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THE EFFECT OF
AGE, SEX, AND LANGUAGE
ON ROTATION OF A VISUAL-MOTOR TASK

by Donna M. Harrison

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Psychology and Education of the
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CURRICULUM STUDIOUM

Donna Marian Harrison was born July 6, 1934, in Glen Ewen, Saskatchewan. She received the Bachelor of Arts degree from the University of British Columbia, Vancouver, British Columbia, in 1958, and the Master of Arts degree in Psychology from the same university in 1961. The title of her thesis was The Effect of Verbal Reward on Schizophrenic Patients' Performance of the Bender-Gestalt Test.

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INTRODUCTION

The dimension of field dependence-independence and its relation to maturation and personality variables has been studied with increased interest in recent years. However, this dimension has received little consideration in relation to sex and even less with respect to culture as manifest through language. Thus, little attempt has been made to understand the role played by cultural background and/or rearing in determining the ultimate response on graphic-motor, personality, and related tests.

The subject matter and the technique of drawings are believed to reflect specific cultural and experiential factors rather than sex or age differences, or developmental stages per se. Thus, specific features of a child's drawing cannot justifiably be used as an index of developmental level apart from his particular experiential background. Particularly in the visual-motor sphere is it difficult, if not impossible, to refer to any task as "culture free".

The focal point and theoretical justification for the present study derives from the literature which suggests that patterns of child rearing result in different rates of maturation which are in turn reflected by variations in field-dependence-independence between and within cultures and between ages. Yet, there is generalized acceptance of the

existence of developmental stages in drawing behavior which are relatively unvarying within and between cultures.

The present research belongs within the broad area of personality assessment at different levels of maturation. It is concerned with the phenomenon of rotation, which is explained through the concept of field-dependence-independence, the latter being defined as the ability to overcome an imbedding context, to experience an item independently of an organized field of which it is a part. Specifically, this study was designed to assess the influence of three different variables, namely age, sex, and cultural environment as manifest through language differences, upon the occurrence of rotation in graphic-motor tasks. Rotation is a score specifying the number of degrees that a design reproduction has been rotated from the vertical or horizontal axis of the stimulus card.

The report of the research is divided into five chapters. The first two chapters comprise the review of the literature. While the intention was to present the material in chronological order, chronology has been sacrificed for contiguity of content. Chapter one begins with a discussion of the concept of field-dependence-independence, which is followed by the consideration of maturation and the drawing function, proceeding on to the cultural aspects of child rearing and test performance. Theoretical

considerations of rotation are dealt with in chapter two, this discussion including perceptual aspects, the rotation of Bender-Gestalt configurations and Minnesota Percepto-Diagnostic test designs. This chapter is concluded by a summary of the preceding literature and research, a statement of the general and research hypotheses.

In the third chapter the experimental design is presented. Included are a description of the subjects and instruments, the testing and scoring procedures utilized, and a brief outline of the applied statistical techniques.

The experimental results are presented in the fourth chapter and discussed in the fifth. This chapter is followed by a summary of these findings and the conclusions then presented.

CHAPTER I

REVIEW OF THE LITERATURE: GENERAL CONSIDERATIONS

In the past two or three decades there has been an increasing interest shown in perception and in psycho-motor activities as a means of gaining a more complete understanding of personality and behavior. This increased emphasis on a broad aspect of perception is due to recognition of findings that perception, as manifest in overt behavior, is not a passive and literal copying of stimuli, but has a projective or expressive nature reflecting the observer's inner state.¹ Gardner Murphy said, "(...) the perceived world pattern mirrors to a considerable degree the organized need pattern within".² In order to develop a technique through which one can explore the "organized need pattern", many investigators have studied intensively various potential tools with different theoretical frameworks.

One approach has been to study perception in an ambiguous situation where "(...) in the absence of any

1 David C. McClelland and John W. Atkins, "The Projective Expression of Needs: I. The Effect of Different Intensities of the Hunger Drive on Perception", Journal of Psychology, Vol. 25, Second Half, April 1948, p. 203-222.

2 Gardner Murphy, Personality, New York, Harper, 1947, p. 351.

compelling organization in the material itself, the person has greater opportunity to structure it in his own unique fashion".³ However, Witkin⁴ suggested that understanding of perceptual processes in well-structured conditions is just as important as in unstructured situations to form a comprehensive estimate of the role of personal factors in perception. The present writer believes that this is the more common process in daily life, and that this approach can be more easily controlled and handled than the approach utilizing ambiguous stimuli.

It is claimed by supporters of the graphic-motor tests that one's graphic performance has greater individuality and is less subject to voluntary control than are his verbal responses. Thus they consider that graphic reproduction presents a truer picture than the verbal response. It is with one aspect of performance on a structured graphic-motor task that this study is concerned, that is, the phenomenon of rotation and its relation to field-dependence-independence.

³ J.S. Bruner and D. Krech, eds., Perception and Personality: A Symposium, Durham, North Carolina, Duke University Press, 1950, p. 146.

⁴ H.A. Witkin, "The Nature and Importance of Individual Differences in Perception", Journal of Personality, Vol. 18, No. 2, December 1949, p. 145-170.

1. Field-Dependence-Independence.

The studies of Witkin and his associates^{5,6} are among the more noteworthy in attempting to relate the process of perceiving to the entire personality of the perceiver. Their central concern has been with the dimension "field dependence versus field independence"; field dependence being defined as difficulty in overcoming the influence of the surrounding field or to separate an item from its context.⁷

Their early studies⁸ on young, normal adults and confirmed in studies of children and hospitalized psychiatric patients, were concerned with the specific influence of an individual's characteristics upon his perception, that is, the relation of perceiving to one's overall psychological organization or personality. Three approaches have been taken: 1) the utilization of field structure to explain perceptual processes, a view by which the content of

⁵ H.A. Witkin, H.B. Lewis, M. Hertzman, K. Machover, P. Brettnall Maissemer and S. Wapner, Personality Through Perception, An Experimental and Clinical Study, New York, Harper and Brothers, 1954, xxvi-571 p.

⁶ H.A. Witkin, R.B. Dyk, W.F. Faterson, D.R. Goodenough and S.A. Karp, Psychological Differentiation, Studies of Development, New York, John Wiley and Sons, 1952, xii-418 p.

⁷ Ibid., p. 2.

⁸ Witkin, et al., Op. Cit., 1954.

the external world is held to be the main determinant of what is perceived to the relative exclusion of personal factors, 2) an emphasis upon stimulus characteristics initiating the perceptual experience in conjunction with the mediating sense organs, and 3) the present approach of examining the perceptual process in the context of the total psychological organization of the individual, that is, the relation of each person's perception to his own needs, emotions, motivation, et cetera. The hypothesis that individual differences are definable on the basis of degree of dependence upon the visual field structure, varying from extreme dependence to analytic independence, is supported by their results.

With respect to perceptual functioning in part-of-a-field perceptual situations from age eight to seventeen these same authors report the following findings. From age eight to ten field structure is a strong determinant in perception, while this influence is significantly reduced between ages ten to thirteen, with only slight changes on up to age seventeen though any tendency is toward greater independence of the field. On the other hand, clear developmental trends are not evident on field-as-a-whole perceptual tasks. Here there are only noticeable up-and-down fluctuations between the different age groups. However, it is in this area that the authors found slight indications of sex differences as the

females aged eight to ten tend to be somewhat less field dependent.

While there is a wide range of individual differences in performance at each age level, individuals do tend to be self-consistent in their perception under different conditions.

Generally, field structure has at all ages a stronger influence on females than on males but only at adulthood does it become pervasive and consistently significant. This means that the factors determining field-dependence-independence are at least minimally operative even at early ages but may be most significant in the adult years.

Therefore, we must consider adult personality differences as they relate to field-dependence-independence. According to these studies, childhood differences in perceptual performance can be related to personality differences, while the personality factors most relevant to perception are similar in children and in adults.

The final field-dependent-independent relationships revealed by Witkins and his co-workers were put as follows:

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In summary, then, field-dependent persons tend to be characterized by passivity in dealing with the environment; by unfamiliarity with and fear of their own impulses, together with poor control over them; by lack of self-esteem; and by the possession of a relatively primitive, undifferentiated body image. Independent or analytical perceptual performers, in contrast, tend to be characterized by activity and independence in relation to the environment; by closer communication with, and better control of, their own impulses; and by relatively high self-esteem and a more differentiated, mature body image.⁹

They further concluded that peoples' "past experiences" play a significant role in their present perceptions, that is, the totality of an individual's available experience as opposed to a specific experience set in relation to a particular situation.

The Witkin group, in their later studies,¹⁰ found field independence to be most closely related to an articulated body concept; the use of isolation and intellectualization, rather than denial and repression, as defenses; being assertive; and being reared by an accepting mother figure. It is because of this last factor that they conclude the cause of field-dependent-independent development to be significantly related to patterns of mothering. This maternal influence can be viewed in the light of the developmental trend in perceptual style from eight years of age on to

⁹ Witkin, et al., Op. Cit., 1954, p. 469.

¹⁰ Ibid., 1962.

young adulthood, progressing from a relatively global approach to a more analytical approach.

2. Maturation and the Drawing Function.

Since the earliest research with children is centered around the maturation process and because of its basic and essential role in motoric reproductions, any evaluation that is made of such tasks should take this factor into consideration. One cannot over-emphasize the necessity of understanding the effects of perception and development when evaluating the reproductions of children. It has been contended by Bender¹¹ that the Gestalt principles are of different types, some appearing at the most primitive levels with others occurring at only the more highly integrated intellectual levels. Two different approaches have devoted themselves to studying the role of development in the reproduction of visual-motor Gestalt designs. The correlational approach is one wherein researchers, though dealing more directly with other problems, have reported, in an incidental manner, the relationship between subject age and quality of Bender functioning. The second approach directly focuses

¹¹ Laretta Bender, "Principles of Gestalt in Copied Form in Mentally Defective and Schizophrenic Persons", Archives of Neurology and Psychiatry, Vol. 27, No. 3, March 1932, p. 651-656.

upon the developmental aspects of visual-motor functioning, further attempting the establishment of age norms.

Tolor and Schulberg,¹² in summarizing the correlational studies on the Bender-Gestalt Test (BG), conclude that only at the extremes of the age distribution is there a significant relationship between age and the quality of reproductions. In other words, this relationship can be said to exist where full development has not been achieved and where subjects, due to aging, are motorically impaired. Generally, age per se has little if any effect on those persons who have attained and retain perceptual-motor maturity. In focusing upon the specific changes which are associated with motoric development in young children, these same authors report that there is first gross, random scribbling followed by refinement into loops. Subsequently, one observes rapid form differentiation between the ages of four and seven. Also of significance is the minimal amount of rotation reported to occur after this period. It is only after the ages of nine to eleven that the developmental processes are sufficiently matured that persistent errors in reproduction can be attributed to factors other than normal motoric immaturity.

¹² Alexander Tolor and Herbert C. Schulberg, An Evaluation of the Bender-Gestalt Test, Springfield, Illinois, Charles C. Thomas, 1963, xxiii-229 p.

As verification that the evolution of Gestalten is due to maturational, rather than educational or imitative processes, Bender¹³ makes reference to the drawings by West African native children of the designs from some army performance tests. The material of this study indicates that:

(...) spatial orientation cannot be spoken of in terms of ontogenesis but in terms of organization of the perceptual motor patterns and that it follows a definite pattern in the different maturation levels which are alike in the so-called primitive and civilized child.¹⁴

Bender also felt that there must be a constant interaction between the motoric and sensory features, that they could not be separated even though one might appear to progress more rapidly in the maturation process or to temporarily dominate a given stage in the evolution of the Gestalt.

In general, the Gestalt designs were held by Bender¹⁵ to be a valuable maturational test of visual-motor performance between the ages of four and twelve, that adults add only to motor or detail perfection in size and distances.

¹³ Laretta Bender, "A Visual Motor Gestalt Test and Its Clinical Use", American Orthopsychiatric Association Research Monograph, No. 3, 1938, ix-176 p.

¹⁴ Ibid., p. 35.

