THE UNIVERSITY OF MANITOBA

A COMPARISON BETWEEN HUMAN FIGURE DRAWINGS OF DEVELOPMENTALLY DELAYED CHILDREN AND NORMAL CHILDREN

by

KYUNG HEE KANG

A thesis
submitted to the Faculty of
Graduate Studies in partial fulfillment
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ABSTRACT

The correlation between Human Figure Drawing (Koppitz, 1968) scores and IQ scores of developmentally delayed and normal children was investigated. The number of and the frequency of items of Emotional Indicators on the HFDs were also examined to determine whether or not developmentally delayed children could be differentiated from normal children.

Two tests, the HFD Test and the Otis Quick-scoring Mental Ability Test, were administered in a group situation to 37 delayed subjects in special classes and 37 normal subjects in regular classes. Each group was formed on the basis of the class regardless of the number of children in each class. The two groups of subjects were matched for their mental age and sex except a few pairs which showed a one-or two-month discrepancy in their mental age. According to the mental ages of 6 and 7, each group of subjects was divided into two subgroups.

There were two hypotheses investigated. The first was that the correlation between the HFD scores and IQ scores would not be significantly different for developmentally delayed children than for normal children. The findings did not support the hypothesis. The HFD scores

were significantly correlated with IQ scores for normal children of both levels of mental age, but nonsignificantly correlated with IQ scores for delayed children. It was not appropriate, then to determine the significance of the difference between the two correlations.

The second hypothesis was that there would be no significant difference between developmentally delayed and normal children in the number of Emotional Indicators and the frequency of specific Emotional Indicators appearing on their HFDs. Hypothesis 2 was supported by results when the HFDs were scored according to the mental age of the subjects as advised by Koppitz. Developmentally delayed subjects could not be differentiated from normal subjects with regard to the number of Emotional Indicators and the frequency of specific Emotional Indicators on the HFDs when their HFDs were scored according to their mental age. Hypothesis 2 could be rejected only when the Emotional Indicators were checked according to the subjects' chronological age. With this method of scoring, developmentally delayed subjects in the present study were characterized by three specific EIs of big figure, omission of feet and omission of neck; or a significantly larger number of developmentally delayed subjects showed

two or more EIs on their HFDs than did normal subjects.

The findings from the present study imply that psychologists and teachers must be cautious in assessing the mental maturity of developmentally delayed children on the basis of the HFD score. The results regarding emotional adjustment lend support to the theory that developmentally delayed children have the same needs and problems in emotional development and adjustment as do normal children of similar mental age.

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CHAPTER I

INTRODUCTION

Graphic activity is regarded as one of the child's most joyful and enthusiastic activities. The spontaneous graphic activity of young children has been divided into two distinct stages: a kinesthetic or scribbling stage and a representational stage (DiLeo, 1970, p. 17). The scribbling stage is followed by a later representational stage in which preschool children attempt to represent the familiar objects in their environment. Of all objects, the human figure seems to be the subject which children tend to draw most frequently (DiLeo, 1970, p. 17; Pikunas & Carberry, 1961).

Psychologists have been using children's human figure drawings for various purposes. For the analysis and interpretation of human figure drawings, they have adopted one of two main techniques: the analysis of human figure drawings as a developmental indicator of mental maturity, and a projective method as an indicator of personality characteristics or the expression of needs and conflicts. Goodenough (1926) and Harris (1963) were concerned with the former approach, while Hammer (1958), Levy (1958), and Machover (1949) were more involved in the latter approach. Koppitz (1968), however, believed that

children's human figure drawings could be used for both purposes. According to Koppitz, the human figure drawing test becomes most valuable when it evaluates the child both from a developmental and a projective point of view.

Researchers who accept the developmental approach to children's drawings have reached the general agreement that concept formation and cognition are the primary determinants of developmental aspects of children's drawings. Harris (1963, p. 160-165) cited some early studies reporting that children's drawings, especially after the acquisition of speech, prominently reflect their comprehension and cognition. Piaget supplemented this cognitive explanation of drawings by his theoretical analysis of object perception and recognition. Drawing behavior appears after the development of object recognition which occurs early in the process of the child's concept formation, being enhanced by language. The development of a child's drawing is coordinate with the development of a system of verbalized concepts, and this coordination may be due to the close link between drawing and cognition (Piaget, 1950, p. 108, p. 123-129). Recently Piaget and Inhelder (1973) have elaborated the relationship between drawing and cognition, suggesting that the child relies on a "memory image" in order to recall the

object or situation which has been observed. As the child tries to reproduce an object without the model, the "memory-image" is not an "extension of perception," but an "imitative symbol" representing the object as a concept. The child's drawing would represent the image which is closer to his thought than to his perception. Both thought and perception are regarded as knowing activities, but different in that thought transforms and assimilates an external thing into the internal scheme while perception just organizes the immediate sense data. The child seems to depend on the image for his drawing "Simply because his thought persists while the perception has gone and can not be replaced by the image" (p. 94-5).

The Goodenough Draw-A-Man Test (1926) and Goodenough-Harris Drawing Test (1963) which accept the human figure drawing as an index of mental maturity, have been devised with the belief that a child's concept of the human figure is an indicator or sample of his general concepts. Harris maintains that the drawing test is most effective among elementary school-age children. In his study for normative data, the test could not reveal substantial progress in mental growth in mid and late adolescence, i.e., 13 to 15 year olds. It was concluded that the period during which the drawings test discriminates best is approximately Piaget's "concrete operational stage" (1950, p. 123), between the age of 7-8 to 11-12 years. Concrete operations

seem to be significant factors in deciding the capacity to synthesize figural and structural aspects of the object on a drawing of that object.

Research studies on human figure drawing have demonstrated significantly positive correlations between scores on the Draw-A-Man Test by Goodenough (1926) or a revised Draw-A-Man Test by Harris (1963) and IQ scores or mental age on such standard intelligence tests as WISC, WAIS, Stanford-Binet, and others. In spite of a wide range of correlation values between the above two types of tests, some studies illustrated in Harris' review (1929-1959) and other recent research clearly indicated that intellectual and conceptual factors greatly dominate the child's drawings, to the extent that they obscure the significance of other factors such as chronological age itself or accuracy of visual perception or motor efficiency (Harris, 1963, p. 96-7; Koppitz, 1968). In normally developed children, mental maturity is closely related to chronological age. However, developmentally delayed children exhibit a great discrepancy between their chronological age and mental age. Their chronological age is obviously higher than their mental age. For this reason, research on the human figure drawing has characterized drawings of developmentally delayed, i.e. mentally retarded children as similar to drawings of younger chil-

dren in the normal intelligence range.

There also seems to be a qualitative difference which can distinguish the human figure drawings made by developmentally delayed children from those made by normal children. Some observable features include a lack of integration, a poor representation of proportion and position, and there is a frequent presence of both precedent and advanced level of features (DiLeo, 1970, p. 224; Goodenough, 1926, p. 76; Harris, 1963, p. 192-6; Spoerl, 1940). Goodenough (1926) explained that these differences were attributable to the retarded children's deficiency in analyzing a figure, grasping abstract ideas, and relating those elements which are beyond the aspects of simple visual imagery and eye-hand coordination.

Research on the drawings of mentally retarded children has shown positive correlation between scores on the Goodenough Draw-A-Man Test or the Goodenough-Harris Drawing Test, and scores on other psychological tests (Carkhuff, 1962; Levy, 1971; Rohrs & Haworth, 1962; Spoerl, 1940; Tobias & Gorblick, 1960). The above two drawing tests were also used with cerebral damaged children and juvenile delinquents. Goodenough and Harris (1950, p. 387-8) reported findings in 1935 and 1940 that cerebral damaged children and juvenile delinquents showed

discrepancies between IQ scores on Stanford-Binet and those on Goodenough. The lower Goodenough IQ scores for children with problems were interpreted to be some indication of brain damage, or emotional or nervous instability.

The mentally retarded subjects included in previously cited studies varied in their chronological age, from preadolescents to adults, and in the degree of retardation. Most of those studies have not included normal children as a comparison group.

The Human Figure Drawing Test (Koppitz, 1968) seems not to have been used with developmentally delayed children, for the purpose of the measurement of correlation with a standard intelligence test. The performance of developmentally delayed children and that of normal children on the HFD Test appears not to have been compared. It would seem useful to investigate whether or not mental age, regardless of the absence or presence of a handicap, is the dominant factor in the correlation between drawing tests and intelligence tests in both developmentally delayed and normal children.

The projective technique in the analysis of human figure drawings has been criticized mainly for its subjective criteria (Harris, 1963, p. 57-67, 1972b; Kitay, 1972). Harris argued that "the drawing test itself should not be used as a diagnostic or even as a screening device

for personality study, for it has not been constructed according to the accepted concepts and assumption of measurement" (p. 411). Machover (1949) proposed that her projective technique is best used along with other techniques for a diagnostic purpose. Koppitz (1968) also admitted the need of combining the HFD Test with other tests, and indicated the HFD is not regarded as a portrait of the child's basic and enduring personality traits nor as an image of the child's actual appearance" (p.4), as well as his mental maturity. Thirty of the items assigned as Emotional Indicators on HFDs have been validated in terms of the close relationship to "anxieties, concerns, and attitudes" (Koppitz, 1968, p. 35), of children age 5 through 12. The occurrence of two or more Emotional Indicators on the child's HFD are said to be highly suggestive of emotional problems and unsatisfactory interpersonal relationships (Koppitz, 1968, p. 42).

Investigations using the Koppitz scale, identified which of the 30 Emotional Indicators occurred significantly more often in each of eight different clinical groups (Koppitz, 1966a, 1966b, 1966c; Fuller, Preuss & Hawkins, 1970). Emotional Indicators were related to each type of "behavior or symptoms" (Koppitz, 1968, p. 43), in eight clinical groups of children: the emotionally disturbed, the shy, the aggressive, the psychosomatic, the neurotic

stealing, the brain injured, children with poor school achievement and children in special class. Later studies have found that socio-cultural differences were reflected on Emotional Indicators on HFDs, whereas differences in the socioeconomic background were not related to specific EIs on HFDs (Koppitz & Morearu, 1968; Koppitz, 1969).

