questions the validity of the RFT as a measure of field-dependence in cross-cultural comparisons.

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APPENDIX ONE

INDIVIDUAL SCORES FOR EACH GROUP
ON THE FOUR TASKS

SCORES FOR SKILLED AFRICANS - GROUP ONE

	TASK:PRFT	FRAME EFFECT	ROD ONLY	PRFT RETEST
Subject 1	4.50	1.50	2.38	4.38
2	3.25	0.63	1.0	1.25
3	2.63	0.63	1.38	0.50
4	3.00	1.13	0.63	3.75
5	0.75	1.75	1.00	0.50
6	1.63	1.25	1.38	3.25
7	1.50	1.38	0.63	0.75
8	1.88	0.63	1.00	2.13
9	1.88	0.88	2.50	4.88
10	1.25	0.50	0.75	2.00
11	1.88	1.50	1.50	1.50
12	1.50	0.50	0.75	1.50
13	6.25	0.38	3.00	4.25
14	0.75	0.50	0.50	0.88
15	3.25	0.75	0.50	1.75
16	0.50	1.13	0.50	1.63
17	3.38	1.50	1.00	2.38
18	1.63	1.13	2.50	1.25
19	2.50	0.88	0.38	1.75
20	<u>2.00</u>	<u>1.75</u>	<u>0.88</u>	<u>0.63</u>
TASK MEANS	2.27	1.01	1.21	2.05

SCORES FOR COLOUREDS - GROUP TWO

	TASK: PRFT	FRAME EFFECT	ROD ONLY	PRFT RETEST
Subject 1	1.25	1.38	1.00	0.75
2	0.75	1.13	0.63	1.63
3	1.63	0.0	0.88	0.88
4	0.88	0.25	0.50	0.25
5	1.50	0.38	1.00	3.00
6	2.38	0.38	0.88	3.13
7	1.00	0.38	0.63	1.50
8	3.13	1.88	0.75	0.75
9	5.75	1.00	0.88	5.63
10	2.50	0.38	1.38	2.38
11	1.38	0.00	0.75	1.75
12	0.0	0.88	0.75	0.50
13	1.25	0.75	1.00	1.88
14	1.13	0.0	0.88	0.88
15	2.38	0.13	2.00	2.38
16	1.25	1.38	1.38	0.75
17	3.88	0.25	2.38	1.75
18	3.00	2.38	3.50	4.25
19	1.25	0.0	1.38	0.75
20	<u>0.75</u>	<u>0.0</u>	<u>0.63</u>	<u>1.50</u>
TASK MEANS	1.85	0.65	1.16	1.76

1.81

SD 1.35

SCORES FOR WHITES - GROUP THREE

	TASK: PRFT	FRAME EFFECT	ROD ONLY	PRFT RETEST
Subject 1	1.38	0.0	0.63	1.25
2	1.00	0.88	0.63	1.00
3	2.88	3.00	3.38	3.13
4	1.00	1.13	1.25	1.88
5	1.38	1.00	1.25	2.25
6	5.75	1.63	2.13	4.13
7	1.25	1.13	0.50	1.38
8	1.88	0.75	1.00	1.38
9	2.88	1.38	0.25	0.75
10	1.50	1.63	0.75	1.25
11	1.00	1.63	0.50	1.63
12	1.00	1.38	0.38	1.25
13	1.00	0.50	0.13	0.25
14	2.13	0.75	0.50	1.38
15	1.25	1.63	1.38	1.13
16	1.25	0.25	0.88	1.63
17	1.38	1.75	1.25	0.75
18	1.75	1.75	0.38	1.38
19	1.63	1.25	1.50	1.63
20	<u>1.50</u>	<u>1.63</u>	<u>0.63</u>	<u>1.50</u>
TASK MEANS	1.74	1.25	0.96	1.55 ✓