¹⁵ -----, Child Psychiatric Techniques: Diagnostic and Therapeutic Approach to Normal and Abnormal Development Through Patterned, Expressive, and Group Behavior, Springfield, Thomas, 1952, referred to by Alexander Tolor and Herbert C. Schulberg, An Evaluation of the Bender-Gestalt Test, Springfield, Illinois, Charles C. Thomas, 1963, p. 24.

Goodenough,¹⁶ Bender¹⁷ and Harris¹⁸ provide similar descriptions of the development of the drawing function. Their approaches to a theory of children's drawing behavior, as well as their conclusions concerning drawing behavior, are also congruent.

It is generally accepted that the first drawings of children are scribbles that represent pure motor play performed for the pleasure of the motor expression rather than being representative or meaningful designs. However, it may acquire significance after production. As the drawing function matures these scribbles become differentiated forms, primarily single closed loops or parts of loops. Combinations of these differentiated forms lead to patterns or gestalten intended to resemble or symbolically represent the perceived stimulus. At this level perseveration of any one learned pattern to other figures predominates. Also, direction is of considerably greater importance to the child at this age than is distance or size. While motor features are in large part responsible for

¹⁶ Florence L. Goodenough, Measurement of Intelligence by Drawings, New York, World Book Co., 1926, xi-177 p.

¹⁷ Bender, "A Visual Motor Gestalt Test and Its Clinical Use", Op. Cit., ix-176 p.

¹⁸ Dale B. Harris, Children's Drawings as Measures of Intellectual Maturity, New York, Harcourt, Brace and World, 1963, xiii-367 p.

predominance of the directional factors, one cannot ignore the fact that the optic field is organized on movement.

While the foregoing refers to the visual-motor patterns in children from two and one-half to four years, between four and seven years there is a very rapid differentiation of form. The most frequently postulated reason for this development is that it is at this age children are sent to school and expected to learn to read and write.

According to Bender, in the Gestalt problem of reproducing perceived form, the factors that contribute to the integration are:

(...) The biological character of the visual field or the principles of perception based upon spatial relationships; (2) Temporal relationships based upon the span of the preceding experiences of the individual and, therefore, upon the length of the maturation process; (3) Motility factors which are closely related in the impulses and attitudes toward the problem itself.¹⁹

Harris²⁰ provides us with a well formulated set of empirical conclusions concerning drawing behavior. His material organizes the diverse succession of empirical studies focusing on many relatively limited aspects of the drawing process into the following four empirical generalizations which, with their subcategories, provide a

¹⁹ Bender, "A Visual Motor Gestalt Test and Its Clinical Use", Op. Cit., p. 48.

²⁰ Harris, Op. Cit., p. 155-173.

foundation for a theoretical approach to drawing behavior.

1) The earliest scribbles are patterned by the mechanical arrangement of the hand, wrist and arm rather than being simply random markings. Further modification is probably due to visual observation and to a lesser extent by relations within the drawing field. 2) In general, young children show a common directionality in drawing simple forms. Motor development is believed to influence this directionality as well as the orientation of the object drawn on the page. 3) Children's drawings are wholes, containing discernible parts, representing objects as they perceive them. This whole or Gestalt quality becomes progressively detailed and more complexly organized with increased age. 4) Cognitive factors appear to be crucial in determining developmental features of children's drawings.

Material on children's drawings leaves little doubt that the drawing function changes as the child matures. Though at first it is primarily a means of motor expression involving only rudimentary concept formation, the motor expressive aspect becomes progressively less important with the conceptual and communicative aspects becoming increasingly significant. Although some theories on the psychology of drawing suggest that productions are representative of mind given neurological patterns, others postulate that organized behavior is more significantly determined by the

subject's repeated environmental contacts mediated by sensory processes.

"Orientation of the figure on the page appears to be related to handedness, but, with age, comes under the influence of cultural conventions of reading and writing."²¹ This statement by Harris could be said to imply that culturally different environmental contacts produce some differentiation in drawing productions, particularly in terms of figure orientation. Since this is the concern of the present study the next section will be devoted to related cultural aspects.

3. Cultural Aspects.

Each human response is made to the stimulus or stimulus-situation as defined and interpreted in accordance with man-made patterns, that is to say, culture. It is equally clear that in any complex assemblage of events, individual idiosyncracies, the situation, and cultural influences are all inextricably intertwined. Secondary influences such as life experience, learning, and motivation also play their part. Except as to minute details, an adult's behavior is rarely determined as a totality by his inherited genetic make-up. Nor is an individual's behavior determined, except

²¹ Harris, Op. Cit., p. 159-160.

in the most elliptical way, by the whole of his culture. Behavior is in reality influenced by those aspects of a person's culture which he has internalized as a result of having specific parents, a particular environment, and an infinite number of objective and subjective forces which, by selection and distortion, produced his individualized variant of the generalized culture. Thus, we can better say "culturally influenced" than "culturally determined".

Although the concept of culture arises from behavior and returns to behavior, it is not behavior. Rather, it is one element in human behavior. As Sidney says,

(...) culture patterns may well be considered in abstraction from actual behavior for the purpose of comparative study and analysis, this does not imply that culture is nothing but a logical construct of patterns or forms (...) the unit of culture is the patterned process and (...) culture comprises the patterned behavior of man in society. Only by combining patterns and process as distinguishable but inseparable elements of cultural behavior will it be possible to discover and understand the 'dynamic mechanisms'.²²

Furthermore, according to Ausubel,

²² D. Sidney, Theoretical Anthropology, New York, Columbia University Press, 1953, p. 155.

The capacity for inventing and acquiring language is one of the most distinctive features of human development. It is undoubtedly both a prerequisite for the original development of culture and a necessary condition for the subsequent acquisition by the individual of the complex cognitive, social and moral products of the culture in which he lives.

Language may also be thought of as both a product or reflection of culture and as a patterning or limiting factor in the cognitive development of the individual carriers of the culture. It reflects the particular kinds of psychosocial standardisation of word-object and word-idea relationships as well as the characteristic attitudes, values, and ways of thinking that prevail in a given culture. (...) Thus, characteristic patterns of thought in a particular culture affect the nature of the language that evolves, and the language in turn patterns and limits the type of thinking in which individual members of the culture engage.²³

A. Patterns of Child Rearing.

Neither a total culture nor a particular child rearing discipline ever completely determines the uniqueness of an individual personality. The different culturally accepted ideals of personality to a large extent reflect and perpetuate the child training practices and their effects within a particular culture. It is probably true, as Sikkema²⁴ says, that parental attitudes are more important

²³ David P. Ausubel, Theory and Problems of Child Development, New York, Grune and Stratton, 1958, p. 521.

²⁴ Mildred Sikkema, "Observations on Japanese Early Child Training", Psychiatry, Vol. 10, No. 4, November 1947, p. 423-432.

than methods, but attitudes are also in part cultural products. In the words of Beaglehole and Beaglehole,

A group perpetuates itself biologically by the process of reproduction. It perpetuates itself socially, as a group that is, by transmitting from one generation to the next all the patterns of behavior, all the ways of feeling and methods of thinking which together make up the culture of the group and which have in the past been found appropriate and adequate for dealing with the problems of living and dying, of coming to terms with the environment, with other human beings, and with supernaturals, whether friendly or hostile.²⁵

A similar idea is expressed by Ausubel:

Since cultures obviously tend to perpetuate themselves, i.e., to produce adult individuals who develop ways of behavior that are consonant with prevailing norms, it is self-evident that cultural values must somehow be woven into the developing fabric of personality structure.²⁶

Explicit mention should also be made of the fact that cultures which appear to be quite dissimilar in many basic features of content and form may show very striking psychological similarities. There is also a strong possibility of the reverse occurring. Often, there has been an unjustified tendency to assume homogeneity of both culture and personality in primitive societies and a startling disregard of the complexity of modern life. We

²⁵ E. Beaglehole and Pearl Beaglehole, Some Modern Maoris, Wellington, New Zealand Council for Educational Research, 1946, p. 117.

²⁶ Ausubel, Op. Cit., p. 259.

must, as Bendix says, "(...) resist the temptation to attribute to the people of another culture the uniformity we are unable to discover in our own".²⁷

An objective description of cultural patterns for child rearing is not enough from which to infer personality formation consequences. Roughly identical systems may produce contrasting results due to the different meaning which the same or similar acts early acquire for children in different cultures.

Since cultural variations may influence child-rearing practices, it may also be assumed that such variations also affect personality development. Over the years, the relationship between culturally-determined child-rearing practices and personality development has been the focus of numerous unsystematic observational studies. For example, in a Belgian Congo tribe, the development of weak affectional ties and a value system emphasizing safety and conformity, have been held due to child-rearing practices.²⁸ They have also been held responsible for the precocity of

²⁷ Reinhard Bendix, "Compliant Behavior and Individual Personality", The American Journal of Sociology, Vol. 58, No. 3, November 1952, p. 292-303.

²⁸ M. Th. Knapen, "Some Results of an Enquiry Into the Influence of Child-Training Practices on the Development of Personality in a Bacongo Society (Belgian Congo)", The Journal of Social Psychology, Vol. 47, Second Half, May 1958, p. 223-229.

Uganda infants in adaptivity, language, and personal-social relations.²⁹

A systematic cross-cultural study³⁰ contrasted the child-rearing practices of societies believing in benevolent gods and spirits with those believing in aggressive gods and spirits. The former were found to have somewhat indulgent practices while the latter tend to follow relatively rigid, nonpermissive child-rearing practices. Characteristics attributed to the supernatural also play a part in children's behavior, those from societies with beliefs in aggressive gods displaying greater self-reliance and independence, as well as less nurturance, than those in a contrasting society.

One could also anticipate differences in the behavior and personality of children from varied racial and religious groups since they frequently differ in socialization and child-rearing practices. According to Lesser's³¹

29 Marcell Geber, "The Psycho-Motor Development of African Children in the First Year, and the Influence of Maternal Behavior", The Journal of Social Psychology, Vol. 47, First Half, February 1958, p. 185-195.

30 William W. Lambert, Leigh Minturn Triandis and Margery Wolf, "Some Correlates of Beliefs in the Malevolence and Benevolence of Supernatural Beings: A Cross-Societal Study", The Journal of Abnormal and Social Psychology, Vol. 58, No. 2, March 1959, p. 162-169.

31 Gerald S. Lesser, "Religion and the Defensive Responses in Children's Fantasy", Journal of Projective Techniques, Vol. 23, No. 1, March 1959, p. 64-68.

data, Catholic boys employed more defensive inhibitions against aggression than did Protestant or Jewish boys in their TAT stories. However, the groups did not differ significantly from one another in either covert or fantasy aggression. While these results are suggestive they are relatively meaningless without information on actual socialisation and child-rearing differences specific to the different religious backgrounds.

Because of their geographic and economic similarity Green³² chose Jamaica and Puerto Rico for a bicultural study of child-training. Through an analysis of the then recent publications, she compared the economically similar segments of Jamaica and Puerto Rico with the intention of showing that:

(...) the imposed culture of England in Jamaica and of Spain in Puerto Rico accounts for the difference observable in the sub-culture of the two islands where the economy is approximately equivalent.³³

Her conclusion was that different values in the Spanish and English cultural tradition produced noticeable variations in child-raising patterns which, in turn, are manifest in adult

³² Helen B. Green, "Comparison of Nurturance and Independence Training in Jamaica and Puerto-Rico, With Consideration of the Resulting Personality Structure and Transplanted Social Patterns", The Journal of Social Psychology, Vol. 51, First Half, February 1960, p. 27-63.

³³ Ibid., p. 27.

personality differences because of the differences in nurturance and independence training.

Dansiger,³⁴ in an investigation based on interview data, attempted to determine whether differential Javanese social class experience is reflected in independence training during child rearing. Conclusions, based upon the reports of sixty Javanese mothers representative of workers, white collar and professional groups, were that there is a statistically significant tendency with increasing professionalism for independence to be encouraged at an earlier age, particularly in activities of preschool age as opposed to older children. However, differences in independence training reported in this study could be due to social class group differences with respect to geographic origin, educational level, living conditions and so on.

