TWO TESTS OF PERCEPTUAL MOTOR DEVELOPMENT: A CROSS-CULTURAL STUDY

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ABSTRACT

The present study investigated the applicability of the Bender Gestalt Test and the Developmental Test of Visual-Motor Integration (Beery, 1967) to 'Coloured' children, since previous research has indicated that cultural differences and socioeconomic factors influence perceptual motor development (Carlson, 1966; Moseley, 1969).

The Bender Gestalt (Koppitz scoring, 1965) and VMI tests were administered to 90 schoolchildren aged 6 to 10 years 5 months from upper, middle and lower socioeconomic levels.

The results indicated that the present sample was significantly different in mean test performance when compared with the VMI developmental norms, but not when compared with the Bender Developmental norms. Additional analyses showed that VMI test performance was influenced by age and/or socioeconomic factors, but that Bender test performance remained consistently similar to the normative data at all age groups and socioeconomic levels. Positive correlations were yielded between obtained and expected test performance on both tests.

It was concluded that the Bender Gestalt test offers a more valid measure of perceptual motor development in comparison with the VMI test, and is therefore more 'culture-fair' for the 'Coloured' population. The validity of theoretical principles underlying perceptual motor development was

discussed with respect to the sequential pattern of perceptual motor development yielded on both tests. Methodological limitations of the present study were noted and suggestions made for further research.

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1. INTRODUCTION

The present study is a cross cultural investigation of two tests of perceptual motor development. The tests in question, the Bender Gestalt Test and the Developmental Test of Visual-Motor Integration are widely used clinically in South Africa despite the limited information regarding their applicability locally. The intention of the research is thus to provide information relevant to the advisability of the continued clinical usage of these tests. Using the tests, this study investigates perceptual motor development in a particular subcultural group. Account is taken of some theoretical issues regarding perceptual motor integration and methodological issues peculiar to cross cultural research.

1.1 REVIEW OF CONCEPTIONS OF PERCEPTUAL MOTOR INTEGRATION

The multitude of theories in the field of perception has yielded important generalizations, but, according to Allport (1955), "out of it all there has not yet come a theory that promises to be fully explanatory and general". In the more specific area of perceptual motor integration, although a great deal of research has been undertaken, there is a lack of a "systematic account of perceptually guided motion within our general behaviour theories" (Smith and Smith, 1962). Several theoretical approaches have, however, sought to conceptualise the developmental changes in perceptual motor functioning, each differing in emphasis on the

continuum of the nativism-empiricism controversy.

The Gestalt psychologists, who adhered to the nativist approach, conceptualized alterations in perceptual activity according to their central tenet which states the primacy of the whole over the parts. Thus, young children fail to perceive details in complex configurations, attending rather to the whole configuration of the stimulus pattern in a global, diffuse manner. Attention to detail is seen to appear in middle childhood and is later followed by an integrative mode of perception, in which the parts and whole are perceived simultaneously and in relation to each other. Overall, studies in the Gestalt tradition reveal developmental changes: better identification of the alternative organisation of reversible figures (Elkind and Scott, 1962), better identification of embedded figures (Ghent, 1956), more identification of the parts and whole of stimulus configurations (Elkind, Koegler and Go, 1964) and better recognition of incomplete figures (Gollin, 1962, 1965). However, the implications of the data are not always clear "since the relevant stimulus dimensions are not clearly specified" (Pick and Pick, 1970). Furthermore, although much information regarding the developmental changes in the perception of form and shape was contributed by the Gestaltists, the motor aspects of perceptual integration were largely unexplored. As regards perceptual motor functioning, one study in the Gestalt tradition explored the ability of preschool children in the copying of forms (Graham, Berman

and Ernhart, 1960). The study yielded equivocal data in terms of the alterations according to Gestalt expectations, but it was found that accuracy improved in all Gestalt characteristics as a function of age.

While the Gestaltists ignored motor components of response in their theory of isomorphism, Piaget (1970) provided an interactionist model in his theory of development. Piaget's concept of adaptation stresses the biological aspects, his basic premise being the inheritance of modes of functioning rather than intellectual structures. The latter are seen to develop as a result of environmental interaction during development. Cognitions, therefore, await motor development and the consequences of action. Adaptation is seen as the interplay between two complementary processes, assimilation and accommodation. Assimilation occurs when an organism uses something in its environment for some activity which is already part of its repertoire. It is the acceptance and incorporation of new ideas into existing structures.

Accommodation involves the addition of new activities to the organism's repertoire or the modification of old activities in response to environmental events. Therefore, accommodation may be seen as the changing of structures to meet the demands of the new environmental situation. Human intelligence is thus the terminal stage of an evolutionary and developmental process that is inherent in the self-regulation of an equilibrated organism (Piaget, 1953).

For Piaget (1969, 1970) perceptual development is an elaboration of early sensori-motor activities and is thus related to the development of intelligence. Through the development of visually guided movement during the first six months, object permanence is established. Visual exploration is initially characterised by difficulty in choosing and fixating on the best points of centration to gain maximum information. The regulatory principle of decentration corrects visual exploration until points of reference and logic are utilized in perceptual motor activity. Such internal mechanisms of equilibration or self-regulation, by a series of anticipatory and retrospective compensations on the part of the subject in response to external disturbances, reconciles the roles of maturation, experience with objects, and social experience.

The behavioural theories of perception have regarded reinforcement or other consequences of learning to be of primary importance. Taylor (1962) postulates that mind is a set of functions of behaviour and that perception is a multiple simultaneous state of readiness for all the responses that have been conditioned to the afterent input in operation at a given time. The process of adaptation is therefore seen as the selection of certain behaviours by reinforcement.

Although Hebb (1949) also stressed the importance of learning on the system, he attempted to bridge the gap between the physiological and psychological, for example, postulating that associative learning is based on repeated sequences of

eye movements underlying perception. Hebb felt, moreover, that predetermined and fixed brain circuits can be functionally modified through learning and that complex pattern recognition takes place through experience which provides for the development of synaptic control from certain neurons in response to features of a figure.

Further studies of the neurophysiological aspect of perceptual motor development have demonstrated more fully the interdependence of organised, co-ordinated action patterns and afferent input (Brown and Sherrington, 1912; Liddell and Phillips, 1952; Thompson and Gellhorn, 1944). It has been suggested that the process of perceptual motor development consists of increased sensory differentiation, intersensory integration and a hierarchical shift from proximoceptor to teloreceptor sensory control of an organised action sequence (Birch and Lefferd, 1967). These changes appear to occur in a series of age-related levels of input organisation. With the emergence of teloreceptor pre-eminence at about five years of age, organised and directed action becomes subserved by intersensory or multimodal patterning. Thus, with intrasensonsory differentiation, perceptually guided motor skills require proprioceptive-visual experience, rather than visual experience per se. Following this argument, it would appear that improved intersensory organisation is critical for the development of refined and modulated adaptation to the environment (Held and Hein, 1963; Walk and Gibson, 1961).

Freeman (in Allport, 1955) develops the motor aspects of perception further in his "dynamotor" theory, which incorporates both central and peripheral factors. Muscular movement is seen to have a "backlash" action that affects the brain so that there is a lowering of the response threshold of the motor pathways involved.

It is Werner and Wapner (1952), in their sensory tonic theory of perception and cognition who most fully unite the motor and sensory aspects of response. Motor changes within the organism form a part of the total perceptual process by giving rise to one form of sensory element (the kinaesthetic components) to combine with the truly sensory. Thus the two traditionally different components are seen to interact in a dynamic equivalence. Moreover, one can draw parallels with the concept of gestalt in their treatment of the sensory and the tonic as a "whole". Besides providing a framework of sensory-intra-organismic interdependence, data from research within the sensory tonic framework indicates a process of increasing differentiation and hierarchic integration. Although Werner and Wapner may be criticised for drawing an artificial distinction between organism and stimulus input, their work on intermodal relations has stimulated a great deal of research.

The brief review above with respect to conceptions of perceptual motor integration within some theories of perception reflects the evolution historically from conceptions of a passive action of the mind, through conceptions of active

processes of the mind to the more recent interactionist concept.

1.2 THE ROLE OF EXPERIENCE IN PERCEPTUAL MOTOR DEVELOPMENT

The theoretical development outlined above has taken place against the background of the nativism-empiricism controversy. There have been conflicting findings concerning the rôle of experience in affecting one or another aspect of perceptual motor functioning. This has led to a growing awareness of a need to conceptualize the process of perceptual development in an alternative manner (Kantor, in Allport, 1955). Theoretical problems defy resolution as long as researchers continue the "compulsive rephrasing of perceptual constructions carried out from an ages-old approach" (Pronko, Ebert and Greenberg, 1966, p.77). It is now assumed that experience is a necessary factor in perceptual motor development, although this conclusion neither denies nor affirms that other processes such as maturation occur concomitantly. Thus Birch (Introduction in Haeussermann, 1958) states that "alterations of experienced environment occur both as a direct consequence of physiologic peculiarities and as a reactive consequence to ... (the) physical and social environment".

Studies involving the manipulation of early experience provide the most clarity regarding the interactive relationship between heredity and environment. The main experimental

technique used is that of deprivation, rearing animals in restricted environments from birth or shortly thereafter. The enrichment technique for studying the effects of the environment has been used to a lesser degree. An alternative approach consists of experimentally analyzing the conditions for modifying certain sensorimotor co-ordinations in adults, on the assumption that they are similarly plastic during the entire exposure history of the organism (Held, 1961).

Deprivation studies, involving restriction of movement with full visual experience, showed that there were resultant deficiencies in visually guided behaviour (Riesen, 1961). It was asserted that not only was variation in visual stimulation accompanying movement important, but that variation can only be effective in the development of perceptual integration when it is concurrent with, and systematically dependent upon, self-produced movements (Hein and Held, 1962; Held, 1961; Held and Bauer, 1966). These findings strongly suggest that the development of perception can be conceptualized in terms of the improved ability to utilize feedback from self-produced activity (Zaporozhets, 1965), the information becoming increasingly more subtle and depending on more highly organized and finely co-ordinated activities.

Using the enrichment technique, it has been found that increased handling and additional visual stimuli increased the amount of perceptual activity in institutionalized infants (White, 1968). According to Kephart (1971), all learning

stems from motor functioning, which is necessary for the development of perception and essential for the development of cognitive skills. Thus, poor motor coordination prevents the acquisition of experience necessary for the development of cognitive skills. Cratty (1970) asserts that the training and development of motor skills in childhood may modify other perceptual abilities. Remedial procedures based on the intermodal concept have been implemented widely in educational programmes with reported success (Delacato, 1963; Kephart, 1971). However, it may be noted that there is need for basic research in perceptual motor integration to provide a more stringently theoretical basis for such programmes.

The technique of perceptual rearrangement for studying plasticity in adult human subjects has yielded results which suggest its complementarity to the procedures of research on early experience (Held and Bossom, 1961). It is generally accepted that adaptation to distortion of vision provides evidence regarding the origin of the development of space perception. Of more interest in the present study is the data yielded on how adaptation to optical distortion indicated the modification of perceptual motor-systems through experience. Studies on adaptation to distorted vision have primarily been interpreted to support the empiricist assumption that visual space perception is secondary to the association of visual sensations with previous muscular or tactual experiences. Kohler (1947) and Taylor (1962), for example, claim that motor adaptation results in a change in visual perception.

The thesis that the visual system is flexible has, however, been challenged by Harris (1965), whose study suggests that responses to optical distortion are primarily proprioceptive rather than visual, and that therefore, vision seems to be largely inflexible in perceptual development. Studies by Bower (1966) and Fantz (1966) also support the position that many aspects of visual perception are not influenced by experience and are largely innate, while Smith and Smith (1962) believe that adaptation consists mainly of learning specific motor responses.

Reviewing the controversial findings on experience as an influential factor, one may assert that experience does seem to affect the interaction between the visual and motor systems, although it is as yet unclear which system is primarily affected. The studies above thus imply that a task involving perceptual motor skill would be influenced by differential experience.

2. CROSS CULTURAL RESEARCH: PROBLEMS OF CONCEPT AND METHODOLOGY

The studies reviewed in the preceding section generally examined the effect of experimental variations of experience on perceptual motor development. Differences in culture have been regarded as providing a more "natural" example of variation in experience. Following the latter approach, the present study compares the performance of two different national groups presumed to differ culturally. However, given a number of methodological problems associated with cross cultural studies, it is important to examine the term, culture.

Culture has been defined by some anthropologists as the man-made part of the human environment, the term environment encompassing every aspect of man's ecology (Herskovits, 1955). Koffka, (1935), one of the pioneers of Gestalt psychology, felt it important to distinguish between the geographical and the behavioural environments, such that the behavioural is dependent upon the geographical, and behaviour depends on both. Anthropologists may thus be regarded as providing descriptive data about the artifacts of the culture observed, or attempting an analysis of the structural relationships between different institutions within a culture. Psychologists, however, are more interested in the dynamic interaction between the individual and culture, from which they seek to make inferences about the subjective basis for behaviour.

Cross cultural psychology has served to bring into focus methodological and conceptual issues that are frequently obscured in unicultural research. Therefore, it has brought into question the assumption in much psychological work that the processes under study are invariant across time and place. The motivation for cross cultural research may be divided broadly into two approaches: to investigate the differences in laws and phenomena between cultures and secondly, to attempt to establish the generality of psychological laws.

2.1 METHODOLOGICAL ISSUES IN CROSS CULTURAL RESEARCH

Research aimed at establishing that differences in a law or phenomenon are culturally determined, raises unique methodological problems. One such problem is the necessity to exclude a myriad of rival hypotheses which could account for the observed differences. For example, cross cultural study of the perception of illusions and geometric forms has resulted in several plausible hypotheses. Thus, Segall, Campbell and Herskovits (1966) suggested that, on the basis of ecological cue validity, people living in a "carpentered" environment would be more susceptible to geometric illusions such as the Müller-Lyer illusion. The data in support of this hypothesis did much to negate previous interpretations, including simpleness of mind, suggestibility or educational level per se. However, further studies of Muller-Lyer perception pointed to other factors that may account for observed cultural differences, for

example, modernisation and urbanization, leading to greater accuracy (Davis, 1970). Dawson (1967) suggested that variables of socialization affect field dependence which increases illusion susceptibility. He further attempted to link illusion susceptibility to nutritional deficiency, which leads to endocrinological changes, which in turn influence field-dependence. Other studies suggest that certain environments are more suited to the development of perceptual skill (Berry, 1966). Another possible explanation given is that illusion susceptibility is inversely associated with pigmentation of the oculus fundi, which decreases the ability to detect contours (Berry, 1971). Although these studies produced findings varying in terms of the variables studied, their inclusion of more specficially defined biological as well as social variables illustrates the problems encountered in attempting to account for differences across cultures. Of particular importance, is the indication that a simplistically defined cultural difference is inadequate as an explanatory variable.

A further problem is that cross cultural comparisons are "static group" comparisons, that is, subjects from a superordinate population are not randomly assigned to different levels of the independent variable, namely culture. Moreover, the independent variable is not clearly defined, culture being unsatisfactory as a specification of an independent variable, since it may include various factors, such as social class, ethnicity and nationality (Berrien, 1966). Whichever factor one interprets as the causative variable, it is seldom

acknowledged that another variable associated with the alleged causative factor could potentially serve as an appropriate explanation for the observed mean difference between two samples.

Malpass (1977) proposes several strategies to overcome such difficulties. One approach is to gather as much data on as many alternative hypotheses as possible, in order to demonstrate that they are less plausible than the preferred one. Another method is to study the pattern of subcultural differences between populations on the dependent variable to reduce the number of possible alternative causative factors. A third strategy is to study differences in patterns of relations among dependent variables (Le Vine, 1970), which would reduce the number of alternative explanations possible when levels of simple variable means of local populations may differ due to cultural variation. The studies on illusion susceptibility highlight the necessity for investigating alternatives to a given plausible hypothesis.

Another methodological problem encountered in cross cultural research refers to the possible differences between the researcher and the subjects, so that the investigator is unable to identify or manipulate stimulus events that are meaningful within the context studied. Several strategies may be utilized to overcome this methodological difficulty. Campbell (1964) suggests that the interpretation of differences is only possible if there is a background of similarity between the investigator and the sample studied. Alternatively,

one would require the collaboration of an investigator who possesses similar experience to the group under study. Thirdly, the task being tested must of necessity be so constructed that the meaning of the subjects' responses are unambiguous and virtually unaffected by the investigator. Thus, interpretation of data gained would be minimally influenced by the investigator's ignorance of the cultural context he is studying.

2.2 A KEY ISSUE: THE EMIC-ETIC DILEMMA

A crucial issue in the methodology of cross cultural research is the decentering of concepts, which is closely associated with the emic-etic dilèmma.