These studies however, have not explored how mental retardation as a specific type of handicap, is reflected on EIs on HFDs. Will there be any difference between retarded and normal children in the proportion of children who exhibit more than two of the 30 items on the HFDs? If a significantly larger number of retarded children show more than two Emotional Indicators, this finding would suggest that emotional problems in developmentally delayed children, i.e., mentally retarded children, may be more prevalent than in normal children. Another question would be concerned with whether the developmentally delayed child can be differentiated from the normal child by any specific Emotional Indicators. Answers to these questions might allow such a simple test as the Human Figure Drawing Test (Koppitz, 1968) to be used to learn more about developmentally delayed children and thus to assist in planning their environment.

Purposes

The study was planned to determine if:

1. The difference in scores on HFDs (Koppitz, 1968) between developmentally delayed children, i.e., mentally retarded children and developmentally normal children is reflective of the difference in their mental age.
2. Developmentally delayed children may be differentiated from normal children on the basis of the number of and the frequency of items of the 30 Emotional Indicators on the HFDs.

Hypotheses

For the purpose of analysis, the following hypotheses were proposed in the null form:

1. The correlation between the HFD scores (Koppitz, 1968) and IQ scores (on the Intelligence Test administered by the school) is the same for normal children as it is for developmentally delayed children.
2. There will be no significant difference between developmentally delayed and normal children in:
    a) the frequency of specific Emotional Indicators appearing on their HFDs,
    b) the number of Emotional Indicators appearing on their HFDs.

CHAPTER II

REVIEW OF RELATED RESEARCH

Since the beginning of this century, increasing attention has been paid to developmental trends in children's drawings. The studies on the developmental sequence of drawings have provided the basis to differentiate the usual from the unusual features in children drawings, supporting a conceptual theory of drawing. A projective analysis has been an alternative approach to drawings, in which a child's graphic activity is regarded as a way of outward expression of his feelings, needs and attitudes, rather than as the reflection of his form concept. Children's human figure drawings have been analyzed either qualitatively or quantitatively according to the relevant psychological problem to be solved.

A Human Being as an Object of Drawing

Of various objects in the child's environment, a human being is most frequently selected for the analysis, whatever its purpose may be. Goodenough (1926) indicates that the human figure is the object with which all children are invariably familiar. Its essential properties are scarcely variable, and it is "simple in its general out-

line", but "Sufficiently complicated in its detail to tax the abilities of an adult" (p. 16).

Moreover, the human figure is the object that is universally interesting and attractive to children (Goodenough, 1926). Because of these properties of the human figure, it has been used as the subject of drawing tests (Goodenough, 1926; Harris, 1963; Koppitz, 1968; Machover, 1949).

A human figure appeared as the most favorite drawing content of children. Children between the ages of five and fifteen tended to draw most frequently human figures, then factory-made objects, animals and houses followed orderly in frequency (Pikunas & Carberry, 1961).

Measuring Techniques

Children's human figure drawings have been interpreted by means of psychologists' subjective evaluation or standardized tests which are based upon different scales and scoring systems. The Draw-A-Man Test (Goodenough, 1926), as a quantitative and objective scale, was devised as a group test for children age four through twelve years. Children are asked to draw a picture of "a man". The scale includes 51 items, each of which meets a following criterion: (a) a clear differentiation between high, average and low school performance of children who are of the same age; (b) the regularity and the

rapidity of increase in the percentage of children who show the point with the increase of age. The average correlation with the Stanford-Binet scale was .76 for each of the age groups four through twelve years.

Harris (1963) revised the Draw-A-Man Test (1926) to extend the test into adolescent years, exploring new items relevant to cognitive ability and also the possibility of projective use. From this work, Harris concluded that the drawings test best reveals intellectual growth for elementary school age children. The scale contains 73 items, each of which meets similar criteria to those in the original test. This test can be used either in a group or individually, but individual administration is preferable for pre-school children or for clinical purposes. Harris indicates that each child is asked to draw three drawings in the following order: a man figure, a woman figure, and the self. From the relatively low correlation found between the man and woman scale (.75), Harris suggests that the evaluation of drawing becomes more reliable when both scales are combined. The correlation with Raven Progressive Matrices (1947) was .22 in 100 kindergarten children and the correlation with the original Draw-A-Man Test ranged from .91 to .98 (Harris, 1963, p. 90).

The projective method most frequently used in relevant research is the Machover Figure Drawing Test (1949). In this test, Machover attempted to interpret human figure drawings by a method of personality analysis. This scale is available for children aged two and over, administered in a group or individually, and it consists of eight categories. The child is instructed to draw "a person", then another person of the other sex. This scale has been criticized for the lack of statistical normative data, reliability, and validity. It is also said to include the danger of over-estimating the degree of pathology, since each item is considered quite sensitive to pathology (Kitay, 1972).

The surveys of drawing tests have revealed that an indicator approach to personality characteristics has scarcely been validated by research findings. An exception is found in Koppitz' studies (Harris, 1963, 1972b; Roback, 1968; Swensen, 1968). The Human Figure drawing test by Koppitz (1968) will be described in more detail in the following chapter of method as the instrument to be used in this study.

Most drawing tests, including those illustrated above use the same materials for drawing, a paper sized 8½" x 11" and a number 2 pencil or medium-soft pencil with an eraser,

and give no time-limit. Some difference is found in the human being the child is instructed to draw: Machover (1949) and Koppitz (1968) are in agreement that children produce more self-revealing drawings when they are asked to draw "a person", than to draw "the self" as Harris instructes (1963). Young children tend to be too concerned with insignificant details of their clothes and appearance, and self-awareness of young adolescents prevents them from drawing themselves. Koppitz in her test instructs the child to draw "a whole person" and she says:

> One nonspecific instruction to draw "a whole person" seems to lead the child to look into himself and into his own feelings when trying to capture the essence of "a person". The person a child knows best is himself; his picture of a person becomes therefore a portrait of his inner self, of his attitudes (p. 5).

It seems difficult to determine, without further research, the effect different instructions might have on children's drawings.

The number of drawings made on request is also different among tests. Goodenough and Koppitz require only one drawing while Machover asks for two figure of opposite sex, and Harris adds one more drawing of "the self". Harris (1963) investigated the consistency of children's performance in drawing by administering the Goodenough test to four classes of kindergarten children on each of

ten school days. The variance of ten successive drawings was insignificant. This finding supported Koppitz' belief that one drawing from each child provides sufficient information "the screening of school beginners and for quick evaluation of children for research purposes" (1968, p. 5).

Cognitive Development and Human Figure Drawing

Children's human figure drawings have been considered an index of the concept of a man, which reveals progressive uniformity across successive ages. According to this conceptual theory, the drawing activity taps the ability to form concepts which become increasingly abstract. The process of concept formation consists of three functions in common with intellectual maturity. Harris (1963) describes three functions which intellectual activity requires: "(1) the ability to perceive, i.e., to discriminate likeness and differences; (2) the ability to abstract, i.e., to classify objects according to such likenesses and differences; and (3) the ability to generalize, i.e., to assign an object newly experienced to a correct class, according to discriminated features, properties, or attributes. These three functions, taken together, comprise the process of concept formation" (p.5).

In discussing the psychology of drawing, Goodenough

(1926) and Harris (1963) illustrated some early studies manifesting that immediate visual imagery and eye-hand coordination may not be sufficient in explaining children's drawings. The study by Kerschensteiner in 1905 showed that children who used to draw the full face of a man from their memory did not change this position even if the model to be copied was placed in front of them in the profile position. Transparencies in drawings which can be often observed in young elementary school children also support that children draw what they know, not what they see. Beyond the visual acuity, more complicated and higher cognitive process, "higher thought process" (Goodenough, 1926, p. 73), must intervene in drawing activity, because drawing activity requires the ability to recognize abstract characteristics of the human figure such as proportion and spatial relations between features of the body.

In investigation of developmental sequence in drawings, researchers seemed to agree, that the predominating element of the drawing is different across successive stages of drawing. Young children at scribbling stage draw circles as a part of innate motor development (Schiller, 1957). Townsend's study (1951) indicated that the copying ability of children aged six to nine years correlated more with mental age than with chronological

age or with motor skill. Campbell and Gruen (1958) found that both children and adults tended to modify the model in a systematic way when they reproduced it from memory. They simplified or amplified unfamiliar or ambiguous objects into objects familiar to them. This finding reaffirms concept formation and cognitive development as the central factor in drawings.

Another confirmation can be found in the study of the effect of operative understanding on reproductive memory performance. Furth, Ross and Youniss (1974) asked children from kindergarten to the fourth grade to draw four copies of glass, stick, dice and house with chimney, then to draw them from memory without these copies. The grade levels of children were significantly related to a consistent increase of unmodified drawings, with exception of the house. The older children, compared with younger children, showed less fluctuation on drawings from memory over the time. Furth et al, with reference to Piaget's proposal, explained this finding that drawing manifests two components of the general knowledge developed in the process of the child's experiences. They said that drawing from a copy is relevant to the imitation aspect of the figure content while the operative factor of the child's knowledge is predominating in drawing from memory.

When we accept that drawing activity requires certain

cognitive processes, involving "discrimination, association and generalization of details and of relations" (Goodenough, 1926, p. 72), or an "operative component" of the general knowledge through which a given figure is transformed into something understandable to the child (Piaget & Inhelder, 1973, p. 94-5), it becomes clear that the child's intelligence or general mental ability should be closely related to his drawing performance. Obviously, the brighter child would analyze the figure more precisely and observe quantitative and qualitative relationships which determine the proportion and position of various parts of the object (Goodenough, 1926).