1 = 0.25

SCORES FOR UNSKILLED AFRICANS - GROUP FOUR

	TASK: RFT	FRAME EFFECT	ROD ONLY	PRFT RETEST
Subject 1	2.13	2.13	3.13	1.88
2	3.13	2.25	2.63	2.63
3	5.75	3.00	4.50	6.13
4	2.75	2.50	1.50	3.75
5	5.00	3.38	3.13	4.13
6	2.50	1.50	3.63	3.75
7	4.13	1.13	1.25	2.88
8	2.63	2.13	2.25	1.63
9	6.25	2.88	4.38	5.88
10	3.25	1.50	3.75	3.88
11	1.75	2.13	2.75	1.50
12	1.50	1.63	2.75	1.00
13	4.25	2.25	4.38	2.25
14	4.75	3.63	3.38	3.88
15	2.50	2.50	3.00	3.25
16	3.13	3.13	3.75	4.50
17	1.50	2.00	4.25	3.88
18	7.13	3.88	3.63	5.00
19	3.38	3.50	3.38	4.00
20	<u>4.88</u>	<u>3.25</u>	<u>2.25</u>	<u>3.25</u>
	3.62	2.52	3.18	3.45

APPENDIX TWO

EMPLOYMENT TYPES OF THE FOUR GROUPS

	<u>CATEGORY</u>	<u>N</u>
GROUP ONE	Boss boy	3
Skilled	Bricklayer	2
Africans	Carpenter	1
	Crane Driver	2
	Kerb layer	3
	Mason	1
	Plasterer	4
	Scaffold erector	2
	Surveyor's assistant	2
GROUP TWO	Bricklayer	4
Coloured	Carpenter	10
	Mason	4
	Plasterer	2
GROUP THREE	Operator inspector	5
Whites	Rectifier	8
	Stores	5
	Welder	2
GROUP FOUR		
Unskilled	Garden Labourers	20
Africans		

MODE OF JUDGEMENT BY GROUPS ON THE FOUR TASKS

<u>Group</u>	<u>Judgement</u>	<u>N responses</u>
GROUP ONE	body used	2
SKILLED AFRICANS	eyes used	15
Tasks one and four	frame ignored	1
	nose used	2
	refer to angles	3
	rod appears straight	1
	sit straight	3

Task two	divide square in two	7
	eyes used to judge	14
	nose used	1
	use corner's angle relevant to rod	1

Task three	body position used	1
	brain only used	1
	circle ignored - look at rod only	1
	divide circle in two	10
	eyes only used	5
	nose used	2

<u>Group</u>	<u>Judgement</u>	<u>N responses</u>
GROUP TWO	eyes used to judge	4
COLOUREDS	frame disregarded - use outer circle	2
Tasks one and four	make rod plumb and dis- regard frame	1
	sit straight	4
	use corner's angle relative to rod	

Task two	eyes used to judge	5
	frame disregarded - look at rod	3
	frame divided into two	13
	look at outer circle for reference	1

Task three	eyes used to judge	4
	disregard circle - look at rod	3
	divide circle	9
	tip of rod to cut top and bottom corners of circle	2
	tip of rod plumb with centre dot on rod	2
GROUP THREE	check top and bottom of opposite corner's angles	7
WHITES	disregard frame and cut big circle	4
Tasks one and four	disregard frame - use image of clock to cross lines from 3 to 9 o'clock	2
	eyes used to judge	5
	if top of rod moves away from bottom	2
	sit straight	1

<u>Group</u>	<u>Judgement</u>	<u>N responses</u>
Task two	align rod with top point of outer circle	1
	bisect top line only	1
	body angle	1
	divide circle in two	11
	eyes used to judge	1
	rod cuts top and bottom lines of frame equally	4
	rod parallel to frame side	2
	use outer circle and eyes	1
Task three	body feeling used	1
	divide circle into two	12
	draw imaginary horizontals cut with vertical	1
	eyes used to judge	4
	rod set to top and bottom of circle	2
	set like a watch from 12 to 6 o'clock	1
GROUP FOUR	eyes used to judge	2
UNSKILLED	knowledge of vertical used	7
AFRICANS	line up rod with body	2
Tasks one and four	measure rod with corner of frame	1
	rod looks straight	11
Task Two	body line used	3
	eyes used to judge	4
	knowledge of vertical used	6
	make rod parallel with sides of frame	3
	rod looks straight	7

<u>Group</u>	<u>Judgement</u>	<u>N reponses</u>
Task three	eyes used to judge	2
	knowledge of vertical used	6
	line up rod with body	2
	rod looks straight	9
	rod to touch top corner of circle	3