The emic approach is defined as utilizing concepts employed in the population being studied and therefore yields an appropriate description of a phenomenon within that culture. However, by definition, emic data cannot be compared across cultures, since the concepts developed in a single culture may not be universal. The etic approach is assumed to utilize universal concepts and therefore is best suited for cross cultural research. However, most studies use a pseudoetic approach in that firstly, the concepts used are merely approximations or variants of emic concepts. Secondly, emic measures are frequently merely assumed to be etic, so that psychological assessment procedures are simply translated and used in other cultures.

The emic-etic dilemma has been most evident in the controversy regarding cultural differences in IQ scores. It has been shown repeatedly that poor children have a lower mean IQ than middle class children and that Blacks score more poorly on IQ tests than Whites. Jensen's (1969) statement that this data points to the genetic origin of racial and social class differences in intelligence, led to a host of studies pointing to the importance of recognising the culture-bound concept of intelligence tapped by IQ tests. Ginsburg (1972), reviewing the literature on IQ differences cross-culturally, points out that the IQ test may be seen as a measure of specific skills that are determined by cultural and social class factors. Hence the interpretation of the data on IQ differences requires the acknowledgement of the culture-bound concept of intelligence, as well as the recognition of the limitations of the test utilized. Moreover, Labov (1970) has argued that such differences in minority groups are related to motivational factors and that IQ test results cannot, therefore, be used as a reflection of intelligence. Thus, although cross-cultural data using the pseudoetic approach may indicate the level of achievement possible within a western, middle class environment, such an approach does not ascertain the particular intellectual strengths specific to other cultures. Nor does it appear to elucidate the universality of developmental principles in different cultures.

The assumption that poor children come from an impoverished environment, which causes deficits in perception and thought

processes, provides a further illustration of the emic-etic controversy. Klaus and Gray (1968), with their empiricist approach to development, claimed that poor children are concrete in their thinking and lack the level of abstraction that the western world demands. This view has led to many programmes of compensatory education to provide the intellectual and motivational skills which are supposed to be lacking. The authors have not, however, provided empirical data concerning the nature of the poor child's environment, although it is generally assumed that a slum environment or a rural African background does not provide enough stimulation for the development of normal cognition.

The myth of the "deprived" child (Ginsburg, 1972) has given rise to many hypotheses, the most recent pertaining to the formation of language in poor children. Bernstein (1966) has stated that there is a fundamental difference between working class speech and middle class speech due to different socialization processes. The working class are seen to develop a "restricted" code of language that is rigid, concrete and particularistic, whereas the "elaborated" code of the middle class is flexible, permeable and universalistic, so that it is context-free. However, Bernstein has been criticized for his lack of knowledge and empirical data on the language of what he defines as the "working class" (Rosen, 1972).

Labov (1969) suggests that "the notion of verbal deprivation is part of the modern mythology of educational psychology

... the myth of verbal deprivation is particularly dangerous, because it diverts attention from real defects of our educational system to imaginary defects of the child (in Keddie, N. (ed.), 1973, p.22). Labov has meticulously studied the conversations of children alienated from the school and found that, when removed from the typical research situation, these children are highly articulate. Moreover, the use of non-standard Negro English does not indicate the inability to grasp the meaning of concepts spoken, but rather an alteration of superficial form. This data is vital, since it shows us that the vernacular does not prevent the development of logical thought, since it possesses its own logic, which has merely been interpreted as different from the logic utilized in standard English.

The above research illustrates the growing contention that cross cultural research has eroded the previously assumed validity of universal principles and that one can only attempt to attain principles of short-term, context-bound validity. Moreover, the mass of conflicting data in cross-cultural studies appears to undermine the motive to establish principles that have veridicality across contexts (Cronbach, 1975). Furthermore, the methodological problems encountered severely hinder the search for theories of pan-human proportions.

However, one might argue that the limitations of cross-cultural research lie not in the inaccessibility of enduring principles, but in the inability to contemplate the form that

such principles might take and the methodology by which they may be discovered. The attempt to "prove" the universality of developmental principles first established in one culture assumes that these principles are universal, which constitutes an unverifiable statement. Weisz (1978) suggests that it would be more useful to evaluate present principles with respect to their stability across changes in context, to ascertain what he defines as "trans-contextual" validity. Thus, a developmental principle that can be shown to hold good across physical and cultural setting and time may be defined as having transcontextual validity. This shift of focus implies that the discovery of a stable body of general principles would ultimately be more useful in yielding specific hypotheses, than the attempt to generalise theoretically from an empirical statement that is established as valid for a particular context.

2.3 THE TRANSCONTEXTUAL VALIDITY OF PRINCIPLES OF EARLY COGNITIVE DEVELOPMENT

The critiques of cross cultural research outlined above may be interpreted as a process of refinement, encouraging the search for transcontextual validity and questioning rigid generalisations made on the basis of developmental phenomena observed in one culture. In the area of perceptual motor development, despite the existence of cross cultural research, theoretical analysis has been limited and confined within a pseudoetic framework. Given the fact that this approach has hindered interpretations concerning cross cultural

differences, it may, however, be useful to re-examine the data on cognitive development in general in different cultures.

Recently, there have been attempts to examine the effect of social class on sensorimotor development in terms of Piaget's theory. Klaus and Gray (1968) maintain that the environment of the poor child is spatially and temporally disorganised, so that the child's passivity is reinforced, rather than the active exploration which is essential for the development of adequate perception. A "deprived"environment such as this would, therefore, be expected to result in massive deficiency in perception, thinking and language. However, Golden and Birns (1968), when investigating sensorimotor skills on Piaget's original tasks, found no social class differences in object concept development. Wacks, Uzgiris and Hunt (1971) supported these results in their study of object concept development in infants of different social classes, although infants in the lower social class were poorer at means-end relationships at 11 months. However, since these differences were eliminated at 15 months, one can postulate that sensorimotor development, in the sense of the attainment of certain cognitive structures, proceeds fairly uniformly, regardless of social class or culture (Knobloch and Pasamanick, 1958; Palmer, 1970; Bayley, 1965; Williams and Scott, 1953). Other studies suggest that although children may differ in the ages at which basic cognitive skills emerge, the cognitive abilities will be actualized at a later age (Bakker, 1972; Bosco, 1972; Kagan and

and Klein, 1973). Kagan and Klein (1973) further suggest that different cultural groups may score poorly on certain tests because of their relative retardation on culturally specific skills, rather than deficiency in cognitive development. Lesser, Fifer and Clark (1965) examined the variations in the patterns of diverse skills that are associated with variations in social class and cultural conditions. Their results showed that ethnic groups displayed different patterns of mental abilities, giving rise to the hypothesis that ethnicity affects the organisation of mental abilities, so that, for example, Chinese children excel in spatial ability, not verbal skills. Moreover, the study indicated that social class differences existed in all ethnic groups, the lower classes performing consistently poorly on all tests. Social class may thus be interpreted as influencing the level of ability attained regardless of ethnicity, or it may merely reflect performance difference owing to poor motivation. Ginsburg (1972), although acknowledging the stringent methodological procedures, criticizes the study in that the tests are superficial; thus the distinction between behaviour and knowledge is difficult to ascertain.

In general, studies support Piaget's theory of cognitive development across cultures (Goodnow, 1962; Greenfield, 1966; Vernon, 1965). Differences in cognitive development have been found, some pertaining to the age at which cognitive skills are mastered, others being attributed to the contextual content of thought. However, the evidence suggests that certain aspects of cognition are universal, in that all children

acquire certain basic categories of thought. Within the perspective of similarities, the data on cognitive development cross-culturally would appear to reflect the trans-contextual validity of Piagetian developmental principles.

Much of the confusion regarding the interpretation of cross-cultural findings seems in fact attributable to the variety and inconsistency of terminology. It thus appears important in cross-cultural research to distinguish between ability and skill. The former term refers to the underlying cognitive structures which are universally attained, perhaps at different rates, while the latter, being variously referred to as skill, performance, competence or behaviour, is defined as the culturally specific form in which the ability is expressed, and which depends on culture specific demands for its expression. In addition, the notion of content is important, since culture determines content, which may spuriously give an impression of difference. Finally, motivation is crucial in cross-cultural research, particularly where pseudoetic measures are used.

3. PERCEPTUAL MOTOR DEVELOPMENT

3.1 DEVELOPMENTAL TRENDS IN PERCEPTUAL MOTOR INTEGRATION

The present study examines the development of a particular aspect of perceptual motor integration, namely the skill in copying two-dimensional forms, which has been shown to have a defined developmental course (Bender, 1938; Birch and Lefford, 1967; Frostig et al., 1961, 1964; Gesell and Armatruda, 1947; Koppitz, 1965, 1975; Singh, 1961; Wedell and Horne, 1969). The changes that occur in perceptual motor functioning appear, however, to be gradual, with no evidence for dramatic qualitative age changes, as may be seen in the development of the conservations in cognition (Pick and Pick, 1970). It is generally accepted that age strongly influences the response to any perceptual stimulus, responses tending to become more complex and more discriminating with the increasing age of the subject. Literature is lacking, however, on the specific changes in response to any one specific stimulus in human subjects throughout the entire lifespan. Ames (1966) indicated that the process of perception develops through "the patterned unfolding of predictable stages of behaviour" and that the process reverses itself in old age, so that responses mirror those levels achieved during the child's maturation.

Various classification systems have been developed to describe the development of copying ability and drawing in children (Bender, 1938; Birch and Lefford, 1967; Di Leo,

1971; Eng, 1931; Gesell, et al., 1947, 1948; Kellogg, 1970; Lowenfeld and Brittain, 1965; Piaget and Inhelder, 1956). These systems provide an ordered way of discussing perceptual motor changes and may be regarded as approximate levels of perceptual motor development, rather than exact developmental norms.

(i) Scribbling (2 - 4 years)

The initial stage of scribbling is characterised by the lack of control over motor activity. With the gradual acquisition of visual control at about 3 years, there is as yet little evidence of representational thought, the scribbles bearing only slight resemblance to objects perceived. Scribbling develops from the attempt to enclose space with semicircular lines to repetitive loops and spirals with increasing organisation. By the age of three years, the child can usually reproduce a circle copied from a card, while by four years, he can usually copy a square with reasonable accuracy, and may attempt triangles, but with little success.

(ii) Preschematic Stage (4 - 7 years)

The greatest development in copying occurs during this stage (Cratty and Martin, 1969), during which there is rapid differentiation of form and a gradual increase in the use of representative symbols, that is, geometric lines. Spatial orientation is largely relative to the perceiver and there is more emphasis on form orientation.

From four to six years the child begins to discriminate curved from straight lines, so that, by the age of six years, there is a significant change in the ability to draw triangles and diamonds. At six years of age the child can copy letters of the alphabet, but with frequent reversals, and by seven years, attention is paid to angles and dimensions.

Bender (1938) postulates that there is a tendency to revert to more primitive principles, for example, simplicity and symmetry, although Graham et al. (1960) found that both more primitive and more advanced responses were made, the consistent changes being manifested through greater accuracy.

(iii) Schematic Stage (7 - 9 years)

During this stage, the child gradually loses egocentrically bound spatial relationships, order being reflected along a base line. The child is able to utilize visual information, such as dots or grids, in copying and there is schematic representation of objects. There is, as yet, difficulty with three dimensional figures, since perspective is not mastered.

(iv) Dawning Realism (9 - 11 years)

Spatial relationships can now be represented in three dimensions, using a plane surface rather than a base line.

Although the above stages describe the changes in perceptual motor development, more specific normative data are not readily available owing to the substantial inter- and intra-subject variability. Furthermore, personality factors have been shown to influence perception (Dyk and Witkin, 1965; Kagan, 1965). Different levels of attention and motivation may also influence perception (Haber, 1968). Taking all these factors into account presents extreme problems in developing normative perceptual motor developmental data. It is perhaps because of these difficulties that there is a lack of theoretical foundation to the techniques that have been developed to assess normative changes in perceptual motor integration.

3.2 CROSS-CULTURAL STUDIES OF PERCEPTUAL MOTOR DEVELOPMENT

The foregoing review on developmental trends has been carried out within an essentially emic approach. On the basis of such research, it has been suggested that the child with retarded perceptual abilities will not profit as much from everyday experiences as will the child with "normal" perception (Frostig et al., 1965).

Koppitz (1975, p.43) states that "research findings suggest that the rate of development in visual motor perception differs among children of various ethnic groups". Cross-cultural differences on Bender test performance were noted by Carlson (1966), using schizophrenic Negroes as subjects. Subsequently, several studies have indicated that Negroes'

performances on the Bender test are poorer than those of American Whites (Henderson, Butler and Goffeney, 1969). Henderson et al (1969), Isaac (1973) and Mosely (1969) all used poor children as subjects and found that the performance of White children was signficantly better than that of Blacks. Other studies using the Bender Gestalt test have compared protocols produced by American Whites with Navajo Indian and Puerto Rican children, the latter groups consistently achieving poorer ratings (Hutt and Briskin, 1960; Piexotto, 1954).

However, several studies support the hypothesis that the discrepancies in test performance between whites and other ethnic groups diminish as a function of age (Greene and Clark, 1975; Taylor and Thweatt, 1972). Moreover, Marmorale and Brown (1977) found that significant differences between White, Black and Puerto Rican children during the first grade diminished by the end of the third grade.

Tiedeman (1971) and Sonoda (1973) investigated cross-national differences and found an accelerated rate of visual motor integration in oriental children, Japanese children doing significantly better on the Bender Gestalt test than their American counterparts. At age 9, however, these differences were no longer significant. The comparison between protocols of Japanese children and children of Japanese origin reared in America revealed the superior performance of the indigenous Japanese sample. Tiedeman hypothesized that child rearing practices and greater emphasis on visual awareness

and motor control may contribute to the faster rate of perceptual motor development.

One of the studies investigating perception by means of the Rorschach test, found distinctive tribal perception patterns which were interpreted as relating to three levels of perceptual maturation (Thompson, 1951). The argument for differences in perceptual patterns was confirmed by Joseph and Murray (1951) who noted that two tribes on Saipan maintained distinctive perceptual patterns. These studies on unique ways of perceiving forms, imply that modes of perception are related to the cultural context, and that further, association with another cultural context would alter modes of perception. De Vos (1969), in a systematic study of acculturation found that modal responses to the Rorschach changed in an immigrant population towards a similar pattern displayed by the normative American sample.

Kagan and Klein (1973), in their study of Guatemalan children, do draw a distinction between universal and culture specific skills, implying a parallel distinction between absolute and relative retardation. The authors tested the children from infancy to preadolescence on tasks designed to assess cognitive processes, including perceptual analysis of embedded figures. Their data suggests that absolute retardation on the tasks given at the supposed time of emergence of universal cognitive competencies during infancy is not predictive of comparative deficits for perceptual analysis during preadolescence. They state that there appears to be

no necessary relation between the early emergence of competency in infancy and the level of attainment in different abilities in childhood. Other studies corroborate this conclusion (Bakker, 1971; Bosco, 1972). The above studies also support the hypothesis concerning the long term resiliency of cognitive competency (Dennis, 1973; Dennis and Najarian, 1957).

Drawing on the critiques of the pseudoetic approach to cognitive development discussed previously, one may make the interpretation that the data showing poor perceptual motor functioning in children of different cultures reflects poorer test performance rather than deficits in perceptual motor ability. Research into the sensorimotor aspect of cognitive development suggests that inadequate performance may reflect relative retardation only in culture specific skills. Thus, the child who appears to have difficulty in the copying of two dimensional forms may manifest perceptual motor ability in different ways.

Some authors have claimed that the relationship between poor school achievement and poor Bender Gestalt test performance is indicative of perceptual deficits in "culturally deprived" children (Henderson, Butler and Goffeney, 1969). Moreover, Resnick (1969), using the Rorschach, found that lower class children showed poor integrative capacities and that perceptual training was not as effective with these children as with "non-deprived" children. Studies with the Bender Gestalt have reflected poorer perceptual motor

performance in children from lower class areas (Hammer, 1967; Hoffman, 1966; Mlodnosky, 1972; Zach and Kaufman, 1969). Dinmore (1973) suggested that adequate education may be a factor influencing test performance since the discrepancy between children from adequate and deprived school settings in perceptual motor functioning increased in the primary grades. However, both Hoffman (1966) and Isaac (1973) failed to find significant differences between the Bender test performances of White advantages and disadvantaged pupils. Studies indicate moreover that with perceptual motor training, the test performances of "deprived" children improved (Carlson, 1966; Dinmore, 1973).

The research into the effect of social class on perceptual motor development thus reflects the controversy over the concept of the "deprived" child that arose where these children were seen to perform poorly on IQ tests. Bearing in mind the assumption that certain universals have transcontextual validity, it may be more appropriate to interpret these results as showing the close relationship between culture specific skills and academic requirements. Thus the relationship demonstrated between perceptual motor skills and the acquisition of reading and writing (Koppitz, 1965; Koppitz, Mardis and Stephens, 1961) may be said to reflect the culturally determined necessity for a specific rate of perceptual motor development. The latter would thus allow the child to conform with the demands of a specific cultural institution, namely the school, which is characterised by age-grading.