The correlation between the scores on drawing tests and IQ score on intelligence tests has been the most enthusiastic point of research on children's human figure drawings. Using the Draw-A-Man Test (Goodenough, 1926), or the Goodenough-Harris Drawing Test (1963), studies have shown the validity of human figure drawings of children as an indicator of their mental maturity. Despite a great discrepancy between chronological and mental age of developmentally delayed subjects, the Goodenough scale or the Goodenough-Harris scale was shown to be valuable in estimating intellectual level. The chronological age of subnormal subjects included in various research ranged from less than 10 to 64 years (Carkhuff, 1962; Levy, 1971;

Warren & Coller, 1960). Their mental level was also variable within the limit, ranging from educable mentally retarded in special classes to the trainable in institutions.

The Human Figure Drawing Test which is characterized by "brevity and ease of scoring" (Harris, 1972a, p. 411), has manifested highly significant correlations (.45 to .80) with Stanford-Binet, and WISC in 5-12 year-old children with emotional or learning problems (Koppitz, 1968).

Goodenough and Harris (1950) reported Bender's finding (1940) that most post-encephalitic patients got apparently lower mental age scores on the Goodenough Draw-A-Man Test (1926) than on the Stanford-Binet scale (1937). Nielsen (1961) pointed out a higher discrepancy between Goodenough and Stanford-Binet IQ for the spastic children (cerebral palsied children) than for the normal children. The cerebral palsied children had Goodenough IQ score about 10 points lower than Binet IQ scores. HFD scores and IQ scores on Stanford-Binet or WISC for brain-injured children however, showed significant correlations (.35 to .57) and they were not appreciably lower than those of non-brain injured children (Koppitz, 1968).

In summary, it seems clear that general mental ability or cognitive level is the dominant factor in human figure

drawing performance of preschool and elementary school children. The Goodenough or Goodenough-Harris scale has been found to be valuable in evaluating the intellectual level of developmentally delayed (mentally retarded) people. But as yet the Koppitz HFD scale appears not to have been tested in this way. Compared with Stanford-Binet IQ scores, the former two scales tended to yield markedly lower IQ scores for children with neurological impairment, while the Koppitz HFD scale did not. There would seem to be need for research in the area involving human figure drawings for developmentally delayed children using Koppitz scale.

Personality Characteristics and Drawing Performance

An alternative, or addition to the developmental view in interpreting children's figure drawing is the projective technique. It assumes that drawing, like all creative activity, is an outward expression of the conflict and needs of the drawer. Machover (1949, p. 5) hypothesized that certain body organs become associated with a variety of sensations, perceptions and emotions through the developmental process. The perception of the body image which has developed through personal experience directs the human figure drawing in features and structure. Machover attempted to interpret body organs by "symbol

values" which are in accord with common psychoanalytic and social meanings (p. 9). The basic assumption includes:

> The human figure drawn by an individual who is directed to "draw a person" relates intimately to the impulses, anxieties, conflicts and compensations characteristic of that individual. In some sense, the figure drawn is the person and the paper corresponds to the environment. This may be a crude formulation, but serves well as a working hypothesis. The process of drawing the human figure is for the subject, whether he realizes it or not, a problem not only in graphic skill, but one of projecting himself in all of the body meanings and attitudes that have come to be represented in his body image (p. 35).

The body image hypothesis was not accepted as valid by Koppitz (1968). With reference to Sullivan's theory of interpersonal relationship, human figure drawings are not considered to reflect the child's self-image or persistent personality characteristics. Sullivan (1972) assumes that a man is bound to change in his basic personality pattern through the process of maturity and that adjustment is the total resolution of a particular situational complex, not of an enduring condition. Koppitz agreed with this view and said that figure drawing is sensitive to the child's internal change which "may be both developmental and/or emotional" (p. 4). Harris (1963) has argued the validity of children's drawings as measures of emotional or personality factors. According to him, it is the cognitive and conceptual factor, rather than

the temperament or the personality factor, that accounts for the variance in drawings: "Drawing tells us about the conceptual, intellectual component of personality" (p. 225).

Parallelling the conflict about the concept theory, research on drawings as the projection of one's personality characteristics has revealed contradictory results, supporting, partially supporting or even rejecting the body-image hypothesis. In reviews of literature on drawings, Roback (1968) and Swensen (1968) explained conflicting findings. Roback pointed out that studies between 1949 and 1967 mostly failed to support Machover's "body-image" hypothesis, attributing this negative result partially to the lack of well-designed experiments. Roback emphasized the need for standardized and validated scales which would provide a reliable evaluation of personality characteristics from figure drawings (p. 17). In his summary of the studies between 1957 to 1966, Swensen (1968) concluded that "Global ratings are the most reliable and most valid, while individual signs are the least reliable and least valid" (p. 20). Global ratings score all of drawing behavior included in a given Draw-A-Man test, such as "sexual differentiation," "overall quality", "summed anxiety indicators", "adjustment", and "a large number of specific signs" (p. 24). The struc-

tural and formal measures investigated by studies which were cited by Swensen, contained "size and placement", "stance", "perspective", "type of line", "erasures", and "shadings" (p. 26).

Some recent studies also tended to produce inconclusive results. Prytula and Thompson (1973) investigated the relationship between self-esteem and the size of human figure drawing, using the Coopersmith's self-esteem inventory (Form B) and the Machover Draw-A-Person Test which was modified for this study. The result failed to lend support to the body-image hypothesis. Children high in self-esteem did not draw significantly larger figures as compared with children low in self-esteem.

A study with obese children provided evidence for the theory of body image reflected on drawings (Nathan, 1973). The obese children drew more global and less differentiated figures than non-obese children. A close relationship between body-image and hyperactive disorder was found. A poorer level of performance on human figure drawing was demonstrated in clinically diagnosed hyperactive boys (Crowe, 1972).

The shading on drawing seems to be related to the anxiety of the drawer. Johnson (1971), using Machover Draw-A-Person test, examined the validity of assuming that shading, erasures, and line reinforcement were anxiety

indicators. Anxiety scores of 103 undergraduates were measured by the Institute for Personality & Ability Testing Anxiety Scale. Anxiety scores did not show a significant relationship with the ratings of erasures and line reinforcement, but did reveal a significant relationship with the type of shading.

The relationship between anxiety level and the scores on the Machover Draw-A-Person Test in high-anxiety and low-anxiety 5th and 6th graders was examined by Prytula and Hiland (1975). Each subject drew three figures: man, woman and self. The subjects' figure-drawing scores were not significantly related to their anxiety level as obtained from the General Anxiety Scale.

When evaluating the drawings of handicapped children, the body image hypothesis proposes that the specific disability or bodily impairment of the child would be reflected on his human figure drawing. However, this hypothesis was not supported by Centers and Centers (1963). They concluded from their study that physically handicapped children either denied their problems or expressed a desired image rather than actual appearance.

Using the Machover scale, 40 cerebral palsied children of ages 6 to 14 years, with IQ scores higher than 75, were compared with normal children matched for age, sex and social status. Contrary to expectation, the

physical handicap was not significantly projected on the drawings. Only one out of 18 variables, extremities lacking, occurred more frequently on hemiplegic children than on paraplegic children. This could, of course, have occurred by chance. But a clinical psychologist was able to differentiate the drawings of spastic children from those of normal children. The drawings of the spastic children showed qualitatively remarkable retardation. It was concluded that the spastic children have a primary brain injury which may result in visual-motor disturbances (Nielsen, 1961).

The body-image theory was tested with learning-disabled children and adolescents in comparison with normal children and adolescents. Drawings were scored for the presence or absence of a body and of 15 head-related items, depending on Harris scoring criteria. No difference was found between two groups of children at preadolescent age levels. Learning disabled adolescents showed superiority on head-related items and similarity on the body-related items. This result suggests that children with learning disability do not necessarily have body-image problems. However, a higher performance on head-related items is in accord with Machover's finding that children with retardation in reading and school achievement tend to emphasize the head in drawings

(Gounard & Pray, 1975).

Koppitz (1968) argued that the drawings need not be similar to the child's actual appearance because it is just related to "his attitude toward himself and his body" (p. 104). In various ways, children react to their disabilities and express their reactions in their human figure drawings. If the child with a specific disability does not draw any negative signs, he may have developed positive feelings about himself. Of course, it is possible that he deliberately represses such ideas. She emphasized that "anxieties, conflicts or attitudes can be expressed on HFDs in different ways by different children or by one child at different times" (p. 55).

Some research performed to determine the validity of drawing tests as emotional signs in handicapped children has provided positive support for the claim. The Bender-Gestalt and Draw-A-Person tests were administered to develop an objective scoring procedure for the personality assessment of 57 deaf young adults. Five composite factors were identified as reliable variance and proved irrelevant to nonpersonality factors such as communication skills, IQ, achievement and manual dexterity. The five factors included general adjustment, latent aggression, extraversion, impulsiveness and anxiety-drive (Bolton, 1972).

Koppitz (1968) explored the relationship between any

of the Emotional Indicators on Human Figure Drawing and specific behavior problems in children. It was believed that a child's attitude toward himself would be reflected on his human figure drawing as would his internal attitudes and anxieties be expressed through his explicit behavior. Eight groups of children with different types of symptoms were included: emotionally disturbed, shy, aggressive, psychosomatic stealing, brain injured, poor school achievement, and special class children with emotional problems and/or brain injury. Emotionally disturbed children were differentiated from well-adjusted children by 12 out of 30 Emotional Indicators on HFD. About three-fourths of the former group of children and one-fourth of the latter group of children showed two or more items on their HFDs (Koppitz, 1966a). This validity study by Koppitz was replicated by Fuller et al. (1970). In this later study, the normal and emotionally disturbed children revealed a significant difference on 9 items out of the 12 items Koppitz found. Another finding, that 58% of disturbed children and 82% of normal children drew less than two indicators, partially supported Koppitz' report.