These few studies are fairly representative of those pointing to differentiation in child-rearing practices but rarely specify the postulated personality differences. Nor is any attempt made to interrelate theories of child-rearing, personality variables, and psychological test performance, though some attention is given to these areas in the following data.

³⁴ Kurt Dansiger, "Independence Training and Social Class in Java, Indonesia", The Journal of Social Psychology, Vol. 51, First Half, February 1960, p. 65-74.

B. Test Performance.

The drawings of children have long been regarded as indicative of their interest, attitudes, and other emotional or social characteristics. Although the general psychologist has found many clues to the development of numerous related processes, such as perception and thinking, in the genetic study of drawing behavior, the influence of environment on the nature and developmental sequence of drawing behavior has been studied in a rather vague and limited fashion. Some time ago Anastasi and Foley³⁵ expressed the need for more information regarding this influence in the study of children's drawings in order to justify the making of generalizations or arriving at resolutions to some of the problems in practical application. To date this area has received only limited attention.

Generalized acceptance of the existence of developmental stages in drawing behavior has already been referred to. While these stages are generally viewed as independent of specific environmental stimulation, being merely the products of innate maturational factors, studies leading to such a view have often been inadequate and inconclusive,

³⁵ Anne Anastasi and John P. Foley, Jr., "An Analysis of Spontaneous Drawings by Children in Different Cultures", The Journal of Applied Psychology, Vol. 20, No. 6, December 1936, p. 689-726.

as well as frequently presenting conclusions inconsistent with the facts obtained, leaving a definite need to study the drawing behavior of children reared in widely different cultures. However, inasmuch as white children usually enjoy greater cultural advantages, one would expect them to profit most from cultural bias.

There is conflicting evidence in the literature regarding whether so-called "culture free" tests really do fit the qualifications of such a category. Fuller and Laird,³⁶ in introducing the Minnesota-Percepto-Diagnostic Test, state that, "As the test is culture free, education, intelligence, and reading ability, within limits, do not influence the results."³⁷ However, they present no evidence in support of their claim that the test is culture free.

In many studies a basic assumption is made that non-verbal stimuli, such as those constituted by the Minnesota-Percepto-Diagnostic (MPD) and Bender-Gestalt (BG) test designs, are "culture free". It is generally assumed that all individuals of equal intelligence would be equally capable of accurately reproducing the test designs. Thus, many tests are used equally for subjects of all cultures

³⁶ Gerald B. Fuller and James T. Laird, "The Minnesota Percepto-Diagnostic Test", Special Monograph Supplement, Vol. 19, No. 1 of the Journal of Clinical Psychology, issue of January 1963, p. 111 to 34.

³⁷ Ibid., p. 7.

in spite of studies to the contrary. Since we have no information regarding the relation of cultural factors to NFE performance, it seems relevant to consider research carried out on the BQ test in this area, though factors other than rotation, the focus of the present study, are also involved. Although it appears that the BQ is as culture free as any test this may not be so. The obvious problem is whether the BQ reflects cultural differences when dealing with ethnic groups, or whether variations in figure productions are indicative of intellectual level and personality, or other factors apart from cultural variation.

At least two published references to cultural differences as related to BQ test performance are to be found in the literature. The earliest, reviewed by Toler and Schulberg,³⁸ is based on Bender's work on Saipan in the Mariana Islands in 1947 and 1948. Nearly half of the population of 4,796 natives living on Saipan in July 1947, were under the age of sixteen. The majority of the natives were Chamorros and the remainder, approximately one thousand, were Carolinians. These groups differed in language and, to a considerable degree, in customs. As these ethnic groups lived in different communities there was little

38 Toler and Schulberg, Op. Cit., p. 61-63.

intermingling, thus constituting two relatively distinct samples for the investigation of cultural differences on the Bender Visual-Motor Gestalt Test.

After random sampling procedures the BG was administered to the two hundred children in the sample over five years and under eighteen. While Bender's major findings were related to maturational level and IQ, she also observed that there were "(...) many more primitive or regressive features on these Bender protocols than is characteristic for American children".³⁹ Unfortunately, she did not attempt to distinguish the performance differences, if any, between the Chamorros and Carolinians.

Peixotto⁴⁰ attempted to determine whether the BG reflected cultural differences among several ethnic groups or whether the test reflected intellectual and personality differences apart from cultural variations. With a total sample of thirty-five, and only five subjects in each sub-sample, she used the following seven cultural groups: Chinese, Japanese, Caucasians, Part-Hawaiians, Portuguese, Chinese Hawaiians, and Filipinos. Her subjects were patients active in a psychiatric outpatient clinic. The

³⁹ Tolor and Schulberg, Op. Cit., p. 62.

⁴⁰ H.E. Peixotto, "The Bender Gestalt Visual Motor Test as a Culture Free Test of Personality", Journal of Clinical Psychology, Vol. 10, No. 4, October 1954, p. 369-372.

age range was 14-31, the IQ range 62-135. BQ protocols were scored according to the Pascal and Suttell method.⁴¹ On the basis of an analysis of variance, variation between the ethnic groups was significant at the five per cent level. Feixotto concluded that the BQ reflected characteristics common to any specific ethnic group, but varies between groups and thus is not culture free. The chief criticism of this study is the small size of the subsamples and the use of only patients as representatives of different cultures.

On the basis of these two studies no definitive conclusion is possible as to the status of the BQ test in relation to cultural variations. The degree to which cultural factors interact with individual personality or intellectual differences has not as yet been resolved. Billingslea, in reviewing the BQ test literature from 1950-61 states that, "The clinician dealing with patients with varied cultural backgrounds must be alert for test stimuli that are influenced in a minimum manner by differing cultural milieus."⁴² According to Toler and Schulberg, the best we can say is that "(...) there is a tendency for less highly developed ethnic groups to produce a greater number of regressive or primitive features in their reproductions than is the case

⁴¹ Gerald R. Pascal and Barbara J. Suttell, The Bender-Gestalt Test. Quantification and Validity for Adults, New York, Grune and Stratton, 1951, xiii-274 p.

⁴² Fred Y. Billingslea, "The Bender Gestalt: A Review and a Perspective", Psychological Bulletin, Vol. 60, No. 3, May 1963, p. 242.

for Western Ss".⁴³ These regressive features may or may not include rotation.

A recent study by Shapiro⁴⁴ reports the results of a shortened form of the Drawing Rotation Test by African and English subjects. The Africans consisted of fourteen illiterate and 17 educated subjects; the English of ten brain-damaged, 15 low grade, and 16 high grade mental defectives, 14 imbeciles, and 21 normal and 23 brain-damaged subjects of about normal intelligence. The results showed the illiterate Africans to rotate significantly more than any other group and to do so in accordance with precise laws of organisation. The main conclusion concerned the necessity to account for the higher rotation scores of this group. This the author attempts to explain in terms of the psychological effects of being an illiterate African and/or being an unintelligent African. Of considerable importance is the necessary opportunity for learning in order to integrate the directional properties of the visual world.

With other psychometric tools similar conflicting material is in the literature. An early paper⁴⁵ presents

⁴³ Toler and Schulberg, Op. Cit., p. 64.

⁴⁴ M.B. Shapiro, "The Rotation of Drawings by Illiterate Africans", The Journal of Social Psychology, Vol. 52, First Half, August 1960, p. 17-30.

⁴⁵ H.W. Nissen, S. Nachover and Elaine F. Kinder, "A Study of Performance Tests Given to a Group of Native African Negro Children", The British Journal of Psychology, Vol. 25, Part 3, January 1935, p. 308-355.

results secured with twelve psychometric performance tests of the individual type, administered to fifty native Negro children, aged approximately 5 to 14, in French Guinea in Africa. These subjects were considered to be as isolated and as little modified by culture alien to their own as any group then examined with performance test material. There is little doubt that the subjects' test scores, as compared with the American standardization groups, are distinctly inferior, but they question whether the usual sociological interpretation of such results is valid, going on to say that,

(...) selection of features of their own civilization as a basis for measuring the inferiority of individuals of other cultures is obviously arbitrary and artificial. (...) It is conceivable that under a culture which would place greater emphasis upon affective experience, there might be correspondingly less concern with matters which seem to us of major importance.⁴⁶

Grinder and his associates⁴⁷ used 941 Jamaican school children ranging in age from 7.5 to 10.5 years, and of three skin colors - light, mixed, dark - to test the hypothesis that differences between ethnic groups in

⁴⁶ Nissen, et al., Op. Cit., p. 352.

⁴⁷ Robert E. Grinder, Wendy S. Spotts and Margaret Wooster Curti, "Relationships Between Goodenough Draw-a-Man Test Performance and Skin Color Among Preadolescent Jamaican Children", The Journal of Social Psychology, Vol. 62, Second Half, April 1964, p. 181-188.

intelligence test scores would disappear if methodology could provide suitable controls for environmental variables. This study shows that environmental conditions must be carefully equated in order to factor out their masking effect upon the relationship between measures of color and intelligence and leads the authors to conclude that there is still "(...) no scientifically acceptable evidence for the view that ethnic groups differ in innate abilities".⁴⁸

However, a study by Havighurst, Gunther and Pratt⁴⁹ presents somewhat opposing findings. The Goodenough Draw-a-Man Test was administered to 325 children, aged six through eleven, selected from six American Indian tribes. The sample was selected in such a way as to be representative of each Indian community. In general, the results showed the Indian children to be superior to white children. More specific conclusions were that tribal Indian children do better than white children on the Draw-a-Man Test, Indian boys from Pueblo groups do better than girls on the Draw-a-Man Test, environment affects performance of children on the Draw-a-Man Test, and that the validity of the Draw-a-Man

⁴⁸ Grinder, et al., Op. Cit., p. 187-188.

⁴⁹ Robert J. Havighurst, Minna Korol Gunther and Ines Ellis Pratt, "Environment and the Draw-a-Man Test: The Performance of Indian Children", The Journal of Abnormal and Social Psychology, Vol. 41, No. 1, January 1940, p. 50-63.

as a test of general intelligence with Indian children has not been established.

McConnell⁵⁰ was most interested in the concept of "primitive" man frequently found in psychological literature, particularly as it relates to studies on regression and on abstract and concrete levels of behavior. In a study involving twenty-four adults, aged 17 to 50, from the Southern Tepehuan tribe in Mexico, the authors, with a modified presentation of the Wechsler-Bellevue version of the Kohs Block Design test, attempted to discover if members of an essentially primitive society do function at a concrete level of behavior. They found that the Tepehuan not only can perform at an abstract level, but also function there almost as well as the adult population on which Wechsler standardized his intelligence test.

The presence or absence of abstract behavior has often been the subject of impressionistic judgments in cross-cultural literature rather than being based on sound research. Jahoda,⁵¹ utilizing twenty-seven male, adolescent students from Gold Coast Africa, sought to determine whether

⁵⁰ James McConnell, "Abstract Behavior Among the Tepehuan", The Journal of Abnormal and Social Psychology, Vol. 49, No. 1, January 1954, p. 109-110.

⁵¹ Gustav Jahoda, "Assessment of Abstract Behavior in a Non-Western Culture", The Journal of Abnormal and Social Psychology, Vol. 53, No. 2, September 1956, p. 237-243.

tests of abstract behavior could be validly applied to non-Western people. He found that boys from literate homes performed significantly better than those from illiterate homes on the Goldstein-Scheerer Cube Test, indicating that environmental influences play a part in test results. Further research, replicating McConnell's⁵² work with the Tepahuan, led Jahoda to conclude that "(...) tests of abstract ability are no more "culture-free" than tests of intelligence".⁵³

It seems that the potential influence of cultural variations upon test performance, regardless of the function or process being studied, has been neither substantiated nor disproved, leaving the problem open for further investigation.