It has been clearly shown, moreover, that schools emphasize

skills that are specific to middle class children, so that poor children's skills are not well matched with the demands of schools as currently constituted, leading to scholastic underachievement (Ginsburg, 1972).

Since developmental psychologists are concerned with establishing universal psychological laws, the data on cultural differences reviewed above would appear to undermine the view that perceptual motor development is consistently uniform in different contexts. However, the shift in focus to transcontextual validity suggests that in interpreting findings, the emphasis should not be on the differences in the rate of perceptual motor development, but on similarities in the pattern or process of development. Hence, reinterpretation of the findings reviewed above does not negate the gradual unfolding of more refined perceptual motor responses, as a function of age. However, further studies carried out within the transcontextual paradigm are required to confirm the universality of perceptual motor development following a similar pattern to that suggested by unicultural research. Furthermore, it is necessary to determine how social class and cultural factors affect the expression of perceptual motor ability, that is, the different rates of development and the specific skills exhibited in varying contexts. Finally, given the clinical application of findings regarding perceptual motor development in different cultural groups, it is necessary to provide a framework within which individual test scores on available measures may be meaningfully interpreted.

4. TESTS OF PERCEPTUAL MOTOR DEVELOPMENT

4.1 THE BENDER GESTALT TEST

One of the most widely used tests of perceptual motor development - particularly in the clinical setting - is the Bender Gestalt Test which was developed by Lauretta Bender (1938) and was cited in 1971 as the third most frequently used psychometric instrument (Koppitz, 1975). The test first achieved popularity as a diagnostic aid in assessing brain damage in adults, but has been used in the evaluation of perceptual motor functioning, emotional adjustment and neurological impairment in both children and adults. The present discussion will focus on the use of the test as an indicator of perceptual motor maturation in children.

4.1.1 The Bender Gestalt Test : Research

The Bender Gestalt test consists of nine geometric designs which Bender (1938) selected from a longer series of designs developed by Wertheimer to illustrate certain Gestalt principles. Thus Bender was much influenced by Gestalt theory, which states that the whole is more readily perceived than the parts and that the integration of parts and whole occurs only later in childhood through the process of differentiation. Bender proposed that the perception and reproduction of Gestalt figures is determined by biological principles of sensory motor action. The motor process of

patterning the perceived Gestalt may thus vary according to the growth pattern and maturational level of the individual and his pathologies, either functionally or organically induced, manifested in a tendency to revert to more primitive forms of gestalten.

Bender thus postulated that the development of perceptual motor functioning is reflected first in patterns of whole configurations, which are formed by combinations of loops and organized according to directional tendencies, clockwise or anticlockwise. Differentiation of form progresses rapidly from four to seven years so that, by this time, the child can reproduce all the Gestalt figures, with only a few problems with obliquity and angulation. By the age of eleven, perceptual motor maturity is reflected in the accurate reproduction of all the figures.

Bender (1970) stresses the global nature of the Gestalt function, the inseparability of the perceptual and motor capacities and the inherent nature of maturation in all organismic functions. The evolution of gestalten is seen as primarily maturationally determined and influenced by the biological and pathological state of the child, the effect of learning being minimal. The reproduction of the Bender Gestalt figures is thus seen as representative of the continual state of flux of the child's maturational level and his experience.

The theoretical principles of perceptual motor maturation

as proposed by Bender have received little experimental investigation, although neuro-physiological studies and research into the motor components of sensory motor development have refuted many of the principles proposed by the Gestaltists. Until the principles underlying copying ability have been further investigated, the issue of the construct validity of the Bender Gestalt test will remain unresolved.

The usual method of administering the Bender test is the procedure described by Koppitz (1965). The child is tested individually and is required to copy the nine designs on a blank sheet of paper. The cards are presented one at a time and there is no time limit.

Variations in methods of administration have been shown to influence test performance. Thus Tolor and Schulberg (1963) noted that the horizontal presentation of the paper resulted in fewer rotations.

The standard procedure of copying the designs with a pencil has been modified in the stick-copying method (Wise, 1968) and in the use of plasticine to copy the designs (Wedell and Horne, 1969). These methods perhaps stress the motor component of perceptual motor functioning. Methods of matching and tracing, multiple choice, elaboration and recall have also been devised as alternative methods of test administration, particularly for preschool children.

Keogh and Smith (1961) investigated the reliability of the Bender Test in group administration and found no difference

between scores obtained through individual and group administration. The group technique, however, severely limits behavioural observations which are considered a valuable, if not essential, adjunctto the meaningful interpretation of Bender Test performance.

Although Bender criticizes many of the scoring systems for analyzing a global function into its component parts, she does not provide an objective scoring system, merely giving the age norms for the various designs to provide a standard against which to compare maturational levels. The skill of the clinician is, therefore, of utmost importance in the scoring and interpretation, a factor which has contaminated many studies on the reliability and validity of the Bender Gestalt test.

Several more objective scoring systems have been developed (Mogin, 1966; Ghent , 1966; Hutt and Briskin, 1960; Quast, 1961; Wiener, 1966; Rimmer and Weiss, 1972), which may be generally criticized, since they are not based on the Gestalt principles originally postulated by Bender. Nor have the systems been embedded within any alternate conceptual framework of perceptual motor development. These systems have, moreover, varied considerably in methods for evaluation and scoring of Bender protocols, being based on a limited normative population and designed for a particular group of children. As a consequence, a given deviation on the test may be variously interpreted as a sign of brain injury, emotional maladjustment or perceptual immaturity.

The Developmental Test scores developed by Koppitz (1965) are preferred by clinicians, since they attempt to provide a more objective basis for determining the level of perceptual motor maturation in the child, where deviations in reproductions are evaluated against the age of the child to determine the degree of immaturity reflected. Koppitz, moreover, has asserted that by using multiple interpretation, a single Bender protocol may yield an evaluation of perceptual maturity, possible neurological impairment and emotional adjustment (1965).

The items in the Koppitz scoring system were chosen and adapted from Pascal and Suttell's (1951) scoring system for adults, according to their ability in differentiating children with emotional problems, from those with learning disabilities (Koppitz, 1965; 1958). The system may thus be included in those criticized for not being derived from the theoretical principles proposed by Bender.

The Koppitz Developmental scoring system was standardized on 1104 children for ages five years to 10 years 11 months at 6-month intervals. The sample size may be considered rather small and furthermore, as Koppitz herself states, there was a marked underrepresentation of minority students in the normative sample. The normative data are, therefore, typical only of White school children (Koppitz, 1975).

The Koppitz Developmental scoring system has, however, been found to have high inter-rater reliability (Dibner and Korn,

1969; Dinmore, 1972; Egeland et al., 1967; Kaspar and Lampel, 1972; Rykman et al., 1972; Snyder and Kalil, 1968; Taylor and Thweatt, 1972). Studies investigating test-retest reliability indicate that the Koppitz Developmental Test scores are stable, particularly when the interval between test administration does not exceed three months (Goff and Parker, 1969; Isaac, 1973; Keogh and Smith, 1968; Rykman et al., 1972; Sonoda, 1971). Changes in test scores after an interval of three months would be expected with the continual process of perceptual motor development. The stability of test-retest scores in groups of children with emotional problems and/or minimal brain dysfunction, is not as consistent as that seen in "normal" children. Koppitz (1975) states that the instability of scores reflects the erratic, uneven progress of perceptual motor development in these groups, rather than unreliability of the scoring system itself. Dibner and Korn (1969) found that none of the items listed by Koppitz could be deleted, since all were valid.

4.1.2 The Bender Gestalt Test : Application

Koppitz (1965) states that the Bender Gestalt test may be used to screen for school readiness, to predict school achievement, to diagnose reading and learning problems, to evaluate emotional difficulties, to diagnose brain injury and to study mental retardation.

As a measure of perceptual motor development, the Koppitz scoring system was standardized on children from five to

ten years. The test thus loses its discriminative value in normal children by age ten. The most rapid development occurs between the ages of five and seven (Koppitz, 1965). The differences between Bender Test mean scores for different age levels diminish as the child grows older, so that by age nine, most children can execute the Bender Test without major imperfections. At this age, Bender test mean scores reach a plateau and can no longer discriminate between average and above-average Bender test performance. The improvement in Bender test performance is generally acknowledged (Singh, 1961), although the distribution of mean scores is somewhat uneven.

The original normative study by Koppitz (1965) showed no statistically significant differences between test scores for boys and girls, so that only one set of normative data is presented. Although it is generally accepted that girls mature a little earlier than boys in visual motor perception, subsequent research has confirmed the absence of sex differences in test performance of primary school children. (Dibner and Korn, 1969; Hammer, 1967; Taylor and Thweatt, 1972). Sex differences in Bender test performance may be evident at about six years, when girls perform better than boys at kindergarten level, but these differences diminish into insignificance by the end of the first grade (Dibner and Korn, 1969; Dinmore, 1972; Keogh and Smith, 1968).

Sabatino and Ysseldyke (1972) investigating a group of children with learning difficulties, found that boys did

significantly better than girls on the Bender test. These results were confirmed by Dierks and Cushna (1969) in a clinic population. It has been suggested, however, that girls with mild learning problems compensate better than boys, so that the majority of girls referred for treatment have severe learning problems. Hence the differences found in the studies may be due to the greater severity of problems of the girls in the samples. Koppitz (1975), moreover, found no sex differences in test performance between average pupils and children with emotional and/or learning problems when the groups were matched for age and mental ability.

Koppitz (1965) validated the Developmental Bender Test scoring system against overall scholastic achievement in the first and second grades and recommended that the test be used to screen school beginners. There appears, however, to be no one-to-one relationship between Bender Test scores and school achievement. A good Bender test performance is a better predictor of school progress than an average or poor Bender score. Dibner and Korn (1969) recommend that the test be used at the end of kindergarten, although it would seem that the test is effective as a predictor through the ages five to six (Koppitz, 1975). It has been found, moreover, that the efficacy of the Bender test as a screen for school readiness is increased when used in conjunction with other tests (Koppitz, Mardis and Stephens, 1961; Smith and Keogh, 1963).

Although there is considerable research to support the

predictive value of the Bender in school achievement (Billingslea, 1963; Keogh and Smith, 1967), recent research indicates that several factors influence the level of significance of the correlations found, for example, reading versus arithmetic, levels of mental ability, age and grade level. Research suggests that the Bender test correlates better with arithmetic than with reading achievement (Keogh and Smith, 1967; Vormeland, 1968). Children's success or failure at school depends only partially on visual-motor integration, since other factors, such as language development, auditory-visual integration and recall of information, are equally important for school achievement.

The relationship between Bender Test scores and school achievement decreases when the variables of age and IQ are controlled (Henderson et al., 1969).

Correlations between IQ and Bender scores have been shown to be statistically significant for pupils with average mental ability (Baer and Gale, 1967). However, children with immature Bender Test scores may have a low or high IQ, depending on other factors present.

In summary, it would appear that the Bender Test is more highly correlated with achievement in arithmetic than with reading, but is most closely related to general school performance, rather than to particular skills.

The test, furthermore, is more reliable in predicting high

achievers (Keogh and Smith, 1967), but because of individual variations in perceptual motor development, it is suggested that the Bender test be administered twice within an interval of six months to allow for a more reliable assessment of school progress. Since it has been found that the method of group administration reflects more closely the classroom situation (Mlodnosky, 1972), this method would be preferred in testing for school achievement. The Bender Developmental Test appears to be a reliable predictor of school readiness, but Koppitz (1975) cautions against the use of the test on its own to provide a reliable prediction of school progress.

Clinicians have placed considerable reliance on the results of the Bender Gestalt Test in differentiating supposedly neurologically impaired children from those whose intellectual problems have some other etiological basis. Several studies suggest that there is a relationship between defects in visual motor perception and minimal brain dysfunction (Benton, 1962; Clements and Peters, 1962; Parsons, McLeroy and Wright, 1971). Koppitz (1962) considers the Bender Gestalt Test to be a valid instrument in differentiating brain injured children and normal children. As well as stipulating the possible indicators for brain injury in deviations occurring at particular age levels, Koppitz stresses the need for additional observations before a definitive conclusion may be made, such as the time required to complete the test, the amount of space employed in reproducing the drawings, detailed analysis of the errors, an assessment of the child's awareness of these errors, and

his behaviour in relation to the testing situation.

The Bender Gestalt Test has been shown to differentiate children with learning disorders from those with emotional problems (Koppitz, 1965), as well as discriminating between groups of clinic patients with varying degrees of organic impairment (McConnell, 1967). It has been suggested that, children with minimal brain dysfunction (MBD) develop more slowly and show a lag in visual-motor development, so that one would expect a significantly more immature Bender test performance than that obtained from normal children aged five to ten.

Because of the immaturity of perceptual motor development in some children with MBD, it has been suggested that the total Bender Developmental score can better differentiate between children with, and without, MBD than any individual scoring item or sign. Weiss (1971) indicated, moreover, that rotations are a developmental phenomenon and are not necessarily related to brain damage in children. Koppitz (1962) stressed that age is important in evaluating the diagnostic significance of a given deviation on the Bender.

The presence of neurological impairment cannot be ruled out because of a good Bender test performance. On the other hand, a study on the predictive ability of the Bender Gestalt Test in diagnosing neurological impairment (Welcher et al., 1974) suggested that the Koppitz method resulted in an over-diagnosis of abnormality. It was difficult, moreover, to

distinguish between delay in maturation and retarded perceptual motor development due to neurological impairment.

Some children with MBD will, however, have difficulties primarily in the areas of language and memory, while visual-motor perception is not impaired. Koppitz (1975) therefore believes that it is not possible to predict accurately the presence of MBD from Bender test performance alone. The test is thus recommended in conjunction with other psychological measures and behaviour observations.

Other methods of assessing Bender Test protocols are also effective in discriminating between children with and without MBD. The Quast scoring method (1961) includes more specific signs, although Holroyd (1966) found no difference in the ability to differentiate children with MBD between the Koppitz method and the Quast scoring system. The Canter scoring system may also be used to identify children with cerebral dysfunction.

The Koppitz scoring system includes ten emotional indicators as an assessment of <u>emotional adjustment</u>. McConnell (1967) points out that Emotional Indicators lack internal consistency and therefore cannot be added together into a meaningful score. Koppitz (1975) suggests that the interpretation of Emotional Indicators should be limited to underlying hypotheses, which should then be checked against other psychological data. This aspect of the Koppitz method appears to be minimally useful to the clinician and empirical investigation

has indicated the scoring system of Emotional Indicators to be unreliable (Dibner and Korn, 1969; Goff and Parker, 1969).

4.2 THE DEVELOPMENTAL TEST OF VISUAL-MOTOR INTEGRATION

A test commonly used interchangeably with the Bender Gestalt Test in the assessment of perceptual motor development is the Developmental Test of Visual Motor Integration (VMI), developed by Beery (1967).

The test consists of a series of 24 geometric forms, arranged in order of increasing difficulty. The test may be administered to children in the age range of two to fifteen years, but is most effective for preschool and primary grade children. The ease of administration and scoring makes this test suitable for both group and individual administration. The VMI yields an age equivalent visual-motor integration age or a perceptual motor age.

The VMI evolved from the theory that success in school is highly dependent upon basic skills acquired early in life, including perceptual motor functioning. Academic achievement is dependent upon well developed information processing systems, so that a child's ability to read, write and spell depends on his abilities to see, hear, feel, speak and move. The coordination and organization of the various perceptual functions are essential for efficient information processing abilities. The test itself was devised in an attempt to

bridge the gap between theory and practice in the identification and remediation of learning disorders. The VMI provides not only a diagnostic tool, but also an instrument through which the clinician may assess the individual needs of a particular child. Thus, as well as providing developmental norms in the scoring system, the manual provides simple visual motor tasks in order to determine the source of difficulty. In addition, ten basic forms are suggested for remediation, which are of invaluable help to the teacher in the educational setting.

The test manual reports high reliability and validity coefficients, although no studies have investigated the test in other cultural groups.

Krauft and Krauft (1972) explored the relationship between the Bender Gestalt Test and the VMI in moderately retarded youngsters and found a significant correlation between the scores achieved on both tests.

However, in spite of the similarities between the VMI and the Bender Gestalt Test in terms of content, format and scoring interpretation by means of developmental norms, the domains sampled by these tests are not identical (Liemohn and Wagner, 1975).

Koppitz (1965) attempted to tap the development of visual-motor perceptual function and minimized the influence of both fine. motor coordination and factors not age related. Beery's

developmental scale is, however, designed to determine the degree to which visual perception and motor behaviour are integrated in young children, and thus explicitly employs motor performance in scoring. The VMI scores then, can reflect perceptual; motor, or visual-motor integrative development, while Bender scores are intended to be influenced primarily by visual-motor form-perception, and not by fine motor coordination per se. Therefore one would expect these tests to yield somewhat different types of information, calling in question the interchangeable use of the two tests in clinical assessment.