Koppitz' nine indicators appeared more frequently with either shy children or aggressive children (1966a). Shy children more often drew "tiny figure", "cut off hands" and "omission of nose and the mouth". Aggressive children

exhibited gross "asymmetry of limbs", "teeth", "long arms", "big hands" and "genitals". Koppitz explained that the tiny figure seemed to reflect insecurity and timidity of the shy child. This finding was in line with Machover (1949) and Levy (1958) who regarded the "tiny figure" as a reflection of inadequacy and repression. Most of the rest of the eight indicators were also consistent with the Machover's hypothesis. Lingred (1971) however, failed to support this finding. Contrary to Koppitz' research, there were no significant differences which characterized the drawings of shy and aggressive children.

The psychosomatic children were different from children with stealing experiences on five emotional indicators on HFDs: "short arms", "big hands", "clouds", "no nose", and "no neck". Stealing children exhibited a higher incidence of omission of body and of neck on HFDs, which are related to body anxiety and poor impulse control (Koppitz, 1968).

Human figure drawings of public school children in kindergarten to fourth grade with high and lower achievement were compared by Koppitz (1966c). From kindergarten level to the first two grades, high achievement children were differentiated from low achievement children on the basis of the Emotional Indicators. However, HFDs failed to suggest the positive relationship between school achievement and emotional adjustment in children above the grade

two. It was explained that many other factors beside the child's attitudes influence the school achievement.

Children in special public school classes with emotional problems and/or brain injury also were investigated in terms of emotional indicators. Compared with good students in regular classes, the HFDs of special class children showed significantly more often seven emotional indicators: "poor integration of parts", "slanting figure", "omission of mouth, of body, of arms", "monster or grotesque figures", and "three or more figures". A great discrepancy in the proportion which demonstrated two or more items on HFDs was found between the two groups of children. Seventy percent of the children in special classes and 19% of the good students in regular classes drew two or more emotional indicators on HFDs.

The difference of sociocultural environment which appears to influence the child's behavior within it seems also to be reflected on his HFD. The effect of the sociocultural differences on human figure drawings was examined in Mexican and American children (Koppitz & Moreau, 1968). The findings supported the hypothesis that American children tend to be more aggressive than Mexican children. Three items: "slanting figure", "tiny figure" and "transparencies", occurred more often in Mexican children, indicating that they were more timid and less agressive but less anxious than American children.

Interestingly enough, socio-economic status did not seem to be closely related to any specific Emotional Indicators on HFDs. No significant difference in the number and frequency of any of 30 Emotional Indicators on HFDs was found between lower class and middle-class children (Koppitz, 1969).

To summarize, research attempts to interpret some signs on human figure drawings as the projection of one's personality have been both supported and rejected providing inconclusive results. This finding may be due to the subjective criteria of projective scales used in these studies. As Koppitz indicated, it may be meaningless to investigate a one-to-one relationship between a single sign on a human figure drawing and a personality trait or behavior pattern. When the whole drawing and the combination of various indicators and signs compose the basis of analysis, together with other variables of the individual child such as age, maturity level, emotional development and socio-cultural environment, a human figure drawing could be used as a valuable evaluation tool of a child's emotional behavior, supplementing other test data. In this sense, Koppitz' position may be regarded as congruent with or at least not contradictory to the conclusion asserted by Roback and Swensen (1968).

Emotional Adjustment of Developmentally Delayed Children

Emotional adjustment comprises very complicated reactions which are influenced by various personal and social factors. Thorne (1965, p. 122) indicated that intelligence was an important factor to decide emotional needs and responses. As the person progresses in cognitive development, he learns to control his emotions and to express them in a socially accepted way. However, Thorne emphasized that the cognitive element could not be the only factor in emotional behavior. Every individual can be different in his emotional responses and needs regardless of his mental maturity. Thorne described that "the causes of emotional problems in the retarded are basically the same as those in the nonretarded" (1965, p. 111). However, the outward emotional expression of developmentally delayed children may be different from normal children in spite of "similar internal reactions" (p. 111) because "intellectually he is unable to understand" (p. 112) the fear-provoking or other emotion-provoking situation. For this reason, developmentally delayed children may cry or chuckle in a situation where the normal child may not, partly because he is less aware of and sensitive to others' reaction to his emotional behavior or what result would be produced by it.

In discussing the personality and adjustment of

developmentally delayed children, Sternlicht (1976) cited Cobb's 1961 proposal regarding the self-concept in these children. According to Cobb, the developmentally delayed may be deficient in attaining his self-concept because of limited capacity for perceptual and conceptual discriminations, and for identifying himself and other objects.

A later experiment rejected Cobb's explanation that a developmentally delayed child tends to have a more ambiguous self-concept than a normal child. Miller and Gottleib (1972) assessed the projected feeling and found that the developmentally delayed child most frequently attributed the feeling of anger to the other and the happy feeling to the picture of self. This study suggested that the delayed children could be aware of and sensitive to the "social consequences of their behavior with respect to how others might feel", thus "when I do well, others are pleased. But when I don't do well, others get angry at me" (p. 155).

Sternlicht (1976) concluded that developmentally delayed children's personality is not different from intellectually normal children, though it may be developmentally slower. This conclusion is in line with Thorne's position which views emotional reactions and the adjustment problems of developmentally delayed children as almost the same as those observed in normal children except that the

former are intellectually less equipped to cope with them. Their reduced ability to differentiate, integrate and to generalize external stimuli to their own "cohesive learning experience" (Sternlicht, 1976, p. 196) may lead to poorer emotional adjustment. However, the difference in emotional adjustment is considered to be mainly the effect of environment, rather than intellectual deficiency. With different experiences in school and frequent isolation from normal peers and environment, developmentally delayed children are apt to feel insecure, unworthy and unhappy. The interaction between the lower intellectual ability of the child which brings certain experiences exclusive to him on the one hand, and environmental factors that have little or nothing to do with intellectual ability on the other hand seem to influence developmentally delayed children to develop certain behavior patterns which may be different from those with greater intellectual potentiality and adequate environment.

Summary

To recapitulate, research on human figure drawings has consistently supported that children's drawing performance is primarily determined by their current cognitive level. According to the drawing test used, the correlation between IQ scores on two types of tests for neurologically

impaired children has been shown as equivalent to or remarkably different from those for normal children.

The attempt to analyze some items on human figure drawings as the indicator of certain personality traits has yielded contradictory findings. The single-item-analysis has not generally been supported by research. Global ratings have been found more reliable for appraising personality traits and behavior patterns. A brief survey of research of emotional adjustment of developmentally delayed children does not yet provide enough evidence to expect a remarkable difference on Emotional Indicators on HFDs between these children and normal children.

There is now a need to explore further the use of the HFD test (Koppitz, 1968) as a quick and simple test of the intellectual and emotional development of developmentally delayed children. If findings are in support of this procedure, HFD scores might be used effectively in helping plan the learning environment for these children in the schools.

CHAPTER III

METHOD

Description of Subjects

Seventy-four children comprised the subjects for the present study. Thirty-seven developmentally delayed children (25 males, 12 females) and 37 developmentally normal children (25 males, 12 females) were selected from 8 developmental classes and 3 regular classes in four schools located in Winnipeg, Manitoba. The definition of developmentally delayed children followed the definition for educable mentally retarded children which was currently adopted by schools in Winnipeg. The educable mentally retarded children were those who had been assigned to developmental classes because of their delayed mental development. For the selection of developmentally delayed subjects, the following criteria were used: (a) mental age ranged from 6-0 to 7-11 years as determined by Otis Quick Scoring Mental Ability Test Form As, 1952; (b) chronological age was under 12-11 years; (c) IQ on the Otis Quick Scoring Mental Ability Test was between 60 and 80.

The developmentally normal subjects were selected using the following criteria: (a) mental age was between

6-0 to 7-11 years (b) chronological age was under 8-0 years; (c) IQ was above 90 as measured by the Otis Quick-Scoring Mental Ability Test Form As, 1952. Children with serious gross-motor deficiency or with known brain injury, as judged through the doctor's diagnosis or the teacher's observation and comments, were not used in the study.

After the developmentally delayed subjects were selected, the normal subjects were selected and matched individually according to the criteria of the mental age, chronological age, IQ and sex. Most delayed subjects were matched individually with normal subjects for their mental ages which were exactly equivalent or discrepant by one month. Three pairs showed two-month discrepancy in their mental age. All subjects, except three pairs, were also matched for their sex. In total, both groups showed the same sex ratio.

Table 1 shows the mean and standard deviation of the subjects' CA, MA, IQ and HFD score.

The group of delayed and normal subjects respectively had a mean chronological age of 125.7 months (SD = 17.1) and 82.2 months (SD = 7.4), a mean Otis Quick-Scoring Mental Ability Test IQ 73.3 (SD = 4.5) and 102.6 (SD = 8.2) and a mean mental age of 83.7 (SD = 7.6) and 84.3 months (SD = 7.3). The two groups of subjects showed a prominent

TABLE 1

The Mean and Standard Deviation of CA, MA and IQ for Developmentally Delayed and Normal Subjects

Developmental Group	Chronological Age (in months)		Mental Age (in months)		IQ Score[a]	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Delayed (M25, F12)	125.73	17.08	83.75	7.66	73.27*	4.53
MA 6	113.94	11.31	77.21	3.29	71.31	4.65
MA 7	139.11	11.57	90.66	3.81	75.33	3.43
Normal (M25, F12)	82.29	3.75	84.32	7.35	102.62*	8.24
MA 6	80.31	3.41	77.78	3.52	96.63	3.63
MA 7	84.38	2.91	90.83	3.33	108.94	6.89

[a]Otis Quick-Scoring Mental Ability Test, Form As

*The mean difference between two groups: $t = 18.97$, $P < .0005$

discrepancy in their mean chronological age and IQ scores, whereas their mean mental ages were almost the same.

The resulting sample of 37 developmentally delayed and 37 normal children were split into two groups according to their mental age of either 6 or 7 years.