4. Summary.

From the foregoing material it may be seen that the dimension of field dependence has been defined in terms of an individual's ability to overcome the effects of embedding contexts; the person who can readily do so being referred to as field independent, the person who cannot being called field dependent. The concept of field-dependence-independence has been further related to sex, age and overall development

52 McConnell, Op. Cit., p. 109-110.

53 Jahoda, Op. Cit., p. 242.

with but a brief mention of the part played in this process by patterns of mothering within and between cultures, material of a local nature not being readily available. It was further shown that language and culture are inextricably related, the capacity for developing the former being one of the most distinctive and characteristic features of human development. Language both determines and reflects the patterns of thought and cultural products within an individual's prevailing milieu.

Language, as a manifestation of cultural factors, may influence behavior development at many levels. Broad aspects of the child's intellectual development rather than simply test performance may be fundamentally affected by the cultural conditions under which he is reared. In speaking of the subject matter and the technique of drawings it can be seen that they reflect specific cultural and experiential factors rather than age differences and developmental stages per se. Thus, specific features of a child's drawing cannot justifiably be used as an index of developmental level apart from his particular experiential background. For the same reasons, it is difficult to refer to any task or test, particularly in the visual-motor sphere, as "culture free". However, there may be some justification for referring to them as "culture reduced".

On the basis of the literature reviewed it could be hypothesized that patterns of child rearing result in different rates of maturation which in turn are reflected in variations in field-dependence-independence between and within cultures and between ages. The present study is concerned with the influence of three variables, namely age, sex, and language as it reflects culture, upon rotation on a visual-motor task, the carrying out of which is related to field-dependence-independence. It should follow that if one language group, one age, or either sex, is more field dependent, then more rotation should be expected. However, a brief consideration of the perceptual aspects of the Gestalt principle and rotation would seem relevant at this point.

CHAPTER II

REVIEW OF THE LITERATURE: THEORETICAL CONSIDERATIONS OF ROTATION

Bender, in relating perception to the Gestalt principle, states that:

The gestalt function may be defined as that function of the integrated organism whereby it responds to a given constellation of stimuli as a whole; the response itself being a constellation, or pattern, or gestalt.¹

Later, in the same volume she writes: "The whole setting of the stimulus and the whole integrative state of the organism determine the pattern of the response."² If we accept these principles we can then assume that the reproduction of test designs is a visual-motor act in which alterations of the original pattern indicate malfunctioning or neural injury, variations in intellectual levels, or maladjustment or individual differences in the emotional and/or perceptual field of the perceiving subject. Thus, an understanding of the perceptual basis of drawing tests, such as those with which this study is concerned, is essential in a discussion of the perception of visual form as it relates to the rotation phenomenon.

¹ Loretta Bender, "A Visual Motor Gestalt Test and its Clinical Use", American Orthopsychiatry Association Research Monograph, No. 3, 1938, p. 3.

² Ibid., p. 4.

1. Perceptual Aspects.

The Bender-Gestalt Test is based on the premise that the perception of the normal individual is marked by an integration of what is being received through our sensory receptors to form a good gestalt or coherent whole. Thus, to use Cameron's words,

If need, time and the opportunity are present, however, human beings show irresistible tendencies to supplement the fragmentary pattern, to terminate a series once begun, to group scattered objects and complete an unfinished statement, to make a point-less incident into a meaningful story. They embrace isolated perceptual elements within a coherent whole that is integrated by their need and by the thinking which satisfies the need.³

Bender, in her 1938 monograph, made this point clear by saying,

(...) There is a tendency not only to perceive gestalten but to complete gestalten and to re-organise them in accordance with principles biologically determined by the sensory motor pattern of action. This pattern of action may be expected to vary in different maturation or growth levels and in pathological states organically or functionally determined.⁴

Billingslea pointed out that the BG is a test of visual-motor perceptual behavior which,

³ Robert R. Blake and Glenn V. Ramsey, Eds., Perception: An Approach to Personality, New York, Ronald Press, 1951, p. 292-293.

⁴ Bender, Op. Cit., p. 5.

(...) is considered to involve (a) sensory reception, (b) central neural interpretation, and (c) motor reproduction (hand drawing) by the perceiving subject of the test stimulus objects.⁵

There has been a large volume of literature published in recent years relating perception to personality, and interest in this area seems to be increasing. Determinants of perception may be classified, according to Bruner and Postman,⁶ into two categories: the "autochthonous" or functional on the one hand, and the "behavioral" or motivational on the other. The autochthonous perceptual level represents the innate and relatively unchangeable endowment of perceptual activities. An example of this is the law of perceptual organization of the Gestaltists. On the other hand, those who stress a motivational factor as the perceptual determinant deal with needs, tensions, values, defenses, and emotional conditions.

⁵ Fred Y. Billingslea, "The Bender-Gestalt: An Objective Scoring Method and Validating Data", Journal of Clinical Psychology, Vol. 4, No. 1, January 1948, p. 1.

⁶ Leo Postman, Jerome S. Bruner and E. McGinnes, "Personal Values as Selective Factors in Perception", The Journal of Abnormal and Social Psychology, Vol. 43, No. 2, April 1948, p. 142-154.

In addition to the motivation-centered analysis, Frenkel-Brunswik^{7,8,9} proposed a third variable, which she calls "the personality-centered" factor. She related this factor to basic personality make-up rather than to relatively temporary motivational situations. She studied, for example, the relationship between tolerance versus intolerance of ambiguity and perception. The perceptual correlates of personality have been analyzed considerably in order to establish clinical tools as well as to provide evidence for and against certain theories.

However, since the present study constitutes an analysis of the relationship between specified variables and the phenomenon of rotation, the following discussion will be confined to this phenomenon. Although the rotation phenomenon has been most systematically studied as it is

7 Blake and Ramsey, Op. Cit., viii-442 p.

8 Else Frenkel-Brunswik, "Tolerance Toward Ambiguity as a Personality Variable" (abstract), The American Psychologist, Vol. 3, No. 7, July 1948, p. 268.

9 -----, "Distortion of Reality in Perception and in Social Outlook" (abstract), The American Psychologist, Vol. 4, No. 7, July 1949, p. 253.

manifested in the reproduction of block designs^{10,11,12,13,14,15} this study will confine itself to the appearance of this phenomenon in the reproduction of the designs of the Bender-Gestalt and Minnesota Percepto-Diagnostic Tests.

2. Rotation of Bender-Gestalt Configurations.

Rotation is a phenomenon that, until the development of the Minnesota Percepto-Diagnostic Test,¹⁶ received

10 Kurt Goldstein and Martin Scheerer, "Abstract and Concrete Behavior. An Experimental Study with Special Tests", Psychological Monographs, Vol. 53, No. 2, Whole No. 239, 1941, p. 32-57.

11 M.B. Shapiro, "Experimental Studies of a Perceptual Anomaly: I. Initial Experiments", Journal of Mental Science, Vol. 97, No. 406, January 1951, p. 90-110.

12 -----, "Experimental Studies of a Perceptual Anomaly: II. Confirmatory and Explanatory Experiments", Journal of Mental Science, Vol. 98, No. 413, October 1953, p. 605-617.

13 -----, "Experimental Studies of a Perceptual Anomaly: III. The Testing of an Explanatory Theory", Journal of Mental Science, Vol. 99, No. 416, July 1953, p. 394-409.

14 A.J. Yates, "Experimental Studies of a Perceptual Anomaly: IV. The Effect of Monocular Vision on Rotation", Journal of Mental Science, Vol. 100, No. 421, October 1954, p. 975-979.

15 -----, "Experimental Studies of a Perceptual Anomaly: V. Some Factors Influencing the Appearance of the Block Design Rotation Effect in Normal Subjects", Journal of Mental Science, Vol. 102, No. 429, October 1956, p. 761-771.

16 Gerald B. Fuller and James T. Laird, "The Minnesota Percepto-Diagnostic Test", Special Monograph Supplement, Vol. 19, No. 1 of the Journal of Clinical Psychology, issue of January 1963, p. 111 to 34.

limited consideration in isolation. It has been observed and demonstrated for some time that children frequently incorrectly reproduce the designs of the Bender-Gestalt test. Yet few studies have investigated the basis for this distortion in reproduction. Similarly, general considerations of the appearance of this phenomenon in adults have tended to attribute it to psychiatric disturbance and it is in this area that most of the studies with adults have been carried out.

Tolor and Schulberg, in evaluating the published literature on the Bender-Gestalt test, have the following to say about rotation:

The review of the studies on rotation of figures seems to be a particularly good example of research naivete. Research has been reported that has merely observed the presence and frequency of rotations of individual figures (or parts of figures) or has measured the degree of rotation. With the exception of Fabian's (1945) observation, there has been little effort to relate the rotations to the Gestalt functions, genesis or maturation.¹⁷

However, this evaluation of the research on rotation was composed prior to the introduction of the Minnesota Percepto-Diagnostic Test, to be referred to at a later point in this study.

¹⁷ Alexander Tolor and Herbert C. Schulberg, An Evaluation of the Bender-Gestalt Test, Springfield, Illinois, Charles C. Thomas, 1963, p. xiii-xiv.

Various factors have been postulated as significant in the rotation phenomena. One thousand Bender-Gestalt records, one-third of those collected over an eleven year period by the Psychology Service of a neuropsychiatric hospital, were examined by Griffith and Taylor¹⁸ for the frequency of rotations in the drawings of different clinical groups. This study confirms the belief of clinicians that rotations of Bender's gestalten are of diagnostic significance and suggests that the different orientation between the background shape of the Bender-Gestalt cards and the paper upon which they are to be reproduced is a significant factor in the rotation phenomena. In the same vein, Hannah¹⁹ attempted to show that factors other than mental pathology tend to produce abnormalities in design reproduction. To test this hypothesis he presented a variation of the BC test in which the stimulus cards for two groups of thirty-six subjects, each matched for age, sex, and psychological diagnosis, were different in that the designs on one were printed with each card oriented horizontally, while for

¹⁸ Richard M. Griffith and Vivian H. Taylor, "Incidence of Bender-Gestalt Figure Rotations", Journal of Consulting Psychology, Vol. 24, No. 2, April 1960, p. 189-190.

¹⁹ Lewis D. Hannah, "Causative Factors in the Production of Rotations on the Bender-Gestalt Designs", Journal of Consulting Psychology, Vol. 22, No. 5, October 1958, p. 398-399.

the other test the cards were vertically oriented. This study demonstrated that in at least one way abnormalities in production of the designs may be a function of their orientation on the stimulus cards. Hannah's results were later confirmed by Griffith and Taylor²⁰ who rotated the subject's paper so that it conformed to the horizontal orientation of the stimulus cards. These studies indicate that some rotations may be a function of the manner of presentation of the stimulus designs rather than the subject's pathology.

In recent years an increasing number of studies have been carried out on rotation of designs by children. The observation has been made by Bender²¹ that severely retarded readers rotated horizontally oriented Gestalt figures to the vertical position when copying them. Fabian²² tried to determine the ramifications of such an observation, including the incidence of vertical rotation and its relationship to age and past experience. An extensive study was made of nineteen third grade children who

20 Richard M. Griffith and Vivian H. Taylor, "Bender-Gestalt Figure Rotations: A Stimulus Factor", Journal of Consulting Psychology, Vol. 25, No. 1, February 1961, p. 89-90.

21 Bender, Op. Cit., vi-176 p.

22 A.A. Fabian, "Vertical Rotation in Visual-Motor Performance - Its Relationship to Reading Reversals", The Journal of Educational Psychology, Vol. 36, No. 3, March 1945, p. 129-134.

were of at least average intelligence but were retarded a half year in reading level. Symbol reversals could be noted in seventeen of the nineteen children and when the Bender was administered it was found that ten of the nineteen rotated one or more Gestalten to the vertical position. In an effort by Fabian to obtain normative data regarding the performance of children, particularly in regard to rotations, the BG was administered to 586 pupils distributed from kindergarten through the end of the third grade. It was found that this phenomenon is a very common feature in preschool and beginning school children. Over half of the pupils rotated the figures, eighty per cent of the rotations being from the horizontal to the vertical plane. As the child progresses, rotational tendencies become less pronounced and a significant drop is observed. Only twenty per cent of children at the end of the first grade rotate figures, and of the pupils between seven and one-half and nine years only seven per cent continue to do so. Two of the most frequently rotated designs, A and 3, were presented in the vertical position by Fabian to a group of twenty-three children beginning the first grade. He found that all of the children reproduced the designs correctly with respect to direction, thus reinforcing the impression that horizontal configurations are more likely to initiate figure-ground changes in young children. Fabian concluded

that until the age of seven, children are prone to "(...) 'verticalize' horizontally directed figures, while vertical figures are reproduced with minimal directional distortion".²³

In a brief note on rotations in the BG test as predictors of EEG abnormalities in children, Hanvik²⁴ presents his view that rotations by children are more malignant than rotations by adults. He contends that when rotations occur in the records of children they are almost always pathognomonic of brain damage. He refers to his experience suggesting that "(...) there is undoubtedly a high correlation between rotations (...) and EEG abnormalities".²⁵ In a series of twenty children with one or more rotations he noted an eighty per cent incidence of abnormal EEG records. Although his observations may have some value they suffer from the limitations imposed by the lack of controls and the disregard for an acceptable research design.