Brown (1977) found significant differences between the mean scores obtained on the Bender Gestalt and VMI tests on a group of normal children. These results support the findings of Liemohn and Wagner (1975), and indicate that neither test should be utilised as the sole indicator of perceptual motor functioning.

5. AIM, RATIONALE AND HYPOTHESES

5.1 AIM AND RATIONALE

The aim of the present study is to investigate the clinical applicability of two tests of perceptual motor development - the Bender Gestalt Test and Developmental Test of Visual-Motor Integration (VMI) - in a particular subcultural group in South Africa, namely, the 'Coloureds'.

Research on the Bender Gestalt Test in 'Coloured' children in South Africa is not extensive, but generally indicates their poorer test performance, when compared with the Koppitz norms. Several studies (Evans, 1973; Stock and Smyth, 1967; Freind, 1973) postulated that poor 'Coloured' children, because of malnourishment in early infancy, suffer perceptual motor deficits due to organic brain damage. A comprehensive study into the components of Bender Gestalt test performance in 'Coloured' children in relation to environment, teacher effectiveness and perceptual training (Saunder , 1974) indicated that social class status was a variable in poor test performance, but that with perceptual training, differences diminished. The effectiveness of perceptual training suggests that the Bender Gestalt taps culture-specific skills, and, furthermore, that poor 'Coloured' children lack the necessary skills demanded by the educational system.

The findings of the above studies are broadly similar to those

of other cross-cultural studies using the Bender Gestalt Test to investigate perceptual motor development. It is, however, necessary to re-evaluate the findings in the light of the theoretical and practical issues arising from the use of the test within a different cultural context. Although similar issues may pertain to the VMI, the paucity of research precludes a detailed critique.

The validity of the Koppitz norms has been questioned: these developmental norms were standardised on a predominantly white, middle class sample. Although the Bender Gestalt Test is assumed to measure developmental changes in perceptual motor ability, only a few studies with white subjects are to be found in the literature that support this assumption. There are no specifically developmental studies, moreoever, that describe the changes with age in Bender Gestalt performance in other cultural groups. Furthermore, only one study has included a white, middle class group in cross cultural comparisons of Bender Gestalt scores and Koppitz developmental norms (Marmorale and Brown, 1977).

The issue of whether the Bender Gestalt Test is "culture free" or not, has not been clarified (Billingslea, 1963). The culture fairness of a psychometric instrument is a crucial issue when attempting to establish the validity of developmental principles in different contexts. The Bender Gestalt Test is traditionally considered to be an etic measurement, so that differences in Bender test performance cross-culturally have been interpreted as reflecting differences in perceptual

motor ability. The test, however, was developed within an American, middle class culture, using concepts that are emic to that particular group. The question is raised, therefore, whether the cross-cultural data on Bender test performance have been confounded by the pseudoetic approach, such that cultural differences observed, merely reflect the level of efficiency in culture-specific skills, rather than perceptual motor ability. Cross-cultural studies showing that the discrepancies on Bender Gestalt performance diminish as a function of age, support the impression that the test is a measure of culture-specific skills (Greene and Clark, 1973; Marmorale and Brown, 1977; Taylor and Thweatt, 1972). Investigations have indicated, moreover, that the Bender test performance of different cultural groups improves with specific perceptual motor training, supporting the hypothesis of culture specificity. The cross-national data (Sonoda, 1971; Tiedeman, 1971) on the Bender Gestalt Test have been interpreted as reflecting different rates of maturation. These findings, however, may merely indicate that different groups perform adequately on the Bender Gestalt test at different ages.

The social class factor has not always received sufficient attention. Several studies compared the quality of Bender protocols of different cultural groups with protocols produced by Whites (Carlson, 1966; Hutt and Briskin, 1960; Piexotto, 1954) or with the norms developed by Koppitz (1965), and found that other cultural groups consistently achieved relatively poorer ratings. Subsequent research, however, indicated

that when social class status was a known factor, the results have shown that both Black and White children who fared poorly on the Koppitz norms were from lower class backgrounds (Hammer, 1967; Moseley, 1969; Saunder, 1974; Snyder et al., 1971). One cannot, therefore, assume that children who show poor performance on the Bender Gestalt test are deficient or retarded in perceptual motor ability, rather than a culture-specific pattern of skills.

The issues summarized above highlight the problem of determining the transcontextual validity of developmental changes in perceptual motor ability. More research into the changes noted in Bender test performance in different cultural groups is thus demanded, in order to provide more information regarding the nature of the test as a measure of perceptual motor ability or culture-specific skill. The relationship between findings on two perceptual motor tests in one cultural group might be expected to assist in clarifying the nature of the underlying construct, that is, perceptual motor ability.

Despite the uncertain transcontextual validity of normative data on perceptual motor development, however, both the Bender Gestalt and the VMI tests continue to be used extensively in South Africa. The theoretical problems evident in the research outlined above give rise to many more within the clinical field. Perhaps the most important implications of this research relate to the practical efforts to determine whether the two tests may validly be used as measures of perceptual motor functioning within the particular subcultural group investigated.

Both the Bender Gestalt and the VMI tests are used to determine the level of perceptual motor development for both diagnostic and assessment purposes in the Cape. Although Koppitz (1975) has stated that the clinician must take into account ethnic and sociocultural factors when using the Bender Gestalt test, it is unclear to what extent deviations from the norm may be considered variation due to cultural or socio-economic factors, or to perceptual motor immaturity. The cross-cultural research on the Bender Gestalt test thus far, has led to the explicit assumption that many cultural groups and, more particularly, poor children, perform below standard on the Koppitz norms. The research on 'Coloured' children in South Africa has furthermore perpetuated the clinical practice of regarding poorer scores as permissible due to sociocultural variables. Factors such as practice and motivation, which have been suggested to account for the persistent test differences in lower class children, have tended to be ignored. The extent to which deviation from the norm may be considered due to cultural variation, has not been empirically established. The usefulness of the Bender Gestalt test as a psychometric tool in this particular group has thus been seriously undermined by such intuitive procedures.

It has been shown that poor children do consistently less well at school in comparison with their middle class counterparts (Ginsburg, 1972), and that scholastic achievement is dependent on culture-specific skills. The high correlations between Bender Gestalt test performance and overall school

achievement suggest that the test is an accurate assessment technique in determining the progress of children within a particular cultural institution, namely the school. The clinician, therefore, in making allowances for poor Bender test performance, limits the established accuracy of the test in assessing the child's future progress at school. If indeed sociocultural factors do affect the Bender test performance of 'Coloured' children, there is a need to establish appropriate norms for the given socioeconomic group, or to have available "typical" Bender test scores for that particular population, as suggested by Koppitz (1975). As a measure of culture-specific skills, typical Bender test scores would also be of assistance in the educational field, in attempting to establish the optimum educational conditions for the group under study.

The theoretical and practical issues outlined above concerning the applicability of the Bender Gestalt Test to 'Coloured' children may similarly apply to the use of the VMI test. The assumption that the VMI developmental norms may be reflective of culturally determined changes in specific skills requires verification, however, since cross-cultural data are lacking.

In summary, the present study attempts to extend previous research. The investigation of developmental changes in the performance on the Bender Gestalt and VMI tests in the group would provide more information regarding the trans-contextual validity of the two tests' developmental norms.

The relationship between the findings of the two tests in the sample under study would provide an indication as to which test may be regarded as more "culture free". Comparisons of test performances over a wide age range of children against both the Koppitz and VMI (Beery) developmental norms is advisable, given that cross-cultural differences have tended to diminish as a function of age. Finally, given that previous differences in test performance in 'Coloured' children have been attributed to socioeconomic level, this factor requires further investigation.

5.2 HYPOTHESES

5.2.1 Examination of the applicability of Bender developmental norms to 'Coloured' children between the ages 6 years to 10 years 5 months in three socioeconomic levels:

Hypothesis 1

H_0 - There is no significant difference between chronological age and perceptual motor age, as assessed by the Bender Developmental norms in the present population.

H_1 - There is a significant difference between chronological age and perceptual motor age, as assessed by the Bender Developmental norms in the present population.

Hypothesis 2

H_0 - There is no significant correlation, positive or negative,

between chronological age and perceptual motor age, as assessed by the Bender Developmental norms in the present population.

H_1 - There is a significant correlation, positive or negative, between chronological age and perceptual motor age, as assessed by the Bender Developmental norms in the present population.

5.2.2 Examination of the applicability of VMI developmental norms to 'Coloured' children between the ages 6 years to 10 years 5 months in three socioeconomic levels.

Hypothesis 3

H_0 - There is no significant difference between chronological age and perceptual motor age, as assessed by the VMI Developmental norms in the present population.

H_1 - There is a significant difference between chronological age and perceptual motor age, as assessed by the VMI Developmental norms in the present population.

Hypothesis 4

H_0 - There is no significant correlation, positive or negative, between chronological age and perceptual motor age, as assessed by the VMI developmental norms in the present. population.

H_1 - There is a significant correlation, positive or negative, between chronological age and perceptual motor age, as assessed by the VMI Developmental norms in the present population.

5.2.3 Examination of the relationship between the Bender developmental norms and the VMI Developmental norms as applied to 'Coloured' children between the ages 6 years and 10 years 5 months in three socioeconomic levels.

Hypothesis 5

H_0 - There is no significant difference between perceptual motor age, as assessed by the Bender Developmental norms, and perceptual motor age as assessed by the VMI Developmental norms in the present population.

H_1 - There is a significant difference between perceptual motor age, as assessed by the Bender Developmental norms, and perceptual motor age as assessed by the VMI Developmental norms in the present population.

Hypothesis 6

H_0 - There is no significant correlation, positive or negative, between perceptual motor age, as assessed by the Bender Developmental norms, and perceptual motor age, as assessed by the VMI Developmental norms in the present population.

H_1 - There is a significant correlation, positive or negative, between perceptual motor age, as assessed by the Bender Developmental norms, and perceptual motor age, as assessed by the VMI Developmental norms in the present population.

6. EXPERIMENTAL DESIGN AND METHOD

6.1 EXPERIMENTAL DESIGN

Within the constraints of sample stratification, a total sample size of 90 was randomly selected and hypotheses were tested using multiple "t" tests. As the criterion for chronological age is fixed, while perceptual motor age equivalents may vary, violation of the homogeneity of variance assumption prevented the use of a three way analysis of variance design.

The independent variables (IV's), with the corresponding levels (see Table 1) were the following:

A. Age Group

1. 6 years to 6 years 5 months
2. 7 years to 7 years 5 months
3. 8 years to 8 years 5 months
4. 9 years to 9 years 5 months
5. 10 years to 10 years 5 months

B. Socioeconomic Level

1. upper
2. middle
3. lower

The dependent variables (DV's) consisted of 2 methods of age assessment:

1. Perceptual motor age, as assessed by Bender Developmental norms (BA).
2. Perceptual motor age, as assessed by VMI Developmental norms (VA).

The sources of extraneous variance which were controlled, were the following:

1. Formal school experience
2. Educational attainment
3. Sex.

TABLE 1 : Illustration of Experimental Design

Socio-economic level:	Age Group 6-6.5	7-7.5	8-8.5	9-9.5	10-10.5	
Upper	*					30
Middle						30
Lower						30
	18	18	18	18	18	

* 2 DV's: BA and VA

6.2 SUBJECTS

6.2.1 Description of Population

The group of people officially described as the 'Coloured population group' is the third largest of four major categories in South Africa, comprising a little less than ten percent of the total population. The regional distribution

of the 'Coloured' group is, however, extremely uneven, the majority being resident in the Western Cape area. Thus, in the Cape Town Municipal area, 'Coloureds' are numerically predominant, comprising about 54 percent of the total population (Thomas, 1976).

The uneven regional distribution of the 'Coloured' group has its roots in the historical origins of the people. These origins, however, are far from clear, given the changing and confused definition of the group. It would appear, however, that the progeny of unions between European sailors and settlers, indigenous people (chiefly the Khoisan) and, subsequently, slaves, were at first not subject to any peculiar legal disabilities, but gradually came to be regarded as a more or less distinct group. In the course of time, by further interbreeding with other South African groups, the ethnic composition of the group became further diversified, simultaneously being subject to successive attempts to define its status in statutory terms.

The latter attempts have been interpreted as a means of perpetuating a congruence between colour and ownership or economic interests (Groenewald and van der Merwe, 1976). Such an interpretation seems preferable to a functionalist interpretation in terms of culture, given "the economic and political cleavages that still exist between great masses of Whites and Coloureds" (Groenewald and van der Merwe, ibid., p.1).

Such cleavages take the form of a dominant - subordinate relationship between the White and 'Coloured' groups. The

subordinate position of the 'Coloured' group to the dominant White group is illustrated by studies of occupational mobility. It was found that "mobility of Coloured people over the last two decades did not contribute substantially to the management and executive occupations, but indeed to administrative, clerical and professional occupations which are not 'power' positions to the same extent as the former" (Groenewald and van der Merwe, 1976, p.2).

The relatively small 'Coloured' entrepeneur class is a further indication of societal limitations and barriers, which are today more often of a conventional or traditional nature, than in terms of statutory measures (van der Horst, 1976).

However, as the occupations just mentioned indicate, there is occupational mobility among the 'Coloured' group, leading to occupational differentiation and hence increased stratification and social differences within the group and countering the development of common interests or culture among all 'Coloured' people. (Groenewald and van der Merwe, 1976).
It should be emphasised that the lack of homogeneity is not a recent phenomenon, but has been a continuing feature historically. Beginning with the fact that the 'Coloured' group has evolved from a combination of elements of virtually all ethnic groups in South Africa, a complex social structuring has developed, as summarised by Thomas (1976) in the following terms:

> "In terms of religion and culture it is split at least between the minority Malay group and the so-called

> Cape Coloureds. As far as regional distribution is concerned there are important groups in other parts of the country ... Finally, socio-economically each of these groups reveals a broad pattern of differentiation, including members of higher and lower 'classes' with their social links in quite different communities (i.e. towards Whites and upper class Asians or towards working-class Africans)". (p.68)

In terms of perceptions of people within the 'Coloured' group, definitions are equally heterogenous, reflecting that of the internal social structuring of the group. The situation is further complicated by

> "the determination of many Coloured persons, especially young persons and intellectuals, not to acknowledge the 'Coloured' group concept, giving preference either to non-racialism or Black identity. Much of the behaviour of individuals may thus be seen as a deliberate attempt to transgress the group-barriers and behave a-typically in terms of some of the characteristics of the group" (Thomas, 1976, p.68).

The latter is most strikingly illustrated by the phemomenon of "passing" (for White), a process which is obviously not amenable to quantification, but for which high estimates have been made (Broom, 1976).

Thomas (1976) concluded that the heterogeneity of social structuring and subjective definition "makes any generalisation

about 'the' Coloured people practically meaningless" (p.68). He nevertheless conceded that while the 'Coloured' people do not constitute a culture group distinct from other groups, their structural position in the total political, economic and status hierarchy does have cultural implications. Thus, description of the 'Coloured' group must emphasize socioeconomic characteristics and the particular matrix of discrimination relevant to them, both features being a reflection of their position in the total population.

6.2.2 Socioeconomic Indices

The 'Coloured' group forms the majority in the Cape Town urban area, where the present study was carried out. Indices of particular relevance to the present study are the following:

(i) Occupation

In terms of occupation, 'Coloureds' are restricted more by convention than by statutory measures to particular categories of jobs. However, Broom (1976) suggested that, for 'Coloured' males, there was a significant overlap with the White occupational structure, such that the two groups could be considered members of a single workforce, whose positions are unequally allocated. The major differences are the greater access to managerial, executive, professional and technical positions by Whites (see above), and the greater number of 'Coloureds' in labouring jobs. There is a significant similarity in the percentages of 'Coloured' and White workers employed as sales

workers, craftsmen, foremen, operatives and service workers (Broom, 1976). The latter occupations would be classified as Class III according to conventional socioeconomic classifications. A similar overlap is not evident for 'Coloured' females who are occupationally far more inferior to White females. However, for the purposes of socioeconomic classification, male occupation is usually the determining factor.

It needs to be emphasised that the prestige attached to particular occupations does differ within the 'Coloured' and White groups, particularly at the extremes of the occupational spectrum. Thus, occupations to which 'Coloureds' have limited access, carry proportionately higher prestige and financial rewards, managerial, professional and semi-professional occupations being highly valued within the 'Coloured' group. Hence conventional socioeconomic classifications must be used with extreme caution: what may appear minor distinctions of occupation frequently carry major distinctions in terms of prestige. For example, the prestige and hence, status, of a teacher is greater within the 'Coloured' group than the White group.

The earning capacity of the 'Coloureds' tends to reflect the limited range of occupations available to them. According to Thomas (1976), however, there are, as yet, substantial differences in the salaries and wages paid to 'Coloured' employees doing the same type of work as Whites, despite the fact that the principle of "rate for the job" is gradually being extended to more categories of employment. The lower earnings of 'Coloureds' have a direct effect on life style, dictating to

a large extent, possibilities in terms of housing, recreational activities and education, especially at secondary school level.