Instruments

Otis Quick-Scoring Mental Ability Test, Form As

The Otis Quick-Scoring Mental Ability Test Form As (Alpha Short Form, Otis, 1952) was administered and the scores from this test were employed to determine the mental age and IQ scores of subject in the present study. The Otis Test Form As consists of both verbal and nonverbal material. It includes 45 pictorial and geometric items which were regarded as the most valid ones out of the 90 items in the original Alpha Test of the Quick-Scoring series. The same set of 45 rows of pictures are used for two sets of directions. For the nonverbal part of the test, children mark one picture in each row of four pictures which is different from the others on the row. The verbal part of the test includes 45 oral directions to which one picture in each row should be marked in 5 seconds. This test gives the IQ scores and the mental age.

Reliability. Otis reports the split-half realiability

coefficients which were computed for two samples of third-grade children as .87 and .88. The number of children for those two samples were 740. The standard error of measurement was also calculated for the same two independent samples and it was 4 score points. We can expect that the discrepancy between scores obtained by two thirds of a group and their true unknown scores would not be more than 4 points.

Validity. The Otis Test Form As is considered useful to predict the ability for school achievement. The correlations between Alpha Short Form and the Metropolitan Achievement Test for two independent samples were .63 and .62 respectively (Otis, 1951). The correlations between the Otis Form As and the subtests of the Stanford Achievement Test for Grade 1 to 4 children ranged from .31 to .63 (Barnes, 1955).

The validity of this test was also investigated for the 868 developmentally delayed pupils (Slutzky, Justman, & Wrightstone, 1952). The mean IQ of this group on the Otis Test ($\bar{X}$ = 68.00, SD = 5.72) was lower than that on the Stanford-Binet Test ($\bar{X}$ = 77.47, SD = 8.18). But a large proportion of those children whose IQ scores were 75 or below on the Stanford-Binet, Form L, could be identified by means of the Otis Test. Seventy-four per cent of the children who obtained IQs of 62 or below on

the Otis Test were found to meet the criteria of admission to the special class for developmentally delayed children. The implication was that the Otis Quick-Scoring Alpha Mental Test could be used as a valuable time-saving device for the placement of delayed children into special classes. The 1952 study presented the correlation coefficient between the Otis and Stanford-Binet Test as .42, but the significant level was not revealed.

The Human Figure Drawing Test

In order to measure the drawing performance of the subjects in the present study, the Human Figure Drawing Test (Koppitz, 1968) was used. This test consists of two scales of items: Developmental Items and Emotional Indicators. The developmental scale includes 30 items which were selected mainly from the Goodenough-Harris (1963) scales and from Koppitz' own clinical experience.

The Developmental Items have been determined across successive age samples of children from 5 through 12 yrs. Based upon the percentage of inclusion of items, 30 items are separated into four categories: expected items (more than 86%), common items (51-85%), not unusual items (16-50%), and exceptional items (less than 16%).

The thirty Emotional Indicators in the HFD test

were derived from the projective works of Hammer (1958), Levy (1958), Machover (1949) and Koppitz's own clinical experience. The criteria of selection of items included the following three: (a) unrelatedness to age and maturation; (b) rare occurrence (15% or less) of all HFDs at any age level; (c) clinical significance for identification of "children with emotional problems and behavior symptom" (p. 39). They consist of three types: quality signs, special features unusually found on human figure drawings, and omissions of body parts.

Reliability. The inter-rater reliability reported between two psychologists who independently scored 25 protocols on Developmental Items and on Emotional Indicators reached a 95% agreement that appeared on 444 out of 467 items (Koppitz, 1968). The test-retest reliability has not been demonstrated, because Koppitz believes that a second drawing of most younger elementary school children can scarcely give supplementary information. Harris (1972a) reported that quite a high reliability is assumed.

Validity. According to Koppitz (1965), the frequency of occurrence of 30 Developmental Items was not significantly influenced by the drawing medium used (pencil or crayon), children's drawing ability, or one-year training in kindergarten. High correlations have been found bet-

ween the Human Figure Drawing test scores and WISC and Stanford-Binet IQ scores, and Goodenough IQ scores (Koppitz, 1968; Moreau & Koppitz, 1968).

Koppitz (1968) also found differences between emotionally disturbed and well-adjusted students in the total number of and the frequency of Emotional Indicators on the HFDs. A significantly larger proportion of emotionally disturbed children showed more than two Emotional Indicators and some items differentiated them from the children without emotional problems.

Scoring System. The scoring system is simple but different from the previous drawing tests in that the only two categories of Expected and Exceptional Items are scored to measure the child's mental maturity. Since these two types of items are considered to be relevant to a child's level of mental maturity, the number of Expected and Exceptional Items are different according to successive ages. Absence of Expected Items at a given age level received the value of -1 because it is regarded as diagnostically significant, i.e., mental immaturity or retardation. The presence of an Exceptional Item at a given age is considered an indicator of above average mental maturity, and gets the value +1. A value of 5 is added to the total score received by a child in order to avoid negative scores.

In order to establish inter-rater reliability in the present study, three scorers independently scored 39 drawings collected in one of the four elementary schools involved in the present study. One of the three scorers was a faculty member in the Department of Educational Psychology at the University of Manitoba who was experienced in scoring drawing tests, another was a psychologist at Kinsmen Centre in Winnipeg, and the third was the investigator. These HFDs were made by 19 children in two developmental classes and 20 children in a regular grade one class. The three scorers checked a total of 1646 different items including the Expected and Exceptional Items for mental maturity and the Emotional Indicators which were appropriate for those children's chronological age. The number of Expected and Exceptional Items were 602 and the Emotional Items included 1044 items. Seventy-seven out of 1646 were not agreed upon by the three scorers. In other words, 1569 items were similarly scored by all three scorers. Using the following formula, an inter-rater reliability of 95.32% was obtained:

$$\frac{\text{Total number of agreements}}{\text{Total number of agreements + disagreements}} \times 100$$

Only after the above high inter-rater reliability was obtained, were the drawings collected from the subjects in the other three schools scored by the investigator of the

present study.

Procedure

The two tests, the HFD Test and the Otis Quick-Scoring Mental Ability Test, were administered to 130 pupils in four elementary schools. The HFD Test was administered first, then the Otis Form As was given to all pupils in eight developmental classes and three regular grade one classes. The schedule of test administration was subject to the plan and situation of the schools involved. In six classes (four developmental and two regular classes), the Otis Test was followed immediately by the HFD Test with a short interval of less than ten minutes between two tests. Children in two developmental classes took the HFD Test and the Otis Test with a day interval. In the other three classes, two developmental and one regular class, the Otis Test was given a week after the HFD Test was administered. A short break of five minutes was also allowed to children between the nonverbal and verbal parts of the Otis Test. Both the teacher and the writer were present in the classtoom while the tests were administered. In most classes, the teacher administered and the writer proctorized both tests.

The Otis Form As is a group intelligence test, and was administered to children in their classes. Subjects were selected from all those who took the test.

Individual administration of the HFD Test is preferred because it provides the examiner with an opportunity to observe the child's drawing and to clarify the drawing when necessary. Koppitz, however, regards group administration as "quite acceptable and more feasible" (1968, p. 6) for research purposes or for screening of school beginners. Moreover, the group test can protect the identity of each subject more safely. For these reasons, the HFD Test in the present study was administered as a group test. Following Koppitz' instructions, every subject was seated at an uncluttered table and presented with a blank sheet of paper size 8½" x 11" and a number 2 pencil with an eraser. The following instruction as described in the HFD Test was given to the group of children in a class by the class teacher or the writer.

> On this piece of paper, I would like you to draw a WHOLE person. It can be any kind of a person you want to draw, just make sure that it is a whole person and not a stick figure or a cartoon figure (Koppitz, 1968, p. 6).

Each child was permitted as much time as he wanted, to modify his drawing with an eraser, or to try another drawing on the back of the paper or on a new paper if desired. If any child was found by the examiner to have finished his drawing, he was given another blank paper and asked to draw anything on it. The examiner then said, "Draw anything you want to do on this paper". Testing time for the HFD

Test ran about 15 to 20 minutes. The Otis Test took about 30 minutes to administer. The investigator had, then, for each child an IQ score, a mental age, and scores of Developmental Items (Expected and Exceptional Items) and Emotional Indicators from the Human Figure Drawing Test.

CHAPTER IV

RESULTS AND DISCUSSION

Correlations Between HFD Scores and IQ Scores

Hypothesis 1 was set forth in the null form, assuming that the correlation between the HFD scores (Koppitz, 1968) and IQ scores would not be significantly different for developmentally delayed children than for normal children. The correlation between the intelligence level and a human figure drawing performance was determined by utilizing the Peason's product moment correlation for the statistical treatment.

TABLE 2

Correlations Between HFD Scores and IQ Scores

Developmental Group	MA Level (in years)	N	Correlations	*t*
Delayed	6-0 to 6-11	19	.285	1.227
	7-0 to 7-11	18	-.020	-.080
	6-0 to 7-11	37	.151	.902
Normal	6-0 to 6-11	19	.389	1.742*
	7-0 to 7-11	18	.418	1.842*
	6-0 to 7-11	37	.476	3.201**
Delayed & Normal		74	.601	6.380***

*$p < .05$
**$p < .005$
***$p < .0005$

Table 2 shows separate Pearson's product moment correlations between the Otis Quick-Scoring Mental Ability Test and the HFD Test for the two groups of subjects and at two different mental age levels. Separate correlations were computed also for the total developmentally delayed group, for the developmentally normal subjects, and finally for all the subjects included in this study. The *t*-tests were used to determine the statistical significance of the correlations.