23 Fabian, Op. Cit., p. 143.

24 Leo J. Hanvik, "A Note on Rotations in the Bender Gestalt Test as Predictors of EEG Abnormalities in Children", Journal of Clinical Psychology, Vol. 9, No. 4, October 1953, p. 399.

25 Ibid.

A recent study by Silverstein and Mohan²⁶ was designed to obtain statistics on the incidence of Bender rotations in a hospital for the mentally retarded, to assess temporal stability of rotation, and to evaluate the possible relationships between this factor and the variables of age, sex, IQ, as well as a few other factors. While their findings were consistent with those of Griffith and Taylor in that one or more rotations were produced by forty to fifty per cent of the patients, temporal stability of rotations was significant but low.

A thorough study by Fuller and Chagnon²⁷ utilized a triple classification factorial design in an attempt to provide a tentative rationale for rotation on the Bender-Gestalt cards based on the influence of stimulus variation, cue utilization, or a combination of the two. Results, based on the amount of emotional disturbance in normal, disturbed, and schizophrenic children, suggest that an individual becomes progressively less able to draw on the necessary cues to avoid rotation as he becomes more

26 A.B. Silverstein and Philip J. Mohan, "Bender-Gestalt Figure Rotations in the Mentally Retarded", Journal of Consulting Psychology, Vol. 26, No. 4, August 1962, p. 386-388.

27 Jerry B. Fuller and Gilles Chagnon, "Factors Influencing Rotation on the Bender-Gestalt Performance of Children", Journal of Projective Techniques, Vol. 26, No. 1, March 1962, p. 36-46.

emotionally disturbed, excited or aroused. Also to be noted is their finding that a vertically oriented figure produced more rotation than a horizontal one, and the diamond shape produced more rotation than the rectangular shape. Cue availability and figure-ground orientation were both operating in producing rotation.

Halpin²⁸ was interested in determining whether rotation errors could be predicted from one visual-motor task to another. Her sample consisted of fifteen exogenous and fifteen endogenous retarded children who had been matched for mental and chronological age, and intelligence. The children were asked to reproduce the Bender designs as well as to work on the Goldstein-Scheerer Stick Test. The results indicated that there is no significant relationship between the actual number of rotations made on the two tasks. Halpin was therefore led to conclude that rotations cannot be considered a form of behavior which can be predicted from one visual-motor task to another.

What these studies really say is that there seems to be a relationship between rotation and the following factors: maturation, or education since controls were

²⁸ Virginia G. Halpin, "Rotation Errors Made by Brain-Injured and Familial Children on Two Visual-Motor Tests", American Journal of Mental Deficiency, Vol. 59, No. 3, January 1955, p. 485-485.

either inadequately selected or rarely present in these studies; intelligence; EEG abnormalities; emotional adjustment; figure-ground orientation; and/or cue utilization. However, the evidence is inconclusive. Nor can it be said that there is any relationship between the amount of rotation produced on one visual-motor task and that produced on another.

3. Rotation of MPD Test Designs.

The Minnesota Percepto-Diagnostic Test (MPD)²⁹ is composed of six Gestalt designs which, when reproduced, are scored for degrees of rotation. Test rationale is that "(...) figure-ground relationships interact and that there is a continuum ranging from cohesiveness to ambiguity".³⁰ In other words, the amount of rotation is a reflection of the figure-ground relationship and its specificity, perception being ambiguous when the figure-ground relationship is incongruent. The authors found, through experimentation with these relationships, that brain-damaged individuals perceive a particular set of stimuli as ambiguous and produce considerable rotation while an emotionally disturbed group, perceiving the same stimuli as somewhat more cohesive, rotate

²⁹ Fuller and Laird, Op.Cit.

³⁰ Ibid., p. 9.

to a lesser degree with normal subjects rotating very little due to their perception of the stimuli as primarily cohesive.

As a result of the test standardization on more than twelve hundred children and adults the authors conclude that,

(...) the MPD Test elicits rotations which are measured by degrees, and the degree categorizes the subject as belonging to certain nosological groups. The greater the degrees of rotation, the more severe the pathology.³¹

Thus, the only concern of this test is the elicitation and measurement of rotation.

A comparative study in rotation of Gestalt designs by Wolofsky and Carroll³² sought, through the use of the Minnesota Percepto-Diagnostic Test, to accumulate information on rotation as a developmental phenomenon in a non-Western culture, as well as assessing this test's value as a "culture-free" instrument. The East-African subjects consisted of twenty-three boys and twenty girls averaging 4.7 years of education, their average age being 11 years, and the group's average standard score on the Goodenough-Harris Drawing Test was 87.10. The authors found that these children greatly rotated their reproductions of the Gestalt

³¹ Fuller and Laird, Op. Cit., p. 10.

³² S. Wolofsky and Brendan J. Carroll, A Comparative Study in Rotation of Gestalt Designs, Nairobi, Kenya, Special Centre, Ministry of Education, September 1964, 11 p.

designs of the MFD, tending toward the vertical, though they generally reproduced the figures in the form of the stimulus. To account for the type of distortion noted the following hypotheses are offered:

(...) a basic difference in spatial orientation related to body image, a relation to traditional art forms of the culture, a developmental lag in perceptual organization related to delay in physical growth or illness, differences in perceptual habits associated with such influences as Campbell's 'uncarpentered environment' (3) educational experiences, perceptual stimulation, and so on.³³

While most of the research on rotation conducted since the introduction of the MFD has been concerned with the stimulus properties of the designs and the rotation phenomenon, it does seem from the literature surveyed with respect to rotation that it is equally important to give careful consideration to even the more obvious subject variables such as sex, language, and ethnic affiliation.

4. Summary and General Hypotheses.

In summary, the review of the literature has briefly discussed the dimension of field dependence-independence along with its relationship to personality and has presented a brief discussion of the variations in and relationships between maturation, culture and language.

³³ Wolofsky and Carroll, Op. Cit., p. 10.

Specific attention was then given to the development of the "drawing function" and it can be seen that, regardless of cultural differences, children progress in a relatively similar pattern in drawing but that few studies have attempted to understand the role played by the subject's cultural background and/or rearing in determining the ultimate response. Considerations of the perceptual aspects of the Bender Gestalt Test led to a theoretical background of the rotation phenomenon itself.

Several factors have been postulated as among the more significant in the rotation phenomenon, whether it be in relation to blocks, drawings, or other tasks. Because biological plasticity is present in living organisms and functions, static position is opposed. Immaturity or pathology interfering with maturation tends to increase plasticity. Therefore, vertical movement, the basic principle in visual perception, occurs as a manifestation of Gestalt principles. Similarly, rotation resulting from the primitive tendency to increased movement in perceived objects occurs with those subjects who are immature, retarded or regressed. However, a certain amount of rotation occurs due only to separation of the foreground from the background, or figure from the field, as a primary differentiation in Gestalt functions. According to Schoen,

(...) Rotation is a function of the combined influence of 1) the relative stability or instability of the different gestalten and 2) the relative congruence or incongruence between the fixed axis of the stimulus design and either the vertical or horizontal axis of the visual field (...)³⁴

Although these factors are directly relevant to the occurrence of the rotation phenomenon in the reproduction of both Bender-Gestalt and Minnesota Percepto-Diagnostic Test configurations, it is contended, however, that there may be age, sex, language, and/or cultural differences in the genetic development of visual-motor functions which could influence the rotation phenomenon.

The present research was designed to study the influence of three different variables, namely age, sex, and cultural environment as manifest through language differences, upon the occurrence of one specific phenomenon, that of rotation. Four language groups, each divided into three age groups and having equal numbers of subjects of each sex, were utilized.

From the aforementioned rationale and considerations the following hypotheses can be set forth:

1. The degrees of rotation produced are significantly influenced by age.

³⁴ Virginia E. Schoen, "The Effect of Some Stimulus Variations on the Rotation of Bender-Gestalt Configurations in Non-Patient Young Adult Females", unpublished Doctor's thesis presented to the School of Psychology and Education of the University of Ottawa, Canada, 1964, x-101 p.

2. The degrees of rotation produced are significantly influenced by language group.
3. There is a significant interaction between age and language group for the degrees of rotation produced.

The present research was designed to verify these predictions though there have not yet been enough studies to make predictions regarding the effect of sex upon the degrees of rotation produced nor the interactional effects of sex and age, sex and language, or sex, age, and language, upon the degree of rotation produced.

Stated in the null form the general hypothesis is as follows: There are no significant differences among age, sex, and language groups, or any combinations of these three, with respect to degrees of rotation produced. The specific hypotheses to be tested, derived from this general hypothesis, are as follows:

1. There is no significant difference between boys and girls for the degrees of rotation produced.
2. There is no significant difference between any two of the three age groups for the degrees of rotation produced.
3. There is no significant difference between any two of the four language groups for the degree of rotation produced.

4. There is no significant interaction between the two sexes and the three age groups for the degrees of rotation produced.
5. There is no significant interaction between the two sexes and the four language groups for the degrees of rotation produced.
6. There is no significant interaction between the three age groups and the four language groups for the degrees of rotation produced.
7. There is no significant interaction among the two sexes, three age groups and four language groups, for the degrees of rotation produced.

The following chapter of this manuscript will be devoted to the experimental design utilized in testing the foregoing specific hypotheses.

CHAPTER III

EXPERIMENTAL DESIGN

The hypotheses set up in the previous chapter are the basis of the design of this study. Considered in this portion of the manuscript will be the subjects, the instrument, the testing and scoring procedures, and the statistical approach.

1. Samples.

In order to test the hypotheses of this study, four language groups were selected. These were normal, school-attending children between the age of six years, no months and that of fourteen years, six months. The upper age limit was determined by the choice of technique for intellectual evaluation while the lower limit was set to coincide with the minimum age in commencing school. Each language group was further divided into three subgroups on the basis of age, these being six years, no months to eight years, six months; eight years, seven months to eleven years, six months; and eleven years, seven months to fourteen years, six months. Each subgroup contained forty subjects, equally divided between the sexes.

For the purposes of this study an ethnic group is defined as follows: a racial, religious or social group

discriminated on the basis of distinctive customs, beliefs, traditions and/or language. The four ethnic groups, discriminated on the basis of language, each containing 120 subjects, are the following: English, French, Bicultural, and Canadian Indian. It is, of course, improbable, if not impossible, that one could find a pure ethnic group in any area of Canada. Groups such as the Eskimaux, the Indian, the Hutterites, Mennonites and so on, have all achieved varying degrees of acculturation.

The English-speaking group referred to in this study consisted of sixty male and sixty female students within the specified age ranges, between grades one to seven inclusive, in attendance at Fairfield School in Cardinal Heights. These students come from a predominantly middle class neighborhood and all have English as the first language in the home, though there is varied racial origin. Their geographic location is such as to prohibit any significant exposure to the French culture.

The French-speaking group was obtained from three schools in Hull. Male and female subjects between grades one and four inclusive attended Pius XII, male students from grades five to seven attended St-Rédempteur while female students from grades five to seven attended Carrière. The students in attendance at Pius XII are primarily from working class homes with some overlap into the lower middle class.