(ii) Education

Recently, there has been a rapid increase in government expenditure on education for 'Coloureds' and considerable progress in the extension of basic education, reflected in the increase in the ratio of pupils to the total 'Coloured' population (20,8 percent in 1961 to 25,5 percent in 1970). Despite the increase in numbers of children in the higher standards, the absolute numbers are still very low. The educational facilities available to the 'Coloured' community are still inferior to those offered to Whites (Thomas, 1976). For example, the expansion of schools and classroom facilities has not kept up with the rapid growth of the numbers of pupils. As a result, the number of schools with double shifts has increased gradually, amounting to about 30 percent of all schools and affecting 12 percent of the children. In addition, there is a shortage of teachers, and teachers at all levels are not sufficiently trained to be able to maintain high standards.

(iii) Housing

"There is perhaps no other characteristic which is more directly associated with the current socio-economic situation of the Coloured people than the lack of proper housing and community services in the residential areas" (Thomas, 1976, p.65).

Low income levels and earning capacities of the majority of 'Coloured' workers has made it impossible for them to provide economic-standard housing for themselves and has made them reliant on either squatting or sub-economic public housing. However, the relative improvement in occupation and income level of a part of the 'Coloured' community has created a demand for residential land and better quality townships.

Factors such as the rapid urbanisation of the 'Coloured' people, high rates of population growth and insufficient attention from the local authorities to housing needs, have been cited as significant causes of the housing shortage. A further important factor, which has drastically reduced the supply of housing, has been the imposition of residential segregation through the Group Areas Act.

Related to the actual lack of dwelling units are numerous other features which affect the cultural life of the 'Coloured' people. These features include severe overcrowding of houses and the associated lack of privacy, poor standards of housing and basic amenities, and lack of community amenities such as telephones and insufficient recreational facilities.

The distant location of new townships from the dominant areas of employment and commercial activity imposes on most workers long, time-consuming and expensive transport routes on overcrowded public transport. In addition, residential segregation limits the scope for association with members of other 'population groups' or for participation in cultural and recreational activities available in the city centre.

6.2.3 Sample Selection

Subjects were chosen from the normal school population, with the permission of the Administration of Coloured Affairs. Within the constraints of the variables outlined below, a total number of 90 subjects were randomly selected from school registers within the age range 6 years to 10 years 5 months. The sample was stratified according to the following criteria:

(i) Socioeconomic level:

The housing of the 'Coloured' group is dependent on income (see 6.2.2) and it is governmental policy that children attend the school situated in their residential area. A convenient method of obtaining subjects stratified according to socioeconomic level was, therefore, to use schools in different residential areas, as a basis for selecting subjects representative of relatively distinct socioeconomic levels. Subjects were obtained from schools recommended by the Administration of Coloured Affairs, as being representative of "upper" "middle" and "lower" socioeconomic levels, according to criteria of parental occupation as well as quality of housing. The criteria for each socioeconomic level were verified in consultation with the staff at each school. Although this method of stratification does not provide unequivocal definition of socioeconomic level, the thirty subjects selected for each socioeconomic level generally satisfied the criteria recommended by the Administration of Coloured Affairs.

The "upper" socioeconomic level was represented by subjects

whose fathers generally held professional posts, such as teachers, school inspectors, medical technicians and lawyers. The residential area contained a certain percentage of privately owned homes and the general standard and quality of housing was good.

The "middle" socioeconomic level was represented by subjects whose fathers included tradesmen, small entrepeneurs and clerical workers. Housing in the residential area was of fairly good standard and quality.

The "lower" socioeconomic level was represented by subjects whose fathers were generally unskilled or semi-skilled labourers. Housing was predominantly subeconomic standard and the quality was poor, for example, no guttering.

(ii) Age

Age changes in test performance are well established, as are the regularities and irregularities of the development of different mental abilities (Anastasi, 1958). To exercise control over the age variable, a limited age range of six months was therefore specified for each age group. Koppitz (1975) stated that, for research purposes, the comparison of the Bender test mean scores of a particular group with the normative data, required the selection of subjects within the same age ranges given for the original developmental norms (Koppitz, 1965). The age ranges selected, therefore, coincide with those given in the normative study.

It was decided to omit intervening age ranges when selecting subjects to allow for intrasample variations. The resultant data would, furthermore, adequately indicate any developmental curve in test performance. The following age ranges were therefore selected:

6 years to 6 years 5 months
7 years to 7 years 5 months
8 years to 8 years 5 months
9 years to 9 years 5 months
10 years to 10 years 5 months.

It was further considered necessary to control for the following variables:

(a) Formal School Experience

It is clear (Owens, 1953) that the extent and nature of formal school experience that the child has received affects test performance. Moreover, it appears that schooling differences are especially conspicuous when different social classes or majority-minority groups are compared (Charters, 1963; Ginsburg, 1972; Lesser, Fifer and Clark, 1965). Since there was no intention to study directly such differences in the quality of schooling, some form of methodological control was required. Subjects were therefore selected such that in each age group, subjects had attained the same grade level and had thus had the same number of years' scholastic experience, i.e.

6 years to 6 years 5 months in Sub A

7 years to 7 years 5 months in Sub B

8 years to 8 years 5 months in Std. 1

9 years to 9 years 5 months in Std. 2

10 years to 10 years 5 months in Std. 3.

Differences between private- and public-school attendance were also considered. White the use of some private-school samples would have facilitated locating subjects representative of the "lower" socioeconomic level, control was exercised by excluding all private-school sources and restricting selection to government schools.

(b) Educational Attainment

In order to obtain a sample representing children with average intelligence, it was necessary to eliminate subjects whose test performance may have been influenced by general intellectual deficits owing to mental retardation. Subjects were therefore selected on the basis of a history of no previous failure throughout their schooling. Since the subjects in the lowest age range (i.e. 6 years to 6 years 5 months) were in their first year at school, it was decided to eliminate those subjects who were assessed by their teachers as being likely to fail at the end of the year. This decision may, however, unavoidably have introduced a selection bias related to the subjective nature of the assessment.

(c) Sex

Although sex differences in test performance on the Bender Gestalt were found to be insignificant in the Koppitz normative study (1965), subsequent studies (Caskey, 1973; Dinmore, 1972; Keogh and Smith, 1968) have found sex differences in Bender test performance in young children. Moreover, sex differences in test performance and development of mental abilities have been noted (Havighurst and Breese, 1947; Terman and Tyler, 1954). It therefore seemed advisable to control for sex by selecting equal numbers of subjects of each sex within each socioeconomic level and age group.

6.3 APPARATUS

The Bender Gestalt Test

The Bender Gestalt test comprises nine designs, presented on separate cards. The child is provided with a blank sheet of white paper presented horizontally, on which the designs are copied using a pencil and an erasor, if required.

A detailed description and discussion of the Bender Gestalt Test has been provided above (see 4.1).

The normative data (Koppitz, 1965) for the Developmental Bender Scoring System for Children were derived from 1104 school children, from kindergarten to the 4th grade. This adaptation of the Bender Gestalt Test was prepared as a nonverbal

developmental scale for the ages 5 to 10 years.

Scorer reliability appears satisfactory, the interscorer correlations varying between 0,88 and 0,96. Retest reliability over a four month interval within single grade groups was rather low, with coefficients ranging from 0,547 to 0,659. The low correlations achieved on retest reliability, however, are probably reflective of age differences in test performance.

The scores show consistent improvement with age between the ages of 5 and 10 years, and moderate to high correlations with standard intelligence tests have been reported. Within single year groups, correlations varying from 0,48 to 0,79 were found between Bender Gestalt scores and the Stanford Binet or WISC IQ's. After the age of 10, the Bender Gestalt no longer correlates significantly with either age or intelligence test scores, since by this age, normal children usually achieve perfect scores.

Koppitz (1965) reported fairly high validity coefficients for the test in assessing school readiness and predicting subsequent educational achievement. The Bender Gestalt Developmental score appears to have fairly high validity as a measure of intellectual level and as a predictor of academic achievement among mentally retarded children. According to Anastasi (1968), however, the analyses above were based on small samples and require further verification.

The Developmental Test of Visual-Motor Integration (VMI)

The VMI test comprises a series of 24 geometric forms arranged in order of increasing complexity, presented in a standard booklet, three forms per page. The child is required to copy each form in the space below the model form given, using a pencil. Use of an erasor is not permitted.

A full description and discussion of the VMI has been provided above (see 4.2).

The VMI test manual reports high reliability and validity coefficients for the VMI test, which has been used for both normal and mentally retarded children (Beery, 1967).

The correlation between VMI scores and chronological age is 0,89 for the age range 2 to 15 years. It has been noted that VMI correlations are higher with mental age than with chronological age. There are higher correlations, moreoever, with chronological age and mental age in first grade children than in older children. The VMI shows a higher correlation with reading achievement in the first grade, than with IQ and reading achievement. Beery (1967) stated that the VMI scores are related more to integrative functions than individual functions, suggesting that the test may be regarded as a measure of coordinating abilities.

6.4 PROCEDURE

Administration:

Each subject was tested by the researcher in the school during regular school hours. Although there was some variation in the setting at the different schools, each child was tested in a room in which he was alone with the examiner. In all schools, the rooms were equipped with a suitable desk and chairs and adequate lighting was available.

The teachers were unaware of the content of the test material and there was no opportunity for coaching by the teachers. All the children were introduced to the researcher by the teacher before testing.

Since both tests are of perceptual motor functioning, the tests were administered alternately to eliminate practice or transfer effects. Although it is stated that the Bender Gestalt Test should always be administered first to prevent fatigue effects (Koppitz, 1965), the duration of each testing session was no more than 40 minutes. It was decided, therefore, that the length of the testing session was not sufficient to cause fatigue, and that the control of practice or transfer effects was of more importance.

Precautions that are usually taken in the administration of individual tests were observed. The tests were administered exactly according to manual instructions, either in English or Afrikaans, whichever was the child's primary language

(for Afrikaans instructions see Appendix A). Neither reading nor writing ability was required of the subjects, and directions were kept extremely simple, care being taken to ensure that the child understood the task.

The testing of subjects was completed over a period of four weeks to control for possible variations in test performance due to age differences.

Scoring

Certain ambiguities in the scoring criteria of both the Bender Gestalt and VMI tests were clarified in discussion with an experienced clinical psychologist. As a result certain scoring criteria were more clearly defined (see Appendix B).

The Bender Gestalt protocols were scored according to the Koppitz system. A total Bender Test raw score was obtained for each subject and transformed into the corresponding age equivalent stipulated by the normative data.

The VMI tests were scored according to the criteria given in the manual (Beery, 1967). The total raw score obtained for each subject was transformed into the corresponding age equivalent stipulated by the normative data.

A Bender Gestalt age equivalent (henceforth BA) and a VMI age equivalent (henceforth VA) was thus obtained for each subject.

7. RESULTS

Throughout this section the following abbreviations will be used:

CA Chronological age

BA Perceptual motor age equivalent as assessed by the Bender Developmental norms.

VA Perceptual motor age equivalent as assessed by the VMI developmental norms.

SEL Socioeconomic level.

7.1 INTERSCORER RELIABILITY

Twelve percent of the Bender and VMI tests were scored "blind" by a trained clinical psychologist. Using Spearman rank correlations, the interscorer reliability on the Bender test was found to be 0,81, while the interscorer reliability on the VMI was 0,85. The reliabilities obtained appeared satisfactory in comparison with those found during the standardizations of the tests (see 6.3).

7.2 THE BENDER GESTALT DEVELOPMENTAL NORMS

7.2.1 Comparison of CA and BA across all age groups and SEL's

Hypotheses tested:

H_o1 : CA = BA

H_o2 : There is no correlation between CA and BA.

Sample:

90 Ss from all 5 age groups and 3 SEL's.

Statistical Analysis:

The difference between CA and BA over all age groups and SEL's was statistically evaluated using the t statistic for dependent samples.

TABLE 2 : Means, standard deviations and t and r statistics for CA and BA over all age groups and SEL's

	CA	BA
Mean	99,67	100,48
Standard deviation	17,16	21,98
N	90	
df = 89 t = −0,50 ns		
ds = 88 r = 0,72 **		

** $p < 0,01$

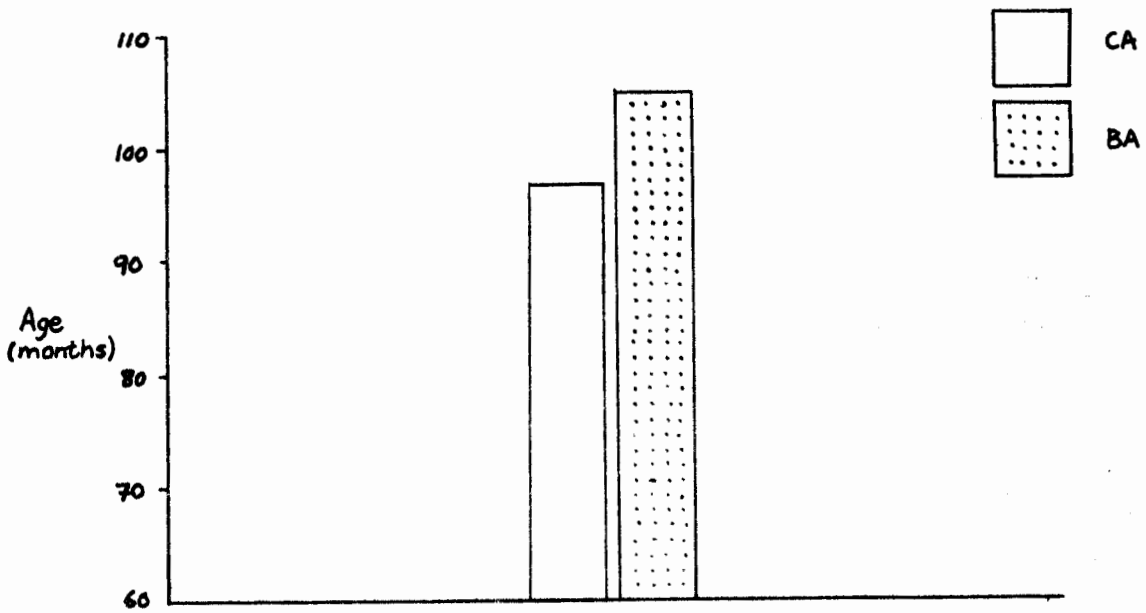

Fig. A : Graphic illustration of the differences between the overall means for CA and BA for all age groups across all SEL's

As indicated in Table 2, it is apparent that $H_0 1$ is accepted ($p > 0,05$) while $H_0 2$ is rejected ($p < 0,01$). The relationship between CA and BA is illustrated in Fig. B and shows marked positive trends.

It may thus be concluded that the difference between CA and BA over all age groups and all SEL's, as illustrated in Fig. A, is not statistically significant.