TABLE 3

The Mean and Standard Deviation of HFD Scores for Developmentally Delayed and Normal Subjects

Developmental Group	HFD Score	
	$\bar{X}$	SD
Delayed (M25, F12)	3.32*	1.78
MA 6	3.31	1.88
MA 7	3.33	1.71
Normal (M25, F12)	5.21*	.75
MA 6	5.00	.66
MA 7	5.44	.78

*The mean difference in HFD scores between two groups:
$t = 5.85$
$p < .0005$

Table 3 shows the mean and standard deviation of the

subjects' HFD score. According to Table 3, the developmentally delayed children scored lower on the HFD Test than did the normal children. The mean difference of HFD scores for the two groups of children was significant at the .0005 level. Attention should be paid to the finding that HFD scores for the delayed children in both the mental age groups were not significantly correlated to the IQ scores, whereas the correlations between HFD scores and IQ scores were significant for the normal grade-one subjects of both mental age groups. This result refutes the assumption of Hypothesis 1 that mental age would be a determining factor in the correlation between drawing tests and intelligence tests regardless of the absence or presence of a mental deficiency. A highly significant correlation between the HFD and IQ scores was revealed when subjects of different intelligence level were not separated for the statistical analysis. The correlation was .601 and significant at less than .0005 level. It is important to remember that correlations tend to increase as the number of subjects increases (Furguson, 1971, p. 170). Because the correlations between IQ and HFD scores for developmentally delayed subjects was not found to be significant, it did not seem statistically appropriate to test the significance of difference between the correlations for developmentally delayed and normal subjects. It was not

possible, therefore, to test out Hypothesis 1 of the present study.

The findings of the present study did not support the results of most of the previous research which demonstrated significant correlations for mentally retarded subjects between IQ scores and scores on the drawing tests such as the Goodenough scale or the Goodenough-Harris scale (Ables, 1971; Byrd, 1969; Carkhuff, 1962; Levy, 1971; Rohrs & Haworth, 1962; Tobias & Gorblick, 1960; Warren & Coller, 1960; Wells & Pedrini, 1971). The HFD Test has not been used for mentally retarded subjects to investigate the correlation with IQ scores, but Koppitz (1968) found significant correlations for mentally normal children of various ages.

The different results of the present study from previous research in the relationship between IQ and human figure drawings, may be attributed to one or more factors. First, the difference in findings may have arisen because different intelligence tests have been used. The intelligence tests which were used most frequently for previous research on drawing performance of intellectually subnormal subjects included the Stanford-Binet, the WISC, and the WAIS. It is very possible that the correlations between drawing test scores and intelligence test scores can vary

according to which intelligence test was employed even if the same subjects were involved. For example, Rohrs and Haworth (1962) investigated the correlations among test scores of Stanford-Binet, WISC, and Goodenough DAM Test with developmentally delayed children. The Stanford-Binet Form L-M and Draw-A-Man scores were not significantly correlated (r = .28) for the 46 delayed children. However, IQ scores on the WISC Full Scale were significantly related to the DAM score (r = .46) at the .01 level of significance. It was found that the correlation between the Stanford-Binet, L-M and WISC Full Scale (r = .69) was highly significant ($p < .01$), even though the subjects made significantly higher mean scores on the Stanford-Binet, L-M than they did on the WISC.

As mentioned previously, Slutzky et al., (1952) stated that the Otis Quick-Scoring Alpha Mental Test could be utilized to identify developmentally delayed pupils. The Otis Test as a group intelligence test, however, may be a less reliable instrument in comparison with an individual test such as the Stanford-Binet or the WISC.

The second factor which may have caused the different findings of the present study is the HFD Test itself. The drawing test which has been utilized for most research on children's human figure drawing was the Goodenough or the Goodenough-Harris Test. The HFD Test can be prominently

distinguished from the Goodenough or Goodenough-Harris Test in the number of items scored and in the scoring system as described in Chapter III (p. 34-5). In the HFD Test, the child's mental maturity is estimated only by two categories of 15 Expected and 11 Exceptional Items which include a reduced number of features when compared with the Goodenough or Goodenough-Harris Test. On the basis of the chronological age and sex of the child, the total number of Expected and Exceptional Items to be scored ranges from 14 to 17. It may be important that the Goodenough scale includes 51 points and the Goodenough-Harris scores 73 points for a man figure and 71 points for a woman figure.

The HFD Test is also characterized by its untraditional scoring system. In the Goodenough or the Goodenough-Harris scales, the total score is the summed value of the number of items appearing on a human figure. Each item that meets acoring requirements gets a credit of 1. All credits are summed to form the raw score for each drawing. The HFD score is not the sum of all credits that are obtained according to the number of features on the drawing. The presence of only Exceptional Items receives a score value of +1. Whereas the presence of Expected Items does not get any value, the absence of those items results in a value of -1. On the HFD Test which scarcely allows the

total score to be higher than 7 or 8, one point of the raw score represents a big individual difference. One-point is 12.5% of the maximum total score the child might get on the HFD Test. One-point on the Goodenough Test or the Harris Test represents respectively only 1.96% and 1.4% of the maximum total score.

The HFD Test is also differentiated from other drawing tests with regard to the convertibility of its score. While the score on the Draw-A-Man Test is converted to IQ score, the HFD score is not converted to specific IQ but to IQ levels of mental ability. These levels of mental ability overlap and include wide IQ ranges of 20 to 45 points. For example, a HFD score of 5 is interpreted as IQ level 85-120, and a score of 4 as IQ level 80-110. The mean HFD score for the delayed subjects in the present study was 3.32 which is corresponding to IQ points of 70-90. Compared with the mean IQ score obtained by the delayed subjects ($\bar{X}$ = 73.27), the HFD seems to overestimate intellectual functioning of those children, whereas the DAM Test was revealed to produce lower IQs than the WISC or Stanford Binet for varying populations of normal, and emotionally or neurologically impaired children (Ables, 1971; Reisman & Yamokoski, 1973).

With both the Otis and the HFD Test, the developmentally delayed subjects of the present study received lower mean

scores than did the normal subjects. The mean differences between two groups in both the IQ and the HFD scores were statistically significant ($p < .0005$). Once again, the delayed subjects showed a non-significant correlation between IQ scores and drawing test scores when the HFD Test was used, whereas significant correlations have been reported in previous research which employed other drawing tests. The explanation of this finding is important if we are to determine the processes involved in drawing tests.

A third reason for the different results of the present study may lie in the different characteristics of the subjects involved. The chronological age of subjects participating in previous research was generally older and the age range was larger than that of the subjects in the present study. Koppitz (1968) investigated the correlation between HFD and Stanford-Binet or WISC score, with children ranging in age from 6 to 12 years. For the same purpose, other researchers have administered the drawing test and the intelligence test to adolescents and adults. In Carkhuff's study (1962), the subjects ranged in chronological age from 17 to 64 years, showing an IQ range between 41 and 89 ($\bar{X} = 67.67$). Subjects in the studies by Tobias and Gorblick (1960) and Levy (1971) were also young adolescents and adults. The subjects' age ranged from 11 to 20 years in the former study and from 17 to 30 years in the latter. Rohrs and Haworth (1962) included subjects ranging

in age from 9.1 to 15.6 years, with IQ range between 50 and 70 ($\bar{X}$ = 61.12). Warren (1960), in his study, included subjects with quite varied ages. The age range was between 9 and 30 years and the mean IQ of subjects was 60.60 on WISC and 63.14 on WAIS.

To summarize, most of the previous studies involved subjects with an age range of from 6 up to 47 years. In the present study, the age range for the developmentally delayed group was 4.5 years and the normal group was under 1 year.

The differences in the age level of subjects involved in the different studies and the age range among the subjects in each study must not be ignored when investigating the correlation between the performance on two different tests. The variability associated with the age of subjects might have contributed to different results even if the same instrument and procedures had been employed.

Attention should be also paid to the IQ level and IQ range of the subjects. The IQ scores of subjects in the studies illustrated above varied around 60, whereas the mean IQ score of developmentally delayed children in the present study was 73. Also the range of IQs in the previous studies was wider than that of the present study in which the developmentally delayed subjects ranged in IQ from 64 through 80. (Carkhuff, 1960; Levy, 1971; Rohrs

& Haworth, 1962; Tobias & Gorblick, 1960; Warren & Coller, 1960; Wells & Pedrini, 1971). In Carkhuff's study (1962), for example, some subjects could be classified into the trainable group (IQ between 41 to 42), while others in the same study reached the intelligence level of a border-line group (IQ of 89).

It should be noted also that the developmentally delayed subjects in the present study had higher average IQ scores than subjects in other studies. They were at a similar intelligence level, an educable retarded group with a mean IQ of 73.27. The IQ range was narrow, with IQ's from 64 to 80.

The IQ range for the normal children in this study was between 94 and 104 for children of MA 6, and 96 and 124 for children for MA 7. Compared with normal children, the developmentally delayed children showed a considerably limited IQ range of 16 points, whereas the IQ range for the developmentally normal children was 30 points. It is possible that the restriction of range in IQ scores and chronological age could have influenced the correlation between the Otis and the HFD scores.

A final factor which might have contributed to different correlations for developmentally delayed and for normal subjects may be related to some personal problems such as emotional maladjustment, cultural deprivation, or

perceptual deficiency. Koppitz (1968) indicated that emotional adjustment problems influenced children's performance on the HFDs. She found that children suffering from serious emotional and personality problems tended to receive a lower score on the HFD Test than on the intelligence test. This finding is contrary to that of the present study in which the HFD score of developmentally delayed subjects indicated a higher intelligence level than did their IQ score. It means that subjects in the present study appear to have no more emotional and personality problem than do normal children. It would be important to remember that subjects with different problems such as cerebral palsied children or juvenile delinquents involved in the older studies showed a lower Goodenough IQ score than Stanford-Binet IQ scores (Goodenough & Harris, 1950; Nielsen, 1961). According to Koppitz, children whose HFD score is higher than their IQ score are suspected of cultural deprivation of perceptual deficiency. However, it would not be appropriate to assume that most developmentally delayed subjects in the present study were culturally deprived or perceptually deficient simply because they received a higher HFD score than their Otis IQ score. Most subjects were selected from schools located in the residential areas of lower-middle or middle class families even though special class children can come

from everywhere. Moreover, brain-damaged children who could be identified by the classroom teacher were excluded. Consequently, it does not seem that the personal problems such as emotional maladjustment, cultural deprivation or perceptual deficiency influenced the developmentally delayed children's performance on their HFDs.