At Carrière and St-Rédempteur, the students come from a more representative assortment of economic levels, although the weighting is probably more toward the lower end. The subjects in this group all have French as their first language in the home and have been brought up almost exclusively in a French-Canadian environment. Although there has undoubtedly been a fair degree of exposure to the English language environment the subjects in this group could by no means be referred to as bilingual or bicultural.

The group herein referred to as Bicultural consisted of students in attendance at Our Lady of Annunciation in Hull. The family economic status is essentially middle class. While these students were all receiving their academic instruction in the English language, the language of the home was almost exclusively French. Also, the environment was essentially French-Canadian. While reference to this group as Bicultural could be questioned, it cannot be viewed as French or English in the same sense as the two foregoing groups.

Children of the Ojibwa and Ottawa tribes of the Algonquin Indian family compose the fourth and final group. In this case all subjects, with the exception of grade four, attended the Wikwemikong Indian Day School located within the Manitoulin Island Indian Reserve. The grade four pupils attended the Rabbit Island School on this same reserve.

The homes of these children were in the majority of cases very poor, almost totally lacking in the modern conveniences that most Canadians take for granted. While most of the teachers were white and English-speaking, a small number were Indian. The language of the home tended to be the tribal tongue and it is doubtful if other than a few of the children had been extensively exposed to English prior to commencing school where, for the first two or more years, the children seem to have rather limited comprehension of the English language. At all grades the tribal tongue is the language of the playground. As the Reserve is somewhat isolated inter-marriage with whites has been minimal, as has been exposure to their way of life. To all intensive purposes, this group has not yet been acculturated to the extent of not being justifiably referred to as a distinct culture or language group.

Table I presents in summary form a description of group characteristics with respect to intelligence quotient, age, and education. As suggested by Fuller and Laird¹ in their monograph presentation of the development and standardisation of the Minnesota Percepto-Diagnostic Test, the

¹ Gerald B. Fuller and James T. Laird, "The Minnesota Percepto-Diagnostic Test", Special Monograph Supplement, Vol. 19, No. 1 of the Journal of Clinical Psychology, issue of January 1963, p. 25.

Table I.-
 Mean I.Q., Age and Education
 of the Four Language Groups.

Group	N	I.Q.		Age		Education	
		M	S.D.	M	S.D.	M	S.D.
English	120	98.83	7.02	10.03	2.28	3.92	2.13
Bicultural	120	97.75	7.05	10.13	2.32	4.10	2.02
French	120	96.30	7.12	9.95	2.48	3.87	2.02
Indian	120	98.18	7.38	10.31	2.52	3.62	1.99

IQ range will be confined from 80 to 110. An additional qualification required of the subjects was that they all be right-handed in order to provide uniformity with respect to the direction of rotation.

Thus, the following criteria were to be met by potential subjects: 1) age between six years, six months and fourteen years, six months inclusive; 2) currently registered in school between grades one to seven inclusive; 3) intelligent quotient between 80 and 110 inclusive; and 4) right-handedness.

2. Instruments.

Intellectual endowment was evaluated by means of the Goodenough Draw-a-Man technique² scored according to the Goodenough-Harris method.³ This scale was selected because it is a quickly administered, objectively scored test which

² Florence L. Goodenough, Measurement of Intelligence by Drawings, New York, World Book Co., 1926, xi-177 p.

³ Dale B. Harris, Children's Drawings as Measures of Intellectual Maturity, New York, Harcourt, Brace and World, 1963, xiii-367 p.

correlates .60 to .80^{4,5,6} with the Stanford-Binet IQ. It is because sex differences have been noted^{7,8} on this test that the Goodenough-Harris scoring method was used, this system providing different tables for converting raw scores to standard scores for boys and girls.

The Minnesota Percepto-Diagnostic Test⁹ consists of six rotation eliciting designs which are measured by degrees. The standardization of the MPD is based on 1,294 individuals, of whom 540 were adults and 754 were children. In support of their statement that, within limits, the test, that is, rotation, is not affected by education, the authors quote correlations of .10 between education and degrees of rotation for the normal children (N:220), -.09 for the emotionally disturbed group (N:194), and .04 for the schizophrenic group (N:100). These findings are all nonsignificant, indicating that the test is not affected by education.

4 Lloyd N. Yepsen, "The Reliability of the Goodenough Drawing Test with Feebleminded Subjects", The Journal of Educational Psychology, Vol. 20, No. 6, September 1929, p. 448-451.

5 Edna W. McElwse, "Profile Drawings of Normal and Sub-Normal Children", The Journal of Applied Psychology, Vol. 18, No. 4, August 1934, p. 599-603.

6 J.H. Williams, "Validity and Reliability of the Goodenough Intelligence Test", School and Society, Vol. 41, 1935, p. 653-656.

7 Goodenough, Op. Cit.

8 Harris, Op. Cit.

9 Fuller and Laird, Op. Cit.

With regard to age the following nonsignificant correlations are reported for children: $-.09$ for the population of normal children; $-.03$ for the emotionally disturbed group; and $.07$ for the schizophrenic group. These findings also indicate that test score, that is, rotation, is not a function of age within the authors' specified limits.

Reported correlations of IQ with degree of rotation are as follows: $-.03$ for the normal children; $-.08$ for the emotionally disturbed children; and $.30$ for the schizophrenic children, this latter correlation being significant at the $.01$ per cent level of confidence.

Within the limits imposed by Fuller and Laird, rotation does not appear to be correlated with education or age, and is only minimally correlated with intelligence. While these same authors give no information regarding the possible influence of sex differences upon MPE performance, Tolor and Schulberg, in evaluating the published literature on the EG test state that "(...) sex differences are negligible",¹⁰ although at least one study achieved positive results in this respect. Though offering no evidence,

¹⁰ Alexander Tolor and Herbert C. Schulberg, An Evaluation of the Bender-Gestalt Test, Springfield, Illinois, Charles C. Thomas, 1963, p. 204.

Fuller and Laird further state that "(...) the test is culture free".¹¹

3. Testing and Scoring Procedures.

The principal of each school from which subjects were selected was provided with the following instructions for the administration of the Draw-a-Man Test:

"On these papers I want you to make a picture of a whole man. Make the very best picture that you can. Take your time and work very carefully. Try very hard and see what good pictures you can make. Remember, make the whole man."

Verbal and written instructions were then communicated by the principal to each teacher in charge of a class that was to be tested. Group administration of the Draw-a-Man test was carried out by the class teacher during regular class time with a thirty minute time limit being imposed upon the drawings.

The drawings thus obtained were then scored according to the Goodenough-Harris method and the raw scores converted to standard scores. For comparative purposes the drawings of those subjects randomly selected for this study, and who also fell within the appropriate age range for both scoring techniques, were also scored by the Goodenough method and the Pearson r between the two methods calculated. For the

¹¹ Fuller and Laird, Op. Cit., p. 7.

English group with an N of 115 an r of .86 was obtained, for the Bicultural group with an N of 114 an r of .87, for the French group with an N of 110 an r of .89, and for the Indian group with an N of 105 an r of .91.

Each subject was then individually administered the NPD under the standardized conditions of administration. Three qualified examiners were involved in this phase of the study. Scoring for degrees of rotation was also carried out in accordance with the test manual.

In order to obtain a test-retest reliability coefficient, twenty subjects were selected at random from each language group and readministered the NPD between twenty-four and seventy-two hours of the first administration. The results obtained are presented in Table II.

4. Statistical Analysis.

This study was designed to determine the effect and/or interaction of sex, age, and language (the independent variables) on rotation (the dependent variable). A three-way analysis of variance patterned after McNemar's¹² "Case X" was most appropriate for analysis of the obtained data. This is a fixed constants model (ADG), in this case with forty different individuals in each of the twelve cells. The

¹² Quinn McNemar, Psychological Statistics, Second Edition, New York, Wiley, 1955, p. 328-329.

Table II.-
Test-Retest Reliability.

Group	N	First Mean Rotation	Retest Mean Rotation	r
English	20	44.00	39.50	.73
Bicultural	20	85.00	82.50	.54
French	20	75.50	71.50	.89
Indian	20	42.00	42.50	.80

proper error term for testing each of the three main effects, the three 2-way interactions, and the one 3-way interaction, is the within variance (s^2_W). This particular model limits generalizations to the three age groups and the four language groups utilized in this study. Generalizations are confined to these particular ages and cultures, that is, language groups. For purposes of this research, a level of significance of $P \geq .01$ was the criterion chosen for evaluating the significance of the obtained F value.

An F value which was found to be significant at, or beyond, the .01 level of confidence was further analyzed by means of 't' tests. The purpose in such cases was to determine the significance of the difference between the means for a specific main effect, or, where indicated, for the double interactions or for the triple interaction. The formula used for the 't' test was: Significant Difference $\geq t(p=.01) \times \sigma_{Diff}$.

The σ_{Diff} was obtained by means of the following formula:

$$\sigma_{Diff} = \sqrt{\frac{2\sigma^2}{n}}$$

The within cubicle variance is represented by σ^2 in this formula while n represents the n for any specific age, sex, or language. Thus, the n for ages is 160 while that for language is 120, as is that for sex. In all cases the

values for t ($P = .05$), t ($P = .01$), and t ($P = .001$) were read from the table of 't' values for 175 degrees of freedom.

In the following chapter will be found a presentation of the results obtained through the foregoing procedure.

CHAPTER IV

RESULTS OF THE EXPERIMENT

The results of the statistical analysis of the data obtained from this study will be presented in this chapter.

1. Analysis of Data for Main Effects: Sex, Age, and Language.

The frequency of the scores of rotation for all subjects is given in Table III.

The summary of the analysis of variance is presented in Table IV. Consideration of this table reveals that for the three main effects of "Sex", "Ages", and "Language" only two significant F values were obtained. The F for "Ages" and the F for "Language" were found to be significant at the .001 level of confidence. Thus, for the variables of age and language the null hypothesis can be rejected. It can be stated that within the conditions inherent in this study, variations in age and variations in language did differentially affect the occurrence of rotation. The F value for "Sex" was not significant and the null hypothesis cannot be rejected.

Because the analysis of variance is an overall test of significance, the results for both "Ages" and "Language" had to be further analyzed by means of 't' tests to determine the significance of the difference between the

Table III.-
Frequency of Scores of Retation.

Retation Score	English (N=120) f	Bicultural (N=120) f	French (N=120) f	Indian (N=120) f
141 - 150		1	4	
131 - 140		3	6	1
121 - 130	1	4	7	3
111 - 120		5	6	2
101 - 110		10	8	8
91 - 100		17	10	4
81 - 90	2	11	11	5
71 - 80	6	10	11	8
61 - 70	9	14	17	6
51 - 60	13	13	14	9
41 - 50	19	8	10	13
31 - 40	25	12	10	25
21 - 30	28	8	2	27
11 - 20	17	4	2	9
6 - 10				

Table IV.-

Summary of Analysis of Variance of the
4 x 3 x 3 Fixed Constants Model.^a

Source of Variation	SS	df	Estimate of Variance	F	F.05	F.01	F.001
S (Sex)	1,672.53	1	1,672.53	2.29	3.84	6.64	10.83
A (Age)	55,490.96	2	27,745.48	37.98	2.99	4.60	<u>6.91</u> ^b
L (Language)	124,098.52	3	41,366.17	56.82	2.60	3.78	<u>5.42</u>
S x A	426.40	2	213.20	.25	2.99	4.60	6.91
S x L	1,579.82	3	526.60	.72	2.60	3.78	5.42
A x L	8,564.59	6	1,427.43	1.95	2.09	2.80	3.74
S x A x L	3,504.75	6	584.12	.80	2.09	2.80	3.74
Within-cubicle	333,124.30	456	730.54				

^a Quinn McNemar, *Psychological Statistics*, Second Edition, New York, Wiley, 1955, p. 328-330, (Case 1).

^b Underlined numbers represent significance at the specified level of confidence.

means for the main effect "Age" and for the main effect "Language".