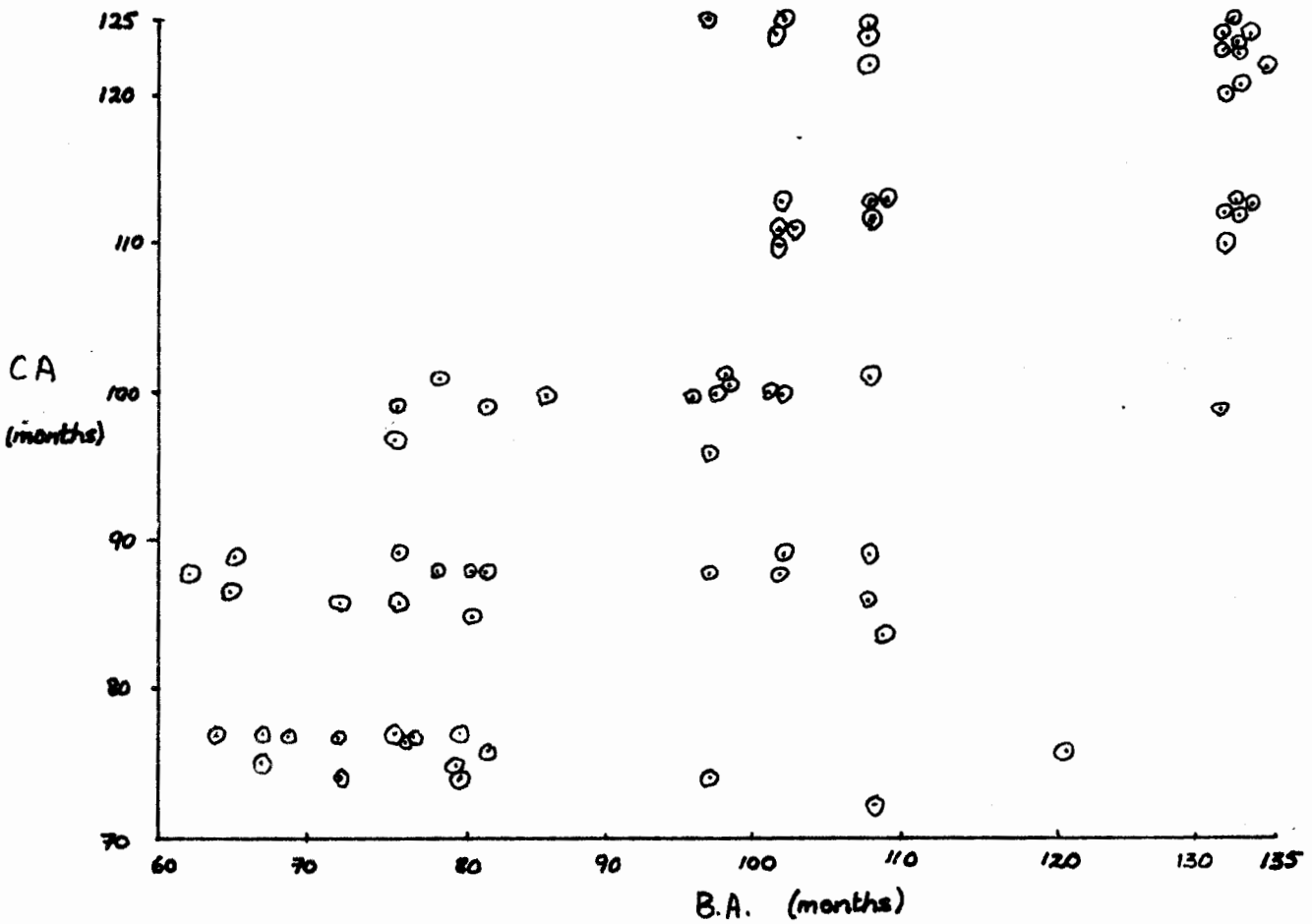

Fig. B : Scatter Diagram illustrating the correlation between CA and BA for all age groups across all SEL's

7.2.2 Comparison of CA and BA for each of the five age groups across all SEL's

Hypothesis tested:

H_01 : CA = BA

Sample:

90 Ss divided into five age groups of 18 Ss each.

Statistical Analysis:

The difference between CA and BA was statistically evaluated using the t statistic for dependent samples. This procedure was carried out independently for each of the five groups.

The Pearson Product Moment Correlation Coefficient was not computed due to the fact that the standard deviation of x (CA) was not free to vary, as this was the original criterion for assignment to groups. This term (Sx), which constitutes part of the denominator in the r formula (Minium, 1970), will tend to zero, yielding an r contaminated by artefact.

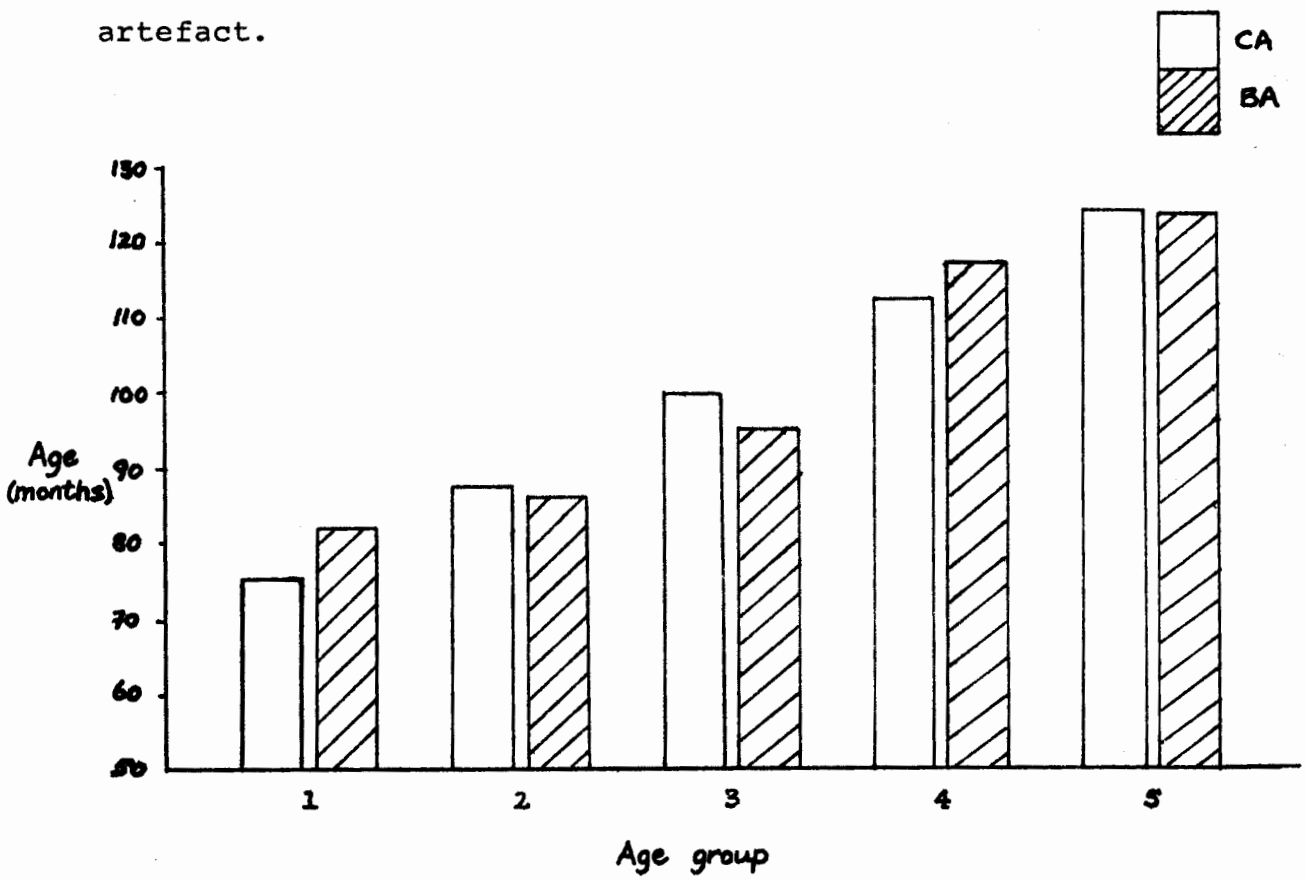

Fig. C : Graphic illustration of the difference between mean CA and BA for each age group across all SEL's

TABLE 3 : Means, standard deviations and t statistics for CA and BA for each age group across all SEL's

	Age Group 1 72-77 months		Age Group 2 84-89 months		Age Group 3 96-101 months		Age Group 4 108-113 months		Age Group 5 120-125 months	
	CA	BA	CA	BA	CA	BA	CA	BA	CA	BA
Mean	75,67	81,89	87,44	86,1	99,61	95,0	112,06	116,67	123,89	123,11
Std. Deviation	1,53	16,98	1,46	15,14	1,29	13,33	1,16	14,29	1,28	14,81
N	18		18		18		18		18	
t	-1,49 ns		0,35 ns		1,48 ns		-1,39 ns		0,21 ns	
df	17		17		17		17		17	

As indicated in Table 3, it is apparent that $H_0 1$ is accepted ($p > 0,05$) for each of the age groups. It may thus be concluded that the difference between CA and BA, as illustrated in Figure C, is not significant. This finding is consistent over all age groups.

7.2.3 Comparison of CA and BA for each of the three SEL's across all age groups

Hypotheses tested:

$H_0 1$: CA = BA

$H_0 2$: There is no correlation between CA and BA.

Sample:

90 Ss divided into 3 SEL's of 30 Ss each.

Statistical Analysis:

The difference between CA and BA was evaluated using the dependent samples t test. In addition, the Pearson Product Moment Correlation Coefficient was computed to investigate whether a relationship between the two variables existed. This procedure was carried out independently for each SEL.

TABLE 4 : Means, standard deviations, and t and r statistics for CA and BA for each SEL across all age groups

	SEL 1 Upper		SEL 2 Middle		SEL 3 Lower	
	CA	BA	CA	BA	CA	BA
Mean	98,90	98,80	99,70	102,97	100,37	99,67
Standard Deviation	17,44	23,16	17,08	22,79	17,51	20,43
N	30		30		30	
t	0,03 ns		-1,03 ns		-0,32 ns	
df	29		29		29	
r	0 ,70**		0,66**		0,81**	
df	28		28		28	

** $p < 0,01$

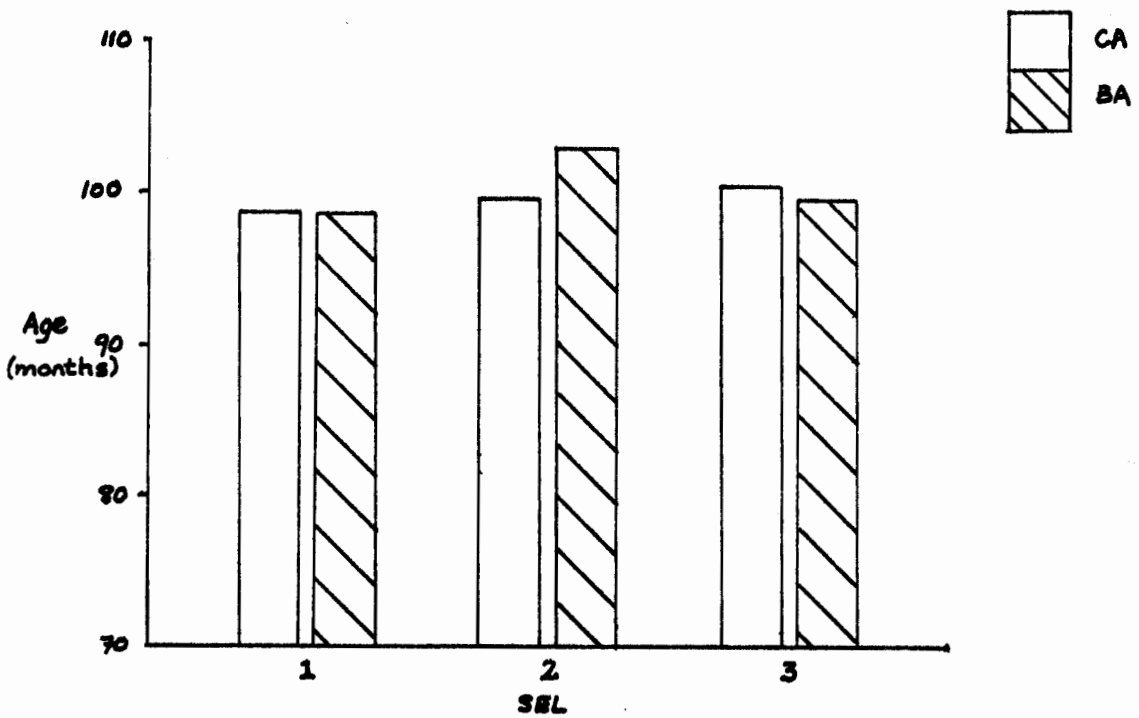

Fig. D : Graphic illustration of the difference between mean CA and BA for each SEL across all age groups

As indicated in Table 4, t tests yielded insigificant probabilities for each of the three SEL's under consideration. Thus $H_0 1$, that there is no difference between CA and BA, is accepted for each of the SEL's ($p > 0,05$). It thus appears that the difference between CA and BA, as illustrated in Figure D, is not significant.

Furthermore, $H_0 2$ is rejected for each of the SEL's ($p < 0,01$). Moreover, the relationship between CA and BA shows a positive trend for each SEL.

7.2.4 Summary of Bender Gestalt Results

From the above results, it is apparent that there is no significant difference between BA and CA. This is the case when the results from all 90 Ss are pooled, and when SEL and age groups are analysed independently. In view of the insignificance achieved in these two instances, no further analysis into individual SEL X age group cells was carried out, since this would increase the probability of committing a type I error, due to artefact.

The Pearson Product Moment Correlation Coefficient, where calculated, was highly significant ($p < 0,01$). Taken in conjunction with an insignificant t, this correlation indicated further that the two variables are not significantly different.

7.3 THE VMI DEVELOPMENTAL NORMS

7.3.1 Comparison of CA and VA across all age groups and SEL's

Hypotheses tested:

$H_0 3$: CA = VA

$H_0 4$: There is no correlation between CA and VA.

Sample:

90 Ss from all 5 age groups and 3 SEL's

Statistical Analysis:

The difference between CA and VA over all age groups and SEL's was statistically evaluated using the t statistic for dependent samples.

As indicated in Table 5, it is apparent that $H_0 3$ is rejected at the 0,001 level of probability. It may thus be concluded that the difference between CA and VA over all age groups and all SEL's, as illustrated in Fig. 8, is statistically significant.

TABLE 5 : Means, standard deviations and t and r statistics for CA and VA over all age groups and SEL's

	CA	VA
Mean	99,67	91,40
Std. deviation	17,16	25,98
N	90	
df = 89 t = 3,91***		
df = 88 r = 0,64**		

** $p < 0,01$

*** $p < 0,001$

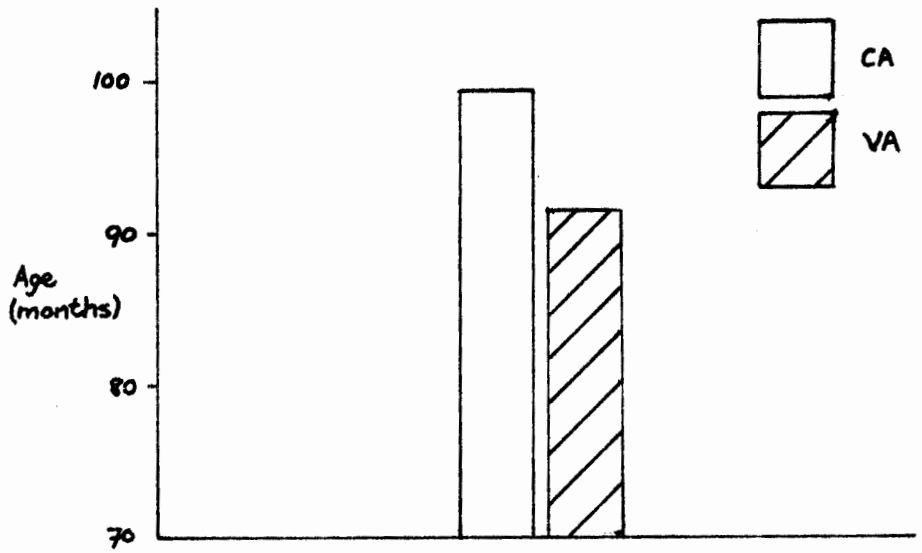

Fig. E : Graphic illustration of the difference between the overall means for CA and VA for all age groups across all SEL's

$H_0 4$ is rejected at the 0,001 level of probability, as indicated in Table 5. The relationship between CA and VA for all age groups and across all SEL's, as illustrated in Figure F, shows positive trends.

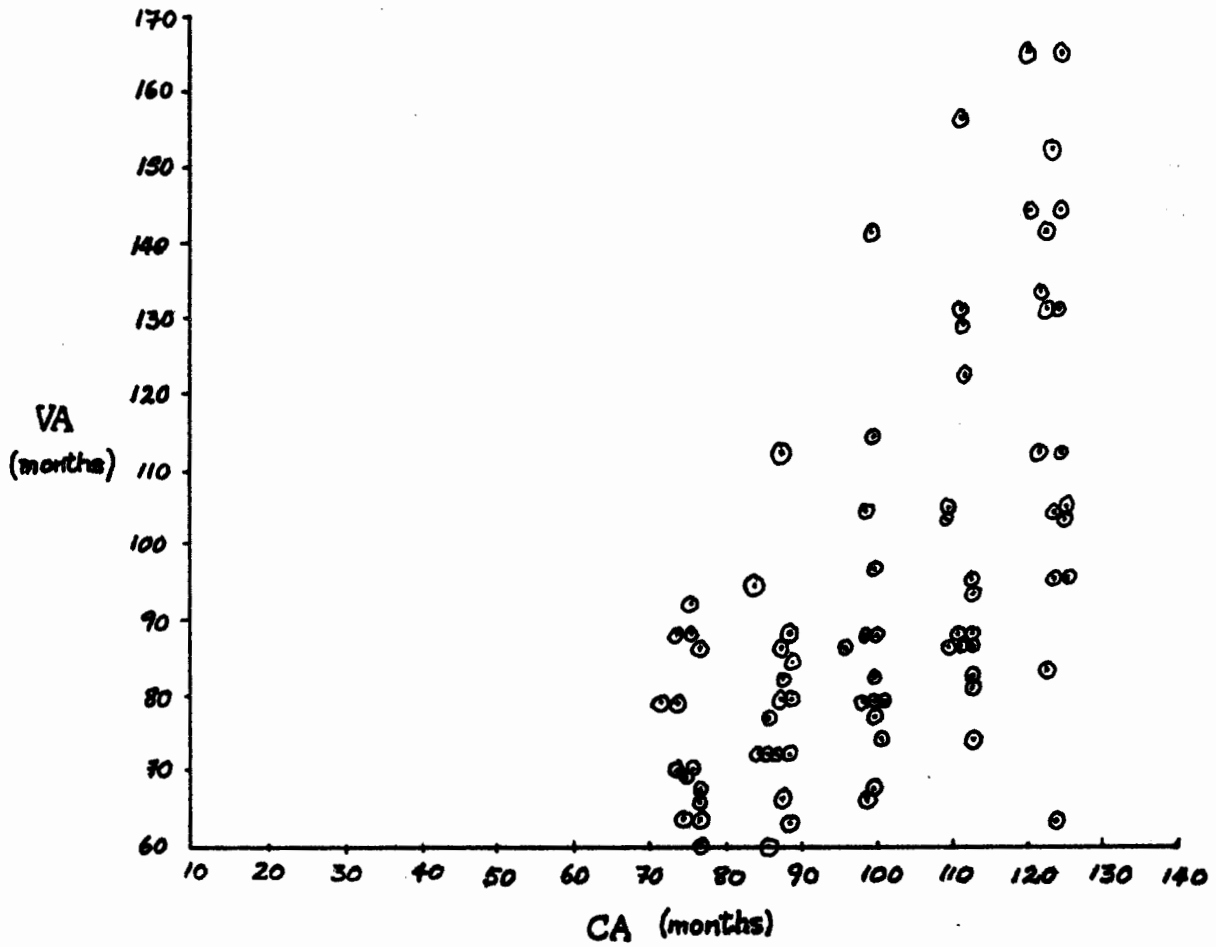

Fig. F : Scatter Diagram illustrating the correlation between CA and VA for all age groups across all SEL's

7.3.2 Comparison of CA and VA for each of the five age groups across all SEL's

Hypothesis tested:

H_o^3 : CA = VA.