It could be meaningful to examine now whether or not developmentally delayed subjects would be distinguished from normal subjects of the same mental ages in terms of Emotional Indicators on their HFD as the discrepancy between their HFD score and IQ score indicated.

In summary, it would appear to be misleading to assess the cognitive ability of children by means of the HFD Test, even though there was a significant correlation between HFD scores and IQ scores for normal children. According to Koppitz' interpretation of HFD Test scores, 21.6% or 8 out of 37 delayed subjects would be evaluated as possessing average to high average mental ability with scores between IQ 85-120 (individual scores on HFD Test and Otis may be found in Appendix A). Twenty-seven percent or 10 out of 37 delayed subjects would be assessed as having low average to average intelligence with IQ scores ranging from 80 to 110.

The findings of the present study indicated that about half of developmentally delayed children were likely

to be over-estimated in terms of their mental ability when they were evaluated by means of the HFD Test. As seen in Appendix A, most normal subjects in this study exhibited HFD scores which correspond to their IQ scores. Twenty-four or 64.8% of the 37 normal subjects got the HFD scores of 5 which was interpreted by Koppitz as average to high average intelligence of IQ 85-120. Either the IQ test incorrectly categorized the developmentally delayed children or as Koppitz implied, the HFD Test does not seem to provide the information sufficient for identifying with any accuracy the level of mental ability of the individual child. Until we can find which of these is true, psychologists and teachers must be very careful about using HFD scores to decide which children might be developmentally delayed and thus require further assessment.

Emotional Indicators

The second hypothesis of this study as stated in the null form assumed that there would be no significant difference between developmentally delayed and normal children in a) the frequency of specific Emotional Indicators and b) the number of Emotional Indicators appearing on their HFDs. To test hypothesis 2 of the present study, the subjects were divided into two groups by their intelligence level regardless of their mental age level. For the hypo-

thesis 2(a), developmentally delayed and normal children were compared for the presence and the absence of the Emotional Items.

Table 4 presents the Chi-squares computed for each of the Emotional Indicators which had been scored on the basis of subjects' chronological age. When scoring according to the subjects' chronological age at which each EI becomes valid clinically, 30 EIs were to be checked for delayed subjects, 26 for normal girls and 25 for normal boys.

The three Emotional Indicators of big figure, omission of feet and omission of neck appeared significantly more often on the HFDs of developmentally delayed children. According to Koppitz, all of these Emotional Indicators are related to age and maturation of children until they reach the age level at which each Emotional Indicator becomes a clinically valid one. In the normative study by Koppitz (1966a), the big figure was found to appear on more than 15% of drawings of children until the age of eight years. The omission of feet and of neck tended to disappear on the drawings as children get older. Koppitz regarded the big figure as clinically significant from the age of eight for boys and girls. Referring to research and her clinical experience, Koppitz indicated that big figures on drawings are related to immaturity and deficient inner

TABLE 4

Chi-square Analysis of the Frequency of Emotional Indicators Found on HFDs of Developmentally Delayed and Normal Subjects When Scored on the Basis of Chronological Age

Emotional Indicator	Delayed Ss	Normal Ss	χ^2
Poor integration	6	5	.00
Shading of face	0	2	.51
Shading of body &/or limbs	1	0	.00
Shading of hands &/or neck	0	0	
Gross asymmetry of limbs	2	3	.00
Slanting figure	2	0	.51
Tiny figure	2	3	.00
Big figure	7	0	5.68*
Transparencies	2	1	.00
Tiny head	1	0	.00
Crossed eyes	0	1	.00
Teeth	6	5	.00
Short arms	12	8	.62
Long arms	2	0	.51
Arms clinging to body	1	3	.26
Big hands	0	0	
Hands cut off	9	8	.00
Legs pressed together	1	0	.00
Genitals	2	0	.51
Monsters	1	0	.00
Three or more figures	2	0	.51
Clouds	1	0	.00
Omission of eyes	0	0	
Omission of nose	2	2	.26
Omission of mouth	0	0	
Omission of body	0	1	.00
Omission of arms	1	0	.00
Omission of legs	1	0	.00
Omission of feet	8	0	6.87**
Omission of neck	15	0	16.39***

* $p < .02$
** $p < .01$
*** $p < .001$

control. Aggressive children and children who stole drew big figures most frequently (Koppitz, 1966b; 1968). According to this interpretation, the high frequency of big figure on drawings of developmentally delayed children in the present study suggests that the delayed children may be emotionally immature and may lack inner control of impulses and of behavior as compared with the normal children of the same mental age.

Another Emotional Indicator which appeared significantly more often on the HFDs of the developmentally delayed children in the present study was the omission of the feet. Omission of the feet becomes a clinically significant Emotional Indicator from the age of seven for girls and age nine for boys. In Koppitz's study (1968), the clinic patients and shy children showed the omission of feet most frequently. Koppitz (1968) and Machover (1949) interpret that the omission of feet on a drawing is associated with a feeling of insecurity and helplessness. If their interpretation is correct, the delayed children in the present study felt more insecure than did the normal children.

The other Emotional Indicator which could be observed significantly more often on the HFDs of developmentally delayed children in the present study was the omission of the neck. The omission of the neck is not clinically significantly until girls are nine years old and boys are 10

years old. The omission of the neck is also related to immaturity and poor inner control of impulses and behavior. Koppitz (1968) reported that this Emotional Indicator was observed most frequently on the HFDs of the clinic patients, brain injured children and children who were in the habit of stealing. The greater the frequency of omission of the neck reinforces the findings of the greater frequency of big figures as stated above.

To summarize, when the Emotional Indicators on the HFDs were scored on the basis of subjects' chronological age, the results indicated that the developmentally delayed children tended to be emotionally immature, helpless and lack inner control and coordination of impulses and behavior. It must be noted, however, that all three Emotional Indicators which appeared significantly more often on the HFDs of developmentally delayed children are those which are related to age and maturity. On the other hand, such Emotional Indicators could not be valid EIs for normal children because normal children did not reach the age level indicated by the HFD Test. It is not reasonable, therefore, to conclusively state that at this stage the EIs of big figure, omission of feet and of the neck are related to mental deficiency.

Instead, it would seem logical to score only those EIs on the HFDs that are appropriate for both the develop-

mentally delayed and normal children's mental age. This means that the same EIs on the HFDs are scored for both groups of subjects, regardless of age since they are matched for both mental age and sex. In this way, developmentally delayed children may not be disadvantaged because of their low intelligence level. In accordance with Koppitz's suggestion in a personal letter dated July 1, 1977, the EIs on the HFDs were scored according to the mean mental age for the two groups of subjects. The results of scoring on this basis are shown in Table 5. The mean mental age for the two groups of subjects was 84.04 months or seven years. Only 25 EIs for boys and 26 EIs for girls were appropriately scored for their mental age level.

As seen in Table 5, none of Emotional Indicators appropriate for their mental age level occurred significantly more often on HFDs of either group of subjects. There was no EI which appeared exclusively on the HFDs of developmentally delayed subjects and not on the drawings of normal children. With this method of scoring, there seemed to be no specific EIs which could be related directly to developmental delay.

Hypothesis 2(b) was to investigate the difference between the developmentally delayed and normal children in the number of EIs on their HFDs. According to Koppitz (1968),

TABLE 5

Chi-square Analysis of the Frequency of Emotional Indicators Found on HFDs of Developmentally Delayed and Normal Subjects When Scored on the Basis of Mental Age

Emotional Indicator	Developmental Group Delayed	Normal	χ^2
Poor integration	6	6	.10
Shading of face	0	2	.51
Shading of body &/or limbs	-	-	
Shading of hands &/or neck	0	0	
Gross asymmetry of limbs	2	3	.00
Slanting figure	2	0	.51
Tiny figure	2	3	.00
Big figure	-	-	
Transparencies	2	1	.00
Tiny head	1	0	.00
Crossed eyes	0	1	.00
Teeth	12	8	.62
Short arms	2	0	.51
Long arms	1	3	.26
Arms clinging to body	0	0	
Big hands	9	8	.00
Hands cut off	1	0	.00
Legs pressed together	2	0	.51
Genitals	1	0	.00
Monsters	2	1	.00
Three or more figures	0	0	
Clouds	0	0	
Omission of eyes	0	0	
Omission of nose	2	2	.26
Omission of mouth	0	0	.00
Omission of body	1	0	
Omission of arms	1	0	
Omission of legs	1	0	
Omission of feet	-	-	
Omission of neck	-	-	

children who show two or more EIs on their HFDs are most likely to have emotional problems and inadequate interpersonal relationship. Table 6 indicates Chi-squares for the total number of subjects in each group who showed two or more EIs on their HFDs. The number of EIs on the HFDs were scored according to chronological and then again according to mental age.

When the scoring method was based upon the chronological age of subjects, it was shown that 23 or 62.1% of the 37 developmentally delayed subjects made two or more EIs on their drawings, whereas only nine or 24.3% of the 37 normal subjects exhibited two or more EIs on their human figures. The Chi-square value of 7.88 is statistically significant ($p < .01$). From this result, developmentally delayed children appeared to have a higher

TABLE 6

Distribution of Developmentally Delayed and Normal Subjects by the Number of Emotional Indicators on the HFDs

Scoring Method	Number Of EIs	Developmental Group Delayed	Normal	χ^2
Based on CA	0 or 1	14	27	7.88*
	2 or more	23	10	
Based on MA	0 or 1	23	26	.24
	2 or more	14	11	

* $p < .01$

incidence of emotional problems than did normal children of the same mental age, but differing chronological age.

If, however, the HFDs were scored according to the subjects' mental age, 14 or 37.5% of the 37 developmentally delayed children showed two or more Emotional Indicators on their drawings, while nine or 24.3% of the 37 developmentally normal children exhibited two or more Enotional Indicators. The difference in the number of children whose HFDs revealed two or more EIs was not statistically significant.