For 160 degrees of freedom, 't' at the .05 level of confidence is about 1.980, and at the .001 level of confidence about 3.373. Substituting in the formula for $\sqrt{D_{\text{Diff}}}$ given on page 63 of this manuscript, $\sqrt{D_{\text{Diff}}}$ for "Ages" equals 3.02. Thus, a significant difference $\geq 1.980 \times 3.02$ or about 5.98 at the .05 level of confidence; and $\geq 3.373 \times 3.02$ or about 10.12 at the .001 level of confidence was required.

For 120 degrees of freedom, 't' at the .05 level of confidence is 1.980, at the .01 level of confidence 2.617, and at the .001 level of confidence 3.373. Substituting in the formula for $\sqrt{D_{\text{Diff}}}$ previously referred to, $\sqrt{D_{\text{Diff}}}$ for "Language" equals 3.48. Thus, a significant difference $\geq 1.980 \times 3.48$ or 6.89 at the .05 level of confidence; $\geq 2.617 \times 3.48$ or 9.11 at the .01 level of confidence; and $\geq 3.373 \times 3.48$ or 11.74 at the .001 level of confidence was required.

Table V presents the results of the 't' tests for the significance of the difference between the means of rotation scores for "Ages". It will be noted from this table that each age group differs significantly from all other age groups at the .001 level of confidence, with the youngest age group, age 6 - 0 to 6 - 6, producing the most

Table V.-

Evaluation of the Difference of Means on the Rotation Scores
of the Three Age Groups by Means of the t-Test.

Ages	Mean Values Compared	Difference	Significant Difference ^a	
			.05	.001
6-0 to 8-6	74.14			
8-7 to 11-6	60.49	13.65	Yes	Yes
6-0 to 8-6	74.14			
11-7 to 14-6	47.81	26.33	Yes	Yes
8-7 to 11-6	60.49			
11-7 to 14-6	47.81	12.68	Yes	Yes

^a t (p = .05), significant difference \geq about 5.98
t (p = .001), significant difference \geq about 10.12

(mean value of 74.14) rotation and the oldest group, age 11 - 7 to 14 - 6, producing the least (mean value of 47.81) rotation.

The results of the 't' tests used to determine the significance of the difference between the means of rotation scores for the four "Languages" are contained in Table VI. Here it can be seen that the English group differed significantly from both the French and Bicultural group at the .001 level of confidence, and also elicited the least (mean value of 39.78) rotation. However, the English group differed from the Indian group at a slightly less significant level, the .01 level of confidence. The French group differed from the Bicultural only at the .05 level of confidence out from the Indian at the .001 level. Similarly, there was a significant difference between the Bicultural and Indian groups at the .001 level of confidence.

2. Analysis of Data for First and Second Order Interactions.

Referring again to Table IV it can be seen that none of the F tests for the three first order interactions were found to be significant. Likewise, the F test for the second order interaction failed to reach significance. Thus, for each of these four interactions the null hypothesis cannot be rejected.

Table VI.-

Evaluation of the Difference of Means on the Rotation Scores of the Four Language Groups by Means of the t-Test.

Languages	Mean Values Compared	Difference	Significant Difference ^a		
			.05	.01	.001
English - French	39.78 79.78	40.00	Yes	Yes	Yes
English - Bilingual	39.78 72.57	32.79	Yes	Yes	Yes
English - Indian	39.78 51.14	11.36	Yes	Yes	No
French - Bilingual	79.78 72.57	7.21	Yes	No	No
French - Indian	79.78 51.14	28.64	Yes	Yes	Yes
Bilingual - Indian	72.57 51.14	21.43	Yes	Yes	Yes

^a $t(p = .05)$, significant difference ≥ 5.85
 $t(p = .01)$, significant difference ≥ 9.11
 $t(p = .001)$, significant difference ≥ 11.74

The results of the study having been presented, the following chapter of this manuscript will deal with a discussion of the data.

CHAPTER V

DISCUSSION OF THE DATA

In chapter two it was hypothesized that variations in age, sex, and language, or any combination of two or more of these factors, could differentially affect the occurrence of the rotation phenomenon. It was shown, in the presentation of the results of the experiment, that the degree of rotation manifested in the subject's reproduction of the MPD designs, was significantly affected by differences in language and age. However, the two sexes did not differ significantly with respect to the amount of rotation they produced. Nor did any of the three first order interactions - sex and age, sex and language, language and age - produce significant differences in the amount of rotation produced. The required level of significance was not reached by the second order interaction of sex by age by language.

The discussion of these findings will be directed toward the presentation of explanations for, and interpretations of, the results. Results for each of the three main effects will be individually discussed, to be followed by a brief examination relative to the findings for the first and second order interactions.

1. Test-Retest Reliability.

The reliability for this study was established by the test-retest method. As noted previously, twenty subjects were selected from each language group and readministered the HFD within twenty-four to seventy-two hours of the initial test session. The Pearson coefficients of correlation were presented in Table II on page 62. Fuller and Laird¹ report a Pearson coefficient of .89 for their group of 120 normal children.

With the exception of the bicultural, that is, bilingual group, whose correlation coefficient was only .54, the obtained reliability indices seem quite adequate for the research purposes of the present study. Though there is generally a wide range of individual differences in performance of a field dependent task at each age level, individuals have been found to be self-consistent in their perception at different times and under different conditions. Why this particular group was lacking in this element of self-consistency will be dealt with under main effects: language.

¹ Gerald B. Fuller and James T. Laird, "The Minnesota Percepto-Diagnostic Test", Special Monograph Supplement, Vol. 19, No. 1 of the Journal of Clinical Psychology, issue of January 1963, p. 15.

2. Main Effects: Sex.

It was shown in the previous chapter that the *F* test for the main effect of "sex" was not significant. That is, the occurrence of rotation was not significantly different between boys and girls. It can be concluded that research on rotation within the age range specified in this study can be conducted on either boys or girls and yet the results can be generalized to both sexes.

This finding is in keeping with previous research on the EC^{2,3} and KFD where sex differences were not found to be significant. Though theories of field-dependence-independence have suggested that field structure has at all ages a stronger influence on females than on males this has not been demonstrated by the present research.

3. Main Effects: Age.

It was seen that the youngest age group produced the highest mean rotation with a score of 74.14 degrees. The middle group produced a mean rotation score of 60.49,

2 Gerald R. Pascal and Barbara J. Suttell, The Bender-Gestalt Test, Quantification and Validity for Adults, New York, Grune and Stratton, 1951, xiii-274 p.

3 Alexander Tolor and Herbert C. Schulberg, An Evaluation of the Bender-Gestalt Test, Springfield, Illinois, Charles C. Thomas, 1963, xxiii-229 p.

while the oldest group produced a mean rotation score of 47.71. These three means, that is, the three age levels, differed significantly from one another at the .001 level of confidence. Though these findings with respect to age and degrees of rotation are basically consistent with those of previous research, they are not specifically in keeping with those reported by Dr. Fuller in a personal communication.

In a letter of February 17, 1964,⁴ Dr. Fuller reported that the following tentative results had been obtained in the setting up of age norms for the MPD:

6 years old:	Mean = 66
7 years old:	Mean = 56
8 years old:	Mean = 44
9 years old:	Mean = 42
10 years old:	Mean = 33

Though both Dr. Fuller and the present writer found a developmental pattern, the latter obtained noticeably higher rotation scores which do not show as great a leveling off at the age of ten. However, the results do tend to support an earlier suggestion that the evolution of gestalten and their accurate reproduction is due to maturational rather than educational or imitative processes. Also, little doubt is left that the drawing function changes as the child matures, the conceptual aspects progressively taking precedence over the motor expressive aspects.

⁴ Gerald B. Fuller, Director of Clinical Research at the Willmar State Hospital, Willmar, Minnesota, Personal Correspondence, letter dated February 17, 1964.

With increased maturation comes increased perceptual differentiation which tends to result in a progressive decrement in rotation of the reproductions of the MPD designs. This rotation eliciting, figure-ground task exemplifies the type of visual-motor test involving the phenomenon of field-dependence-independence. In this test the subject is required to experience the figure apart from the ground, that is, "to experience an item independently of an organized field of which it is a part", in order to accurately reproduce the designs. Research in the area of field-dependence-independence, previously referred to, shows a significant decrement in the quality of field structure as a determinant in perception with increased age. Thus, the present findings that children produce less rotation with increased age leads to the interpretation that they are also less field dependent with increased age.

The findings with regard to age also support the postulated relationships between field-dependence and cognitive processes put forth by Witkin and his co-workers.⁵⁶

⁵ H.A. Witkin, H.B. Lewis, M. Hertzman, E. Nachover, P. Bretnall Meissner and S. Wapner, Personality Through Perception, An Experimental and Clinical Study, New York, Harper and Brothers, 1954, xxvi-571 p.

⁶ H.A. Witkin, R.B. Lyk, H.F. Paterson, S.E. Goodenough and S.A. Karp, Psychological Differentiation, Studies of Development, New York, John Wiley and Sons, 1962, xii-418 p.

The significant role played by peoples' past experiences in their present perceptions again leads to increased judgment, analytic perception, and differentiation.

4. Main Effects: Culture.

From the previous chapter it was seen that the French language group produced the highest mean rotation with a score of 79.76 degrees, the Bicultural or Bilingual group producing a mean rotation score of 72.57 degrees, the Algonquin Indians a mean rotation score of 51.14, with the English-speaking group producing the lowest mean rotation score, this being 39.78 degrees. The English - French, English - Bicultural, French - Indian, and Bicultural - Indian means differed significantly at the .001 level of confidence. The English - Indian mean differed at the .01 level of confidence while the French - Bicultural mean differed at the .05 level of confidence.

Thus, we see that there are significant differences between cultural groups with respect to the amount of rotation produced. It should therefore follow that there are significant differences between the groups in field dependence, the group obtaining the most rotation being most field dependent, the group obtaining the least rotation being most field independent. Precisely why one cultural or language group is more field dependent than another has yet to be

determined. Reference has already been made to the significant relation of field-dependent-independent development to patterns of mothering, the progressive trend in perceptual style being from a relatively global approach to a more analytical approach.

The literature dealing with patterns of child-rearing leaves little doubt that there are both inter- and intra-cultural differences. However, the precise manner in which these differences are manifest in the child's personality development and integration has received little attention. Therefore, only hypotheses may be offered to explain the cultural differences found to exist between the four language groups in the present study. The existing differences cannot be accounted for in terms of such major variables as sex, age, education, and intelligence since the groups were similar in these respects. The only definable difference between these groups was their language, which has been demonstrated to be both a product and reflection of culture. At this point one may postulate that differential patterns in child-rearing practices between cultures lead to differences in rate of maturation which produce differences in field-dependence-independence, this in turn resulting in differences in rotation.

An explanation for the specific finding that the French language group is the most field-dependent with the

English-speaking group being the most field-independent, the Bilingual and Algonquin Indian groups falling between these two extremes, could be briefly formulated as follows in terms of general patterns of child-rearing. Children raised in a field-dependent society have been subjected to excessive authority and need for conformity, the child-rearing practices in general being coercive and/or infantilizing. Interaction inhibiting differentiation could be in the form of physical care of the child inappropriate to his age; control being in a direction opposed to the child achieving mature goals, responsibility, or self-assertion. While parents of field-independent children encourage aggressive, assertive behavior, those of field-dependent children encourage passive, immature behavior, and are over-protective. Field-dependent children are striving for parental goals and standards while field-independent children are encouraged by the parents to set their own goals and meet their own personal expectations rather than those of their parents. Field-independent children tend to be reared in a warmer, more permissive home environment, under more consistent methods, than that of field-dependent children. The parents in a field-dependent culture can thus be said to provide interaction inhibiting differentiation, those in a field-independent culture providing interaction fostering differentiation.

As the French-speaking and Bilingual group differed in rotation only at the .05 level of confidence it may be hypothesized that these two groups are relatively similar with respect to those basic cultural patterns fostering or inhibiting differentiation. The lack of self-consistency mentioned earlier in reference to the test-retest reliability of the Bilingual group may also have a similar origin in the sense that the child-rearing procedures may be so inconsistent as to neither directly foster or inhibit differentiation, thereby leading to inconsistencies in perception at different times and under different conditions.