Sample:

90 Ss divided into five age groups of 18 Ss each.

Statistical Analysis

The difference between CA and VA was statistically evaluated using the t statistic for dependent samples. This procedure was carried out independently for each of the five groups.

The Pearson Product Moment Correlation Coefficient was not computed due to the fact that the standard deviation of x (CA) was not free to vary, as this was the original criterion for assignment to groups. This term (Sx), which constitutes part of the denominator in the r formula, will tend to zero, yielding an r contaminated by artefact (Minium, 1970).

As indicated in Table 6, it is apparent that $H_0 3$ is accepted for the age groups 1 and 5 ($p > 0,05$), but rejected for the age groups 2 and 3 ($p < 0,01$) and 4 ($p < 0,05$). It may thus be concluded that the difference between CA and VA, as illustrated in Figure G, is not statistically significant for the age groups 1 and 5, while the difference between CA and VA for age groups 2, 3 and 4 is statistically significant.

TABLE 6 : Means, standard deviations and t statistics for CA and VA for each age group across all SEL's

	Age Group 1 72-77 months		Age Group 2 84-89 months		Age Group 3 96-101 months		Age Group 4 108-113 months		Age Group 5 120-125 months	
	CA	VA	CA	VA	CA	VA	CA	VA	CA	VA
Mean	75,67	72,11	87,44	78,0	99,61	86,17	112,06	100,0	123,89	120,72
Std. deviation	1,53	10,96	1,46	13,12	1,29	18,14	1,16	21,82	1,34	28,88
N	18		18		18		18		18	
t	1,30 ns		3,07 **		3,13 **		2,31 *		0,40 ns	
df	17		17		17		17		17	

* $p < 0,05$

** $p < 0,01$

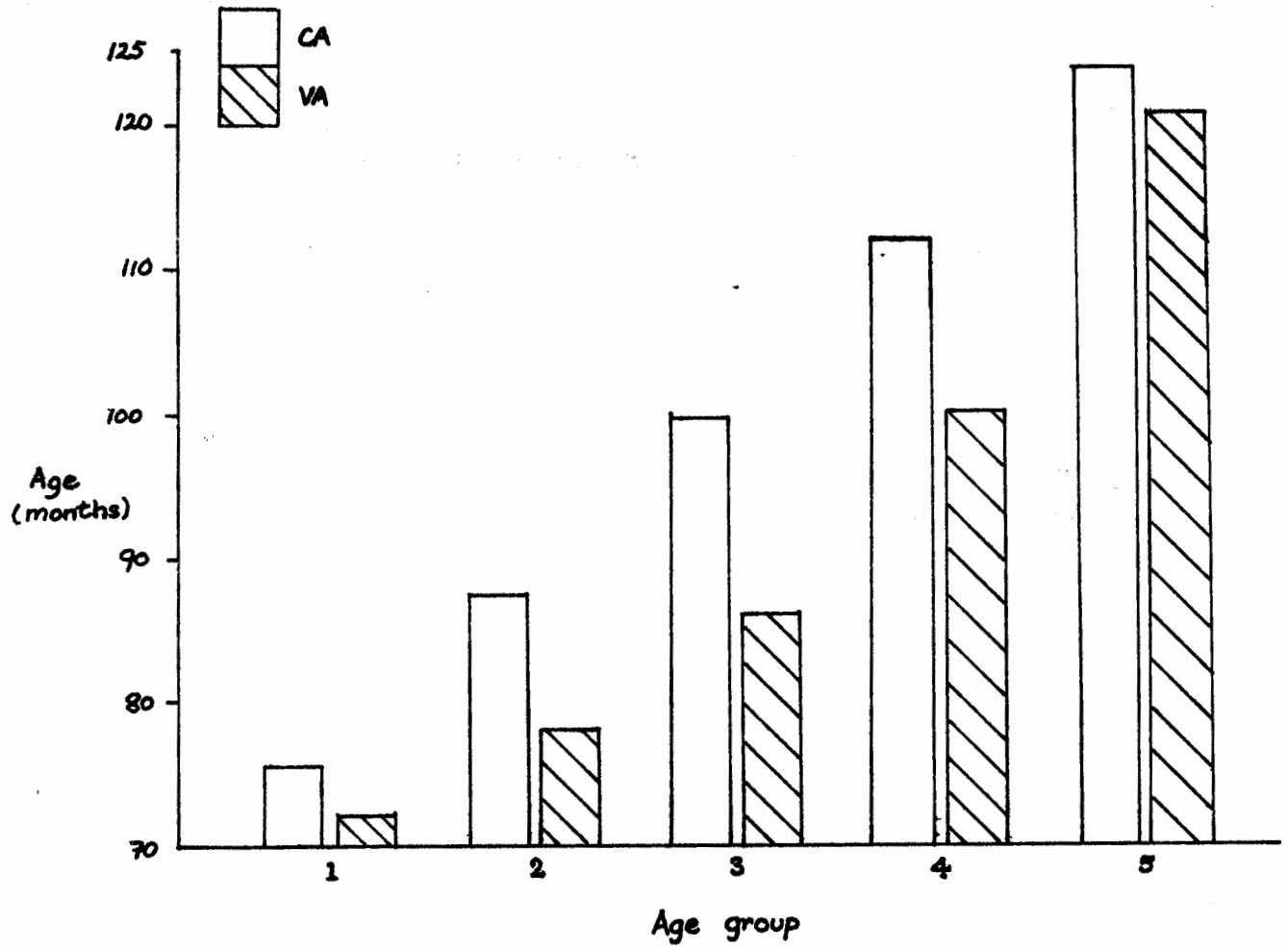

Fig. G : Graphic illustration of the difference between mean CA and VA for each age group across all SEL's

7.3.3 Comparison of CA and VA for each of the three SEL's across all age groups

Hypotheses tested:

$H_0 3$: CA = VA

$H_0 4$: There is no correlation between CA and VA.

Sample:

90 Ss divided into three SEL's of 30 Ss each.

Statistical Analysis:

The difference between CA and VA was evaluated using the dependent samples t test. In addition, the Pearson Product Moment Correlation Coefficient was computed to investigate whether a relationship between the two variables existed. This procedure was carried out independently for each SEL.

TABLE 7 : Means, standard deviations and t and r statistics for CA and VA for each SEL across all age groups

	SEL 1 Upper		SEL 2 Middle		SEL 3 Lower	
	CA	VA	CA	VA	CA	VA
Mean	98,90	91,67	99,70	99,40	100,37	83,13
Standard Deviation	17,44	25,68	17,08	32,10	17,51	15,64
N	30		30		30	
t	2,12*		0,0715		6,65***	
df	29		29		29	
r	0,68**		0,72**		0,64**	
df	28		28		28	

* $p < 0,05$ ** $p < 0,01$ *** $p < 0,001$

As indicated in Table 7, it is apparent that $H_0 3$ (there is no difference between CA and VA), is rejected for SEL 1 (upper) ($p < 0,05$) and rejected for SEL 3 (lower) ($p < 0,001$). $H_0 3$, however, is accepted for SEL 2 (middle ($p > 0,05$). It may thus be concluded that the difference between CA and VA, as illustrated in Figure H, is not statistically significant in SEL 2 (middle), while for SEL's 1 (upper) and

3 (lower) the differences between CA and VA are statistically significant.

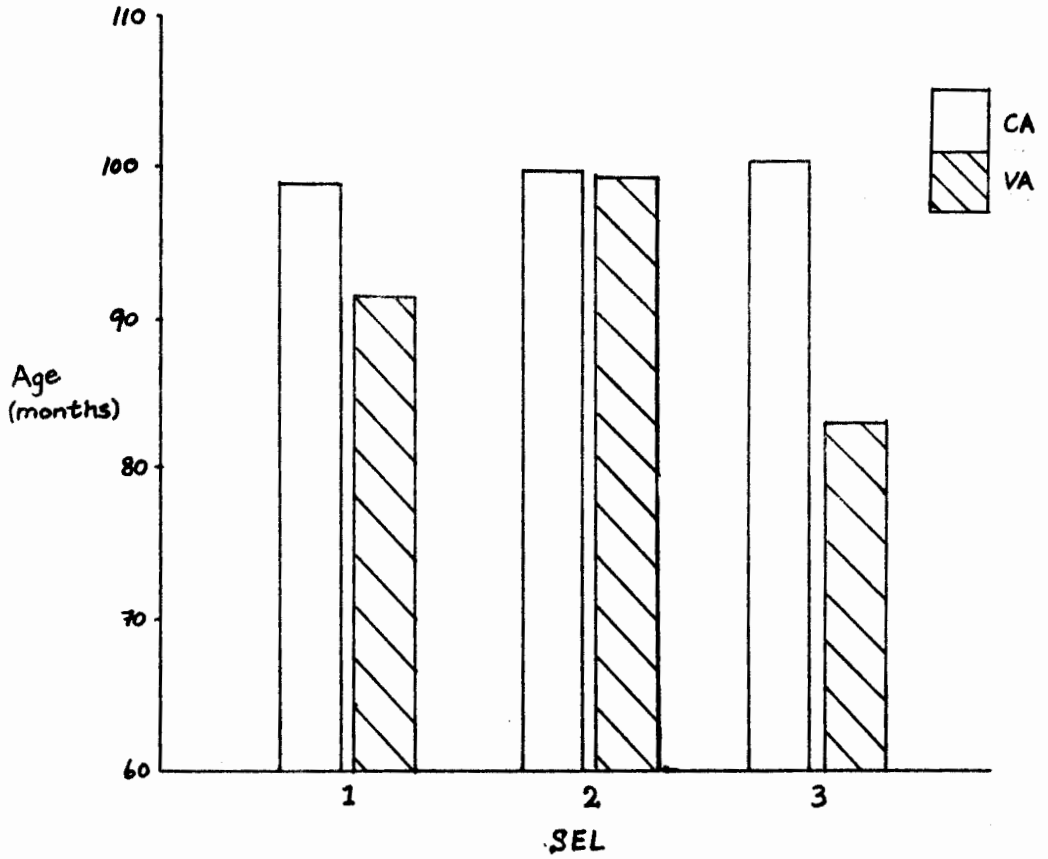

Figure H : Graphic illustration of the difference between CA and VA for each SEL across all age groups.

Furthermore, $H_0 4$ (there is no correlation between CA and VA) is rejected at the 0,01 level of probability for each of the SEL's. Moreover, the relationship between CA and VA, shows a positive trend for each SEL.

It may thus be concluded that there is a significant positive correlation between CA and VA for all SEL's.

7.3.4 Summary of VMI Results

The results yielded by the t tests indicate that there is a difference between CA and VA over all SEL's and all age groups. When these are further analysed, a significant difference between CA and VA is obtained for age groups 2, 3 and 4, and for SEL's 1 and 3.

The Pearson Product Moment Correlation Coefficient, where calculated, was significant ($p < 0,01$).

7.4 THE RELATIONSHIP BETWEEN THE BENDER GESTALT AND VMI DEVELOPMENTAL NORMS

Following from the findings on the Bender Gestalt test reported above, it was concluded that, firstly, BA is not significantly different from CA, and that any difference between the two is due to random sampling variation. Secondly, it was concluded that VA and CA are significantly different at age groups 2, 3 and 4 and at SEL's 1 and 3. It would follow, therefore, that VA and BA would also be significantly different for the age groups and SEL's just specified. One may expect, furthermore, that VA and BA would yield significant positive correlations over all age groups and all SEL's and for each SEL considered independently.

8. DISCUSSION

In the present study, a sample of 'Coloured' children representing five age groups and three socioeconomic levels were investigated with respect to differences between obtained and expected perceptual motor ages, as determined by the normative data on the Bender Gestalt and VMI tests.

8.1 THE BENDER GESTALT DEVELOPMENTAL NORMS

8.1.1 Interpretation of Results

The findings implied that, when all age groups and socioeconomic levels were considered together, thereby comparing the Bender test performance of the 'Coloured' sample in general with the norms, obtained and expected mean perceptual ages did not differ significantly and were significantly positively correlated. Taken together, these findings suggest that perceptual motor development in 'Coloured' children is similar to that described by the normative data.

The latter suggestion cannot, however, be uncritically accepted, given that the overall similarity may have masked differences due either to the age or the socioeconomic factor, or both. Consideration of obtained and expected perceptual motor ages for each age group independently confirmed that the overall similarity reported above, remained consistent. A similar rate of perceptual motor development in 'Coloured' children is thus supported by the data on the age groups.

As regards socioeconomic level, the results indicated that there was no difference between obtained and expected perceptual motor ages for upper, middle and lower socioeconomic levels considered independently. Since the normative perceptual motor ages were derived across all the age groups, the data further support the conclusion that 'Coloured' children do not differ from the norm in the rate of perceptual motor development. The latter conclusion is further confirmed, moreover, by the consistently positive correlations yielded for each socioeconomic level, so that one may expect a similar pattern of perceptual motor development in 'Coloured' children to that of the normative sample.

Thus, one may infer that perceptual motor development in 'Coloured' children from 6 to 10 years 5 months is similar to that indicated by the Bender Developmental norms in both rate and pattern, and that, furthermore, this similarity is evident regardless of socioeconomic factors.

8.1.2 Relevance of Results to the Aims of the Study

The findings discussed above indicate that neither cultural differences nor socioeconomic factors affected Bender test performance of the 'Coloured' sample when compared with the American norms. These findings are at variance with previous cross-cultural research on the Bender Gestalt test which has generally shown that cultural, and, especially, socioeconomic factors, may alter test performance. More importantly, research in South Africa has indicated that

'Coloured' children at the lower socioeconomic level perform below the expected level on the Bender Gestalt test (Evans, 1973; Freind, 1973; Saunder, 1974; Stoch & Smythe, 1967).

The contradiction may relate to certain methodological limitations of sample selection. The present study is limited by the small sample investigated which does raise the question of the representative nature of the data and necessitates caution in generalization. Furthermore, the study may be criticized for insufficient differentiation between the socioeconomic levels. The failure to include the extreme lower end of the socioeconomic continuum is perhaps of particular importance when the present findings are compared with previous research in South Africa. Since the previous studies investigated samples from extremely poor backgrounds, malnourishment may indeed have caused brain damage resulting in perceptual motor deficits, reflected in inadequate Bender test performance (Evans, 1973; Stoch and Smythe, 1967). Thus, it may be questioned whether previous research has not resulted in overgeneralization from a limited sample in terms of socioeconomic level and possible abnormality.

In the present study, however, one of the aims was to investigate the effect of socioeconomic factors on perceptual motor development in 'Coloured' children, as determined by the Bender Developmental norms. In order to highlight the possible role of socioeconomic factors, further sampling constraint was introduced by the decision to exclude subjects

who may perform below the normative level because of factors such as retardation or specific deficits, since inclusion of these children might have contaminated investigation into socioeconomic factors. In addition, although control exercised in terms of the criterion of no failure throughout schooling may successfully have eliminated those subjects who may have perceptual motor deficits due to retardation, it may also inadvertantly have biased sample selection, resulting in an over-representation of children with average or above average intelligence. It would appear, therefore, that the present findings and previous research on the Bender Gestalt test may not be contradictory, but reflect the test performance of different populations.