Table 7 shows a more detailed distribution of the number of Emotional Indicators on the HFDs for two groups

TABLE 7

Distribution of Emotional Indicators on HFDs for Developmentally Delayed and Normal Subjects

Number of EIs	Developmental Group Delayed		Normal		χ^2
0-1	14[a]	(23)[b]	27[a]	(26)[b]	7.88[a*]
2	9	(7)	5	(6)	
3	5	(4)	4	(4)	
4	4	(3)	1	(1)	
5	2	(0)			
6	3	(0)			
Total	37	(37)	37	(37)	
$\bar{X}$	2.35	(1.48)	1.18	(1.21)	

[a]EI number scored on the basis of chronological age.
(the mean difference is significant: $t = 3.50$; $P < .01$)
[b]EI numbers scored on the basis of mental age.
*$p < .01$

of subjects in the present study. Once again, only when the EIs were scored according to the subjects' chronological age, did the normal group have significantly more subjects (p .01) who showed none or only one EI.

To repeat, delay in mental development did not seem to be closely associated with any specific Emotional Indicators on HFDs. None of EIs appropriate for the subjects' mental age could differentiate the developmentally delayed children from the developmentally normal children who were matched for their MA and sex, nor was there a significant difference in the number of EIs on HFDs.

These findings support the literature on emotional adjustment of developmentally delayed children (Miller & Gottleib, 1972; Sternlicht, 1976; Thorne, 1965). Cognitive development appears to be an important factor, but not the only factor to decide one's emotional behavior. Normal children can have the same emotional needs and adjustment problems as can developmentally delayed children. If developmentally delayed children show certain behavior patterns related to emotional immaturity and impulsiveness which may be different from normal children, it may be due partly to environmental factors and not mainly to intellectual deficits.

The results of the present study also extend Goldberg's (1957) findings. Retarded adolescents involved in

Goldberg's study were not differentiated from normal controls on the Bender-Gestalt Test as far as emotional adjustment and problems were concerned. Koppitz concluded that problems arising in emotional and social adjustment are not peculiar to retarded children. In other words, intelligence is not the determining factor in emotional development. Problems in emotional and social adjustment can occur to all children regardless of their intelligence level. The developmentally delayed children in the present study when scored according to their chronological age seemed to show signs of immaturity such as big figure, omission of feet and of neck. But these signs of immaturity reflect very appropriately their lower mental age and so seem logical.

Limitations and Recommendations

The social class of parents was actually disregarded in subject selection procedures. The normal subjects were selected from children attending the schools in a lower-middle and middle-class residential area. The delayed subjects were heterogeneous with respect to socio-economic background, coming from varying areas of the city. Consequently, the socio-economic status was not controlled for either group of subjects in this study. Only grade-one children were included as normal subjects, hence most of

these children were likely in their second year of school. The delayed children on the other hand, being older, would have been in school for much longer. Future studies should include a wider age range and a larger population which represents various socio-economic backgrounds.

This study could have been improved too, by administering the HFD Test individually. As discussed previously, the individual administration of the HFD Test has some benefits. For more accurate assessment, an individual intelligence test is obviously preferable to the group intelligence test, especially for developmentally delayed children.

Finally, children suffering from gross motor disability or known brain damage were excluded in this study. Since such information was primarily dependent upon the students' files or teacher's observation, it is possible that children with unobservable brain damage may have been selected inadvertently. It would be most desirable for future studies to make strict medical diagnosis for the subject selection.

Summary

The study was designed to investigate the correlation between HFD scores and IQ scores of developmentally delayed and normal children. It was also aimed to examine whether or not developmentally delayed children were dif-

ferentiated from normal children based upon the number of and the frequency of items of Emotional Indicators on the HFDs.

The following hypotheses were set forth in the null form for investigation.

Hypothesis 1: The correlation between the HFD scores and IQ scores is not significantly different for developmentally delayed children than for normal children. The result did not support Hypothesis 1. The HFD scores were significantly correlated with IQ scores for normal children of both levels of mental age, but nonsignificantly correlated with IQ scores for delayed children. For this reason, it was not possible to test out Hypothesis 1 of the present study.

Hypothesis 2: There will be no significant difference between developmentally delayed and normal children in the number of Emotional Indicators and the frequency of specific Emotional Indicators appearing on their HFDs. Hypothesis 2 was supported. Developmentally delayed subjects were not differentiated from normal subjects with regard to the number of Emotional Indicators and the frequency of specific Emotional Indicators on the HFDs when their HFDs were checked according to their mental age. Only when the Emotional Indicators were checked according to the subjects' chronological age were developmentally

delayed subjects in the present study characterized by the three specific EIs of big figure, omission of feet, and omission of neck. Also, only when scored according to chronological age was there a significantly greater number of developmentally delayed subjects who showed two or more EIs on their HFDs than did normal subjects.

The findings from the present study imply that psychologists and teachers must be cautious in assessing the mental maturity of developmentally delayed children on the basis of the HFD score. This study also implies that developmentally delayed children may be mislabeled when their IQ scores are used as the only criterion of their mental ability. It may be that developmentally delayed children are functioning at a lower level in IQ tests than their real potential because they are not accustomed to following directions or answering the questions within a time limit. The results regarding emotional adjustment lend support to the theory that developmentally delayed children have the same needs and problems in emotional development and adjustment as do normal children of similar mental age.

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APPENDIX

CONTROL VARIABLES AND RAW HFD SCORES

Control Variables and Raw Scores on HFD Test
(Mental Age 6)

Developmentally Delayed Subjects							Developmentally Normal Subjects						
S No.	Sex	CA[a]	MA[a]	Otis IQ	HFD Score	EIs (no)	S No.	Sex	CA[a]	MA[a]	Otis IQ	HFD Score	EIs (no)
S 1	M	136	72	62	0	5 (3)[b]	S 1	M	77	73	95	5	1
S 2	F	124	72	64	2	4 (2)	S 2	F	78	72	94	5	3
S 3	M	126	74	65	1	3 (1)	S 3	M	78	74	96	4	2
S 4	M	104	74	73	5	1 (1)	S 4	M	84	75	90	5	1
S 5	F	103	75	74	3	2 (1)	S 5	F	80	75	95	5	0
S 6	M	107	76	73	4	2 (2)	S 6	M	77	76	98	5	1
S 7	M	132	77	67	3	2 (1)	S 7	M	84	78	92	5	1
S 8	F	118	77	69	4	2 (1)	S 8	F	78	78	100	5	4
S 9	F	104	78	75	0	4 (2)	S 9	F	78	78	100	5	3
S 10	F	106	78	74	4	6 (4)	S 10	F	79	79	94	5	0
S 11	M	103	79	77	2	2 (1)	S 11	M	78	79	101	5	1
S 12	F	113	79	72	5	1 (0)	S 12	F	83	80	96	5	3
S 13	F	118	79	70	4	2 (1)	S 13	M	84	80	95	5	1
S 14	M	117	80	71	6	2 (1)	S 14	F	77	80	103	7	0
S 15	F	131	80	68	5	0 (0)	S 15	F	83	82	98	6	1
S 16	M	103	82	79	3	3 (3)	S 16	M	86	83	96	4	1
S 17	M	104	72	71	5	1 (1)	S 17	M	78	72	94	5	0
S 18	M	102	81	72	6	1 (1)	S 18	M	77	81	104	5	0
S 19	F	104	82	73	1	5 (2)	S 19	F	87	83	95	4	0
$\bar{X}$ =		113.947	77.211	71.316	3.316				80.316	77.789	96.632	5.000	
SD =		11.311	3.293	4.655	1.887				3.416	3.521	3.639	0.667	

[a]Chronological Age and Mental Age are given in months
[b]The number in the bracket is the number of EIs depending upon mental age

Control Variables and Raw Scores on HFD Test
(Mental Age 7)

Developmentally Delayed Subjects							Developmentally Normal Subjects						
S No.	Sex	CA[a]	MA[a]	Otis IQ	HFD Score	No of EIs	S No.	Sex	CA[a]	MA[a]	Otis IQ	HFD Score	No of EIs
S 1	M	140	84	69	1	6 (4)[b]	S 1	M	82	85	104	5	1
S 2	M	143	84	71	4	5 (3)	S 2	M	84	86	103	5	1
S 3	M	105	85	80	4	0 (0)	S 3	M	89	86	96	5	3
S 4	M	134	88	74	4	1 (1)	S 4	M	88	88	100	6	0
S 5	M	155	88	70	5	1 (1)	S 5	M	85	87	103	5	0
S 6	M	122	89	77	2	6 (4)	S 6	M	86	90	105	5	1
S 7	M	147	89	73	3	3 (1)	S 7	M	84	89	107	5	1
S 8	M	140	89	73	3	3 (2)	S 8	M	84	91	109	6	2
S 9	F	149	91	73	5	2 (2)	S 9	F	81	92	116	5	1
S 10	F	134	93	78	-2	2 (1)	S 10	M	86	92	108	7	2
S 11	M	150	93	75	4	0 (0)	S 11	M	85	92	109	4	1
S 12	M	138	93	77	5	1 (1)	S 12	M	87	93	108	5	3
S 13	M	142	95	78	3	4 (3)	S 13	M	86	95	112	5	1
S 14	M	143	95	79	4	2 (1)	S 14	F	86	94	111	5	1
S 15	M	143	95	79	5	0 (0)	S 15	M	83	95	116	6	1
S 16	M	143	92	73	3	2 (1)	S 16	M	71	78	119	6	1
S 17	M	129	95	79	3	5 (3)	S 17	M	86	95	111	6	0
S 18	F	147	94	78	4	1 (1)	S 18	F	79	94	124	7	1
$\bar{X}$ =		139.111	90.667	75.333	3.333				83.389	90.833	108.944	5.444	
SD =		11.570	3.819	3.430	1.715				2.913	3.330	6.898	0.784	
Total $\bar{X}$					3.324							5.216	
SD					1.780							0.750	

[a]Chronological age and mental age are given in months
[b]The number in the bracket is the number of EIs depending upon mental age