In Canada, ethnic, social class, and regional variations in child-rearing patterns, have not been a major area of research. According to Elkin,⁷ the parent-child relationship is the major determinant in the formation of the individual's personality and future relationships. The parents act both in their own right and as a medium between the child and their culture as a whole. He goes on to say that the authority relationships in French-Canadian families are in a flux, making reference to a study by Garigue⁸ which

⁷ Frederick Elkin, The Family in Canada, Ottawa, Canadian Conference on the Family, April 1964, 192 p.

⁸ P. Garigue, La vie familiale des Canadiens-français, Montréal, Presses de l'Université de Montréal, 1962, p. 34, referred to by Frederick Elkin, The Family in Canada, Op. Cit., p. 101.

affirms that in the city the husband has the official position of authority in the family, the wife's role being complementary. However, the wife is the emotional focus of the family, the one who integrates the family group, being in reality the parental authority figure. In the French-Canadian milieu there is a greater emphasis upon family and maternal ties than in the other Canadian subcultures. Also, the influence of the church is more profound. On the other hand, Rocher⁹ suggests that the mother's influence may be diminishing in favor of an increase in authority position by the father. Studies by Vallée¹⁰ and Richard¹¹ demonstrate the close relationship between parental behavior and the child's personality in the French-Canadian culture. Though these studies are nonspecific, they do tend to support the present research in that they point to variations in mother-child, father-child, and parent-child relationships within the family in Canada.

9 Guy Rocher, "Le père", Food for Thought, XIV, March 1954, p. 6-10, referred to by Frederick Elkin, The Family in Canada, Op. Cit., p. 102-103.

10 Lionel Vallée, "Attitudes de parents et comportements d'enfants", Master's thesis, School of Social Work, University of Montreal, 1957, referred to by Frederick Elkin, The Family in Canada, Op. Cit., p. 107.

11 L.M. Richard, s.c., "Influence des groupes antécédents sur le groupe actuel", Contributions à l'étude des Sciences de l'Homme, V, 1962, p. 103-137, referred to by Frederick Elkin, The Family in Canada, Op. Cit., p. 107.

5. First and Second Order Interactions.

The double interactions of sexes by ages, sexes by languages, and ages by languages were not found to be significant on the F test. In each case the null hypothesis could not be rejected. This means that no particular combination of a specific sex with a specific age or with a specific language produced more rotation than any other such combination. Although age and language groups were individually significant, when combined together they were not dependent upon each other. That is, no one combination of language and age rotated significantly more than did another. This is in accordance with research which demonstrates that the drawing function is not dependent upon sex or cultural affiliation.

The second order or triple interaction of sex by age by language was not significant. This means that neither sex at any particular age in any particular language group produced significantly more rotation than another such combination. Thus the null hypothesis could not be rejected.

A discussion of the data having been presented, as well as some interpretation of these findings, the final portion of this study will be devoted to the summary and conclusions.

SUMMARY AND CONCLUSIONS

The purpose of the present research was to investigate the influence of three variables, namely age, sex, and cultural environment as manifest through language differences, upon the occurrence of one specific phenomenon, that of rotation. The tool chosen to measure rotation was the MPT since this test is also a field-dependent-independent task.

Four language groups - English, French, Bilingual, and Algonquin Indian - were employed. The groups, each containing 120 subjects, were equally divided between the sexes and equated for age, IQ, and education. Ages fell between six years, no months and fourteen years, six months; intelligence quotients between eighty and one hundred and ten; and the children were registered in school between grades one and seven. All subjects were right-handed. The four main groups were then subdivided into three age groups of equal numbers, again equally divided between the sexes.

A survey of the literature revealed the relation of field-dependence-independence to sex, age, and overall development but made little reference to inter- or intra-cultural differences. Consequently, a general hypothesis, stated in the null form, was formulated as follows: There are no significant differences among age, sex, and language

groups, or any combination of these three, with respect to degrees of rotation produced. The seven major statistical hypotheses tested by the present study, stated in the null form, were as follows:

1. There is no significant difference between boys and girls for the degrees of rotation produced.
2. There is no significant difference between any two of the three age groups for the degrees of rotation produced.
3. There is no significant difference between any two of the four language groups for the degrees of rotation produced.
4. There is no significant interaction between the two sexes and the three age groups for the degrees of rotation produced.
5. There is no significant interaction between the two sexes and four language groups for the degrees of rotation produced.
6. There is no significant interaction between the three age groups and the four language groups for the degrees of rotation produced.
7. There is no significant interaction among the two sexes, three age groups and four language groups, for the degrees of rotation produced.

Research hypotheses 2 and 3 were rejected on the basis of an analysis of variance of the original data. However, the five remaining hypotheses could not be rejected. The 't' tests were then applied to test hypotheses 2 and 3 since they had obtained a significant F value.

In general the statistical findings tend to support Witkin's contentions regarding field-dependent-independent

relationships. Though no sex differences were demonstrated in this study, maturation, as represented by increasing age, did lead to greater perceptual differentiation, subjects becoming progressively more able to experience the figure independently of the organized field of which it is a part.

The significant differences in rotation noted between the language groups cast doubt upon the authors' contention that the MPD is a "culture free" test. Differential patterns of mothering or child-rearing were postulated to account for these cultural differences, it being held that children from field-dependent cultures produce a significantly greater amount of rotation than those reared in a field-independent environment. That is, maternal control which involves either coercion or at the other extreme indulgence, contributes to interaction inhibiting differentiation. On the other hand, a non-indulging, noncoercive but directing attitude contributes to an interaction fostering differentiation.

It was further suggested that when there is an intermingling of patterns fostering and inhibiting differentiation, inconsistencies may occur in perception at different times and under different conditions.

The two main conclusions which may be drawn from the present research are that the MPD is not a "culture free" test and that rotation is differentially affected by

age and language. Explanations were attempted for each of these conclusions.

If differences in patterns of child-rearing between cultures could be established, hypotheses to be tested could then be put forth. For example, the question could be raised as to whether children are influenced by patterns of mothering at different ages and, if so, why does this influence continue, particularly as age increases. More research is also needed upon rate of physical and mental maturation between cultures, specifically as this relates to demography, socio-economic level, family roles and relationships.

It is further suggested that research should concentrate on the assessment of personality characteristics within and between local cultures, particularly with respect to cue utilization, with the intention of determining common factors if they exist. Such an attempt in all areas of functioning, at all age levels, might lend more insight into the utilization of our present psychometric tools as well as provide hints for future development of cross-cultural diagnostic techniques.

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The author's presentation of a visual-motor test to assess the development and maturational level of the visual-motor gestalt function in children is of secondary importance to her discussion of this general area. Herein are presented the basic gestalt principles underlying the geometric designs, as well as a clinically oriented description of design deviations.

Fuller, Gerald B. and James T. Laird, "The Minnesota Percepto-Diagnostic Test", Special Monograph Supplement, Vol. 15, No. 1 of the Journal of Clinical Psychology, issue of January 1963, p. iii to 34.

This monograph formally presents the Minnesota Percepto-Diagnostic Test (MPD), which stemmed from an earlier work of Fuller and Chagnon. The theoretical rationale is followed by a review of the five studies leading to the development of the MPD. The test standardization, administration and scoring procedures, and protocol interpretations are then presented.

Utilized with adults the test is said to differentiate between normal, organic, and personality disturbance perception. While the normal, emotionally disturbed, and schizophrenic child may also be differentiated; if the referral is based upon a reading or learning problem rather than a behavioral problem, the etiology, on the basis of the MPD, may be classified as primary, organic, or secondary. The test is of too recent origin to permit an evaluation of its diagnostic utility.

Harris, Dale B., Children's Drawings as Measures of Intellectual Maturity, New York, Harcourt, Brace and World, 1963, xiii-367 p.

This book presents a revision and extension of the original Goodenough Draw-a-Man scale through original researches which further add to our knowledge of the psychology of children's drawings. An invaluable and comprehensive survey of the literature on children's drawings in North America and abroad is also included.

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Witkin, H.A., H.B. Lewis, M. Hertzman, K. Machover, P. Bretznall Meissner, and S. Wapner, Personality Through Perception. An Experimental and Clinical Study, New York, Harper and Brothers, 1954, xxvi-371 p.

An experimental study of individual differences from a laboratory and dependency analysis approach, providing a description of the relationship of certain personality variables to performance in selected perceptual tasks. A series of tests of perceptual space orientation were developed to assess subject dependence upon the total perceptual field, the generalization then being made that field dependency should also be measurable by means of personality tests. This book is as a totality more important as an experimental approach to personality than as a study of personality factors involved in perceptual behavior in general.

Witkin, H.A., H.B. Dyk, H.F. Paterson, D.R. Goodenough, and J.A. Karp, Psychological Differentiation. Studies of Development, New York, John Wiley and Sons, 1962, xii-418 p.

A presentation of the recent empirical findings in this area, both by the authors and others, followed by a purportedly new theoretical formulation. This book is concerned with "cognitive styles", their developmental history and relation to intellectual and personality factors. Working primarily with ten-year old boys, the central concern of the authors is the dimension field dependence versus field independence, the latter being defined as "the ability to overcome an imbedding context - to experience an item independently of an organized field of which it is a part". The research design involves the measurement of field independence through the embedded figures and rod-and-frame tests; the relation of these scores to numerous other measures such as intelligence and personality tests, observational data and so on; and the investigation of the role of early life experiences in the development of field dependence or independence.

Here, as in Witkin and his associates earlier book, the correlations and conclusions reached must be viewed with caution since the data has rarely been obtained on isolated perceptual variables or from single projective tests or interviews, many of the correlations involving variables

established empirically rather than by a priori postulation. The main criticism of both of these works is that the interrelationships between field independence and other variables is most simply accounted for by a common factor, general intelligence, which is to be found in all of them.

APPENDIX 1

ABSTRACT OF

The Effect of Age, Sex, and Language
on Rotation of a Visual-Motor Task

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The Effect of Age, Sex, and Language on Rotation of a Visual-Motor Task¹

Existing research on rotation and visual-motor tasks has concentrated on the role played by the stimulus properties of the designs, education, intelligence, and maturation. Less attention has been devoted to cue utilization, language, and ethnic affiliation. The present research has been directed at the investigation of the interaction between the independent variables of sex, age, and language, and the dependent variable of rotation. Rotation, as measured by the MFD, becomes a problem involving field-dependence-independence.

The subjects, equally divided between the sexes, consisted of 420 right-handed students between the ages of six years, no months and fourteen years, six months, registered in grades one to seven, possessing an intelligence quotient between eighty and one hundred and ten. The children were selected from four language groups: Algonquin Indian, French-speaking, English-speaking, and Bilingual.

¹ Donna M. Harrison, doctoral thesis presented to the School of Psychology and Education of the University of Ottawa, Ontario, May 1965, viii-93 p.

The specific research hypotheses were as follows:

1. There is no significant difference between boys and girls for the degrees of rotation produced.
2. There is no significant difference between any two of the three age groups for the degrees of rotation produced.
3. There is no significant difference between any two of the four language groups for the degrees of rotation produced.
4. There is no significant interaction between the two sexes and the three age groups for the degrees of rotation produced.
5. There is no significant interaction between the two sexes and the four language groups for the degrees of rotation produced.
6. There is no significant interaction between the three age groups and the four language groups for the degrees of rotation produced.
7. There is no significant interaction among the two sexes, three age groups and four language groups, for the degrees of rotation produced.

Rotation was defined as the score specifying the number of degrees that a design reproduction has been rotated from the vertical or horizontal axis of the stimulus card.

Rejection of hypotheses 2 and 3 resulted from the statistical analysis. The remaining five hypotheses could not be rejected.

The results tend to support Witkin's theoretical formulations regarding field-dependence-independence. With increased age there is a decrement in degrees of rotation produced but no sex differences are evident at any

level. It was further postulated that the observed differences in rotation scores between ethnic groups reflect variations in field dependence, this in turn reflecting differences in rates of maturation due to patterns of child-rearing. The results were discussed in some detail along with implications for further research.