The foregoing discussion does, however, emphasize that the comparative data provided by the present study need to be viewed strictly within the abovementioned limitations when making generalizations regarding the Bender test performance in 'Coloured' children. Within such limitations, the findings indicate that the Bender Developmental norms are valid for this particular population of normal children, namely, 'Coloured' children between 6 and 10 years 5 months, from the socio-economic levels as defined in this study.

The limitations discussed above are relevant to the question as to whether the Bender Gestalt test may be regarded as 'culture-fair', and an etic, rather than an emic measure. In comparing 'Coloured' children with the norms derived from a predominantly middle class American sample, the study may

be described as a cross-cultural investigation, in which a similarity was found between the two populations in perceptual motor development. The task of copying geometric forms thus appears to have relevance outside the population on which the norms were standardized. However, the cultures of the American normative sample and the 'Coloured' children of the present study do not differ greatly, but share many elements such as urbanization, an industrialized environment and the requirement of school attendance within a literate society. Although it appears, then, that the Bender Gestalt test may be regarded as 'culture-fair' for the particular group under study, more marked differences in culture might nevertheless indicate that the Bender Gestalt test is culture-bound. The latter view is supported by cross-national studies of Japanese and American children (Sonoda, 1973; Tiedeman, 1971) and studies of extreme poor children (Hoffman, 1966; Mlodnosky, 1972).

Thus, generalizations regarding the culture-fairness of the Bender Gestalt test beyond the population from which the present sample was drawn are not warranted. Similarly, the overlap of the two cultures demands caution in inferring that the concepts underlying the measure have validity beyond the cultures studied. Thus, although the present study provides support for the view that the Bender Gestalt test is an etic measure of ability (rather than skill), more extreme cultural differences such as those mentioned above are probably more relevant to the emic-etic dilemma.

The present study shows no difference in the rate and pattern of development in 'Coloured' children as compared with the predominantly white middle class sample on whom the norms were standardized. Hence, this would support the validity of the Bender Gestalt test norms. The similarity in rate and pattern of perceptual motor development furthermore supports the transcontextual validity of the construct underlying the norms, namely perceptual motor ability. The findings thus imply the validity of the theoretical principles underlying perceptual motor development proposed by Bender (1938). Moreover, the indication that cultural and socioeconomic factors are not significant would support Bender's assumption that the process of perceptual motor development is primarily maturational and biologically determined, and that the influence of learning and experience is secondary. Given that previous cross-cultural data have indicated that Bender test performance varies in different contexts (Carlson, 1966; Moseley, 1969), the confirmation of the transcontextual validity suggested in the present study, must be qualified by the sampling limitations already mentioned.

The findings of the present study have considerable significance in the clinical field, since it would appear that the Bender Developmental norms are valid for 'Coloured' children between 6 and 10 years 5 months. It is thus suggested that the norms may be applied to this population as an accurate measure of the level of perceptual motor development. Deviations from the normative expected level in 'Coloured' children

may thus be interpreted diagnostically, according to the criteria stipulated by Koppitz (1965), since it would seem that test performance remains uncontaminated by sociocultural factors. It is perhaps necessary, however, to reiterate that clinicians may need to exercise caution in applying Bender developmental norms to very poor 'Coloured' children owing to the sampling limitations of the study.

With regard to the educational implications of the findings, it appears that 'Coloured' children, from the population from which the sample was drawn, do not lack the ability to cope within the cultural institution of the school. However, the sampling restrictions with respect to socioeconomic level do limit the applicability of this conclusion to the 'Coloured' population as a whole, within which there is considerable variation (see 6.2.2). Moreover, the sampling restrictions with respect to educational attainment and experience may have resulted in a confounding of perceptual motor ability with intelligence.

The applicability of the Bender norms to 'Coloured' children implies that the test may be utilized in the assessment of school readiness and the prediction of school achievement in this population. However, given the criticisms discussed earlier, that the sample may have represented children of average or above average intelligence, the findings of previous research (Koppitz, 1975) that the Bender Gestalt test is a better predictor of high levels of school achievement needs to be borne in mind. Finally, the Bender Gestalt test

may be of use in the educational field in assessing individual requirements for specific perceptual motor training. Thus, used in conjunction with other techniques of assessment, the Bender Gestalt test may contribute to the realization of potential ability.

8.2 THE VMI DEVELOPMENTAL NORMS

8.2.1 Interpretation of Results

The findings of the present study indicated that when all age groups and socioeconomic levels were considered together, the 'Coloured' sample obtained a significantly lower mean perceptual motor age in comparison to the expected age as determined by the normative data. This findings implies a different rate of perceptual motor development in 'Coloured' children as compared with the normative population. However, the significant positive correlation between obtained and expected perceptual motor age suggests that the pattern of perceptual motor development is similar.

Consideration of obtained and expected perceptual motor ages for each age group independently, revealed that differences were not consistent across age groups. The similarity between obtained and expected perceptual motor age for the 6 and 10 year age groups was at variance with the disparities yielded for the 7, 8 and 9 year age groups. The disparity for the 7 and 8 year age group was particularly marked, but decreased for the 9 year age level, until any differences for the 10 year level were not significant. These findings thus imply

that the rate of perceptual motor development in 'Coloured' children, as compared with the normative population, is not uniformly different across age groups.

Since the analysis of each age group was performed across all socioeconomic levels, interpretation of the variability in test performance, as a function of differential rate of development, necessitated the consideration of the influence of socioeconomic level. When the socioeconomic levels were considered separately, the differences yielded were variable as were those reported for each age group.

The findings indicated that the 'Coloured' sample, when tested on the VMI, obtained a perceptual motor age below that expected from the norms at both the upper and lower socio-economic levels, the difference being considerably greater at the lower socioeconomic level. 'Coloured' subjects from the middle socioeconomic level, however, showed no significant difference between obtained and expected perceptual motor age. Thus, rate of perceptual motor development in 'Coloured' children, as compared with the normative population, appears variable as a function of socioeconomic level. The positive correlation at all socioeconomic levels, however, indicated that, despite the difference in rate of development, a similar pattern of developmental changes may be expected in 'Coloured' children on VMI test performance, confirming the results yielded when age groups and socioeconomic levels were considered together.

Thus, 'Coloured' children from the middle socioeconomic level would appear to parallel both the rate and the pattern of perceptual motor development as determined by the VMI norms, while the children at both upper and lower socioeconomic levels appear to show a variable disparity between obtained and expected perceptual motor age across all age groups.

In summary, the findings suggest that 'Coloured' children show similar trends in perceptual motor development compared to the normative population with respect to pattern of development. As regards rate of development, however, there is considerable variability, dependent on age group and/or socioeconomic level, so that a clear picture does not emerge, although, in general, the rate of perceptual motor development appears slower in 'Coloured' children.

8.2.2 Relevance of Results to the Aims of the Study

The findings discussed above indicate that both age and socioeconomic factors may be relevant to poor performance of the 'Coloured' sample on the VMI test. Interpretation of these findings is, however, restricted, since neither socioeconomic level, nor age group, could be extracted as independent factors, since the nature of the data obtained precluded the use of a multifactorial design (see 6.1). Hence, no interpretation may be made regarding the interaction between age and socioeconomic level as affecting performance on the VMI test.

Given the above limitations, only tentative hypotheses may be offered regarding factors which may have been implicated in the differences on the VMI test between the 'Coloured' and the normative sample. The findings regarding the changes in test performance at each age group may be seen in the light of previous cross-cultural research on perceptual motor development, which has shown that discrepancies observed between obtained and expected levels of test performance gradually diminished with age (Greene and Clark, 1973; Taylor and Thweatt, 1972). Such changes have been interpreted as indicating that differences in test performance were unrelated to deficits in perceptual motor ability, reflecting instead, differences in culture-specific skills. The test performance of the children investigated in the present study showed a reduction in discrepancy from the 7 year to the 10 year level, where expected test performance was observed. Despite the normative test performance of children at the 6 year level, a similar, culture-specific factor may have been operative.

The suggestion that sociocultural factors may have been confounded with the age factor, seems possible, given that socioeconomic level, when separately considered, did affect test performance on the VMI, resulting in variably significant differences. The effect of socioeconomic level was not, however, clearcut, since both upper and lower socioeconomic groups performed significantly poorly in comparison with the normative sample, while the middle socioeconomic group showed no significant difference.

Despite the difficulty in interpreting the findings, and given that only children aged 6 and 10 years from the middle socioeconomic level performed at the expected age level, it does appear that the validity of the VMI developmental norms is questionable for 'Coloured' children. The trans-contextual validity of the principles underlying the VMI test is, however, given limited support insofar as the pattern of development is similar for both 'Coloured' children and the normative sample, despite differences in the rate of development. The discrepancy in rate of perceptual motor development does, however, preclude the conclusion that the VMI measures perceptual motor ability rather than a culture-specific skill. The findings, therefore, cannot confirm that the test be considered an etic measure, nor, given the discrepancy between observed and expected test performance, can the VMI test be regarded as 'culture-fair' for the 'Coloured' population.

The findings on the VMI have considerable import for the clinical usage of the test, since it would seem that the VMI developmental norms cannot validly be applied to the 'Coloured' population as defined in this study. Moreover, it seems fair to suppose that 'Coloured' children, from poorer backgrounds than were represented in the present sample, might fare even more poorly on the test. Lacking any reliable means of taking sociocultural factors into account in the application of the test, the diagnostic efficacy of the test must be considerably reduced. Thus, clinical diagnosis and assessment of 'Coloured' children according

to the present norms of the VMI test would be inappropriate.

8.3 THE RELATIONSHIP BETWEEN THE BENDER GESTALT AND VMI DEVELOPMENTAL NORMS

The findings yielded from the consideration of the two tests independently, precluded the necessity for statistical analysis of the relationship between the two tests when applied to the present sample (see 7.4). The following discussion will therefore draw on the observations discussed above (8.1 and 8.2).

It was concluded that 'Coloured' children appear to show the same rate of perceptual motor development on the Bender Gestalt test as the normative sample, but that socioeconomic and or age factors result in generally poorer test performance of 'Coloured' children when measured against the VMI developmental norms. On both tests, however, 'Coloured' children seem to show a similar pattern of perceptual motor development, test performance improving as a function of age.

It has been noted that the sampling constraints and limitations of the present study restrict generalisation from the conclusions drawn from the findings on both tests. However, the findings of the present study are consonant with previous research comparing perceptual motor age equivalents obtained on both the Bender Gestalt and VMI tests from the same sample. It has been found (Brown, 1977; Liemohn and Wagner, 1975) that both normal and retarded children obtain consistently

poorer ratings on the VMI as compared with those on the Bender Gestalt test. It has been suggested that the disparity may be attributed to the more structured format of the VMI test (Krauft and Krauft, 1972), the greater number of designs to be reproduced, and the more specific scoring criteria. It has been further suggested that the disparity may be related to the different functions measured by the tests, the VMI test placing greater stress on motor functions specifically.

It is necessary, therefore, to view the findings of the present study, regarding the possible influences of age and socioeconomic factors, against the previous research which indicates that differences between Bender-Gestalt and VMI test performance are related to the disparity of constructs underlying the two tests.

The disparity of constructs is relevant to the question of the transcontextual validity of the developmental principles underlying the two tests. It would appear that the present findings support the maturational principles proposed by Bender (1938). However, it would seem that the stress on motor functioning possibly confounds the VMI as a measure of perceptual motor ability, calling into question the universality of the developmental principles underlying the VMI regarding the factors affecting perceptual motor integration.

Thus, the present findings provide support for the Bender Gestalt test as an etic measure, but suggest that the concepts

underlying the VMI test are bound to the cultural context from which the normative data was derived. Furthermore, the Bender Gestalt test appears to be more 'culture-fair' than the VMI with respect to the 'Coloured' population. It may be concluded, therefore, that the Bender Gestalt test offers a more valid measure of perceptual motor development in 'Coloured' children than does the VMI, validity being judged in terms of similarity to the normative data and to chronological age, and being unaffected by socioeconomic factors.

The implications of these findings are considerable, since the Bender Gestalt and VMI tests are frequently used interchangeably by clinicians as a measure of perceptual motor development and for the diagnosis of specific deficits in perceptual motor functioning. The above comparison of the two tests would imply that the applicability of the Bender Developmental norms to the present sample, confirms its efficacy as a psychometric instrument for the 'Coloured' population. However, the influences of age and/or socio-economic factors would seem to affect the reliability and validity of the VMI developmental norms as a diagnostic test for 'Coloured' children. Thus, the present study confirms previous research and indicates the inadvisability of using the Bender Gestalt and VMI tests interchangeably as measures of perceptual motor development.

8.4 CONCLUSION

In the investigation of the applicability of two tests of perceptual motor development to 'Coloured' children aged 6 to 10 years 5 months, it was found that, on the Bender Gestalt test, obtained and expected perceptual motor ages did not differ significantly either for the sample overall, or when age groups and socioeconomic levels were considered independently. Moreover, significant positive correlations with the normative data were found for the sample as a whole and for each socioeconomic level. On the VMI, however, the difference in mean perceptual motor age between the present sample and the normative sample was significant, while differences varying in significance were found for age groups and socioeconomic levels considered independently.

The findings seem to indicate that 'Coloured' children differ neither in rate nor pattern of perceptual motor development, from that described by the Bender normative data. However, the discrepancy between test performance of 'Coloured' children and the normative sample suggests that the rate of perceptual motor development described by the VMI developmental norms may be culture-specific. However, it may be postulated that the positive correlations yielded, support the assumption that perceptual motor ability, rather than skills, does indeed follow a measured developmental course, responses becoming increasingly more refined as a function of age.

It may thus be concluded that the Bender Gestalt test norms are more valid than the VMI developmental norms as a measure

of perceptual motor development for 'Coloured' children. Furthermore, the Bender Gestalt test appears to be more 'culture-fair' than the VMI, thus confirming that it may be regarded as an etic measure.

The study appears to support the validity of the maturational principles underlying the Bender Gestalt test, thus apparently being at variance with previous cross-cultural research indicating that cultural and socioeconomic factors influence perceptual motor development, in particular, Bender test performance.

The findings of the present study therefore imply that the interchangeability of the Bender Gestalt and VMI tests in clinical use is questionable as regards the 'Coloured' population, and that caution is warranted in the use of the VMI test as a diagnostic or assessment instrument.

It must be emphasized that the sampling constraints and limitations of the present study restrict the generalizeability of the conclusions beyond the'Coloured' population so defined.

The present study indicates the necessity for further research, utilizing larger samples, into the Bender Gestalt test to provide more reliable verification of the applicability of the test as a measure of perceptual motor development in 'Coloured' children. Moreover, there is an urgent need for further studies on the VMI to investigate more fully the factors that may influence the test performance of 'Coloured' children.

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APPENDICES

AFRIKAANS TRANSLATIONS OF TEST INSTRUCTIONS

Bender Gestalt Test

"Ek het hier nege kaarte met patrone daarop. Ek wil hê jy moet hulle een vir een op dié papier teken. Hier is die eerste een. Begin nou en teken dit presies dieselfde soon hierdie een".

Response to any questions concerning the designs:
"Teken dit sodat dit so na aan die prentjie lyk, as wat jy kan maak".

VMI

"Kan jy een soos hierdie teken?"

Following subject's response:
"Teken joune net hier".

After prompting is no longer necessary:
"Gaan nou aan en maak hulle almal klaar".

APPENDIX B

ADDITIONAL DEFINITION OF SCORING CRITERIA

BENDER GESTALT TEST

Scoring item 19:

Two lines not crossing or crossing at the last sinusoidal curve of one or both lines; two wavy lines interwoven.

Scoring item 21b:

Hexagons are excessively misshapen; one of the more obtuse angles may be rounded; extra or missing angles in one or both hexagons.

Scoring item 22:

Rotation of figures, such that both hexagons are parallel to one another, or the angle between the two is equal to 85^{o} or more.

Scoring item 24:

Hexagon or diamond excessively misshapen; one of the more obtuse angles may be rounded; extra or missing angles: diamond omitted.

THE VMI

Form 8: Criterion No. 3

Fairly equal length of "legs", i.e. proportion of "leg" at intersection less than 2:1.

Form 10: Criterion No. 1

No more than slight separation of forms, i.e. no more than 1/8" apart.

Form 12: Criterion No. 4

Fairly equal length of "legs", i.e. proportion of "legs" at intersection less than 2:1.

Form 14: Criterion No. 4

Baseline fairly horizontal, i.e. axis between 170° and 190°.

Form 15: Criterion No. 6

Relatively equal size of circle and square; one axis of circle or square is twice as long as the other one.

Form 16: Criterion No. 2

Opposing corners (only horizontal) - axis between 175° and 185°.

Form 19: Criterion No.3

Overlap clearly shown but not extreme, i.e. one hexagon may not completely penetrate through the other one.