A COMPARISON OF DRAWINGS BETWEEN A GROUP OF DYSLEXIC ADOLESCENTS AND A GROUP OF NON-DYSLEXIC ADOLESCENTS

THESIS

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The purpose of this paper is to compare a group of adolescents with the learning disorder of dyslexia and a group of adolescents without dyslexia in regard to their ability to make realistic drawings. Subjects selected for the study were from a suburban junior high school in which a random sample was taken of both dyslexic and non-dyslexic students. Each was given three standardized drawing tasks, including a still-life drawing, a contour drawing, and a perspective drawing.

The drawings were judged by five evaluators on a continuum of realistic to non-realistic. The ratings were then analyzed by the application of the Mann-Whitney U-Test, which indicated that there are no significant differences in the abilities of the two groups to render drawings realistically.

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CHAPTER I

INTRODUCTION

The purpose of this study is to compare a group of adolescents with the learning disorder of dyslexia and a group of adolescents without dyslexia in regard to their ability to make realistic drawings. Dyslexia is a perceptual difficulty in children of average or above average intelligence. Used as an inclusive term, dyslexia (derivation--dys--bad; lexis--word, speech) designates a learning disability which prevents a child from reading adequately even though he is of average or above average intelligence, has adequate vision and hearing, adequate emotional adjustment, and adequate motor integration. This condition of faulty reading is thought to be the result of either heredity or a maturational dysfunction or both (3).

Because dyslexia cannot be studied in its pure form or in isolation, there is no one particular symptom which characterizes dyslexics as a group; rather, it is a heterogeneous syndrome with various components. Klasen said, "It will be important to future research that each investigator study one aspect of dyslexia, i.e., the one with which his training and experience have familiarized him, such as intelligence, personality, speech, etc." (3, p. 30). Although there have been batteries of standardized tests given to dyslexic children, such as the Frostig Test of Visual Perception (1) and

Goodenough's Draw A Man Test (2), there is a dearth of information concerning how dyslexic adolescents draw in comparison with non-dyslexic adolescents. Because dyslexia is a growing problem in public schools, it seems essential to discover through various means of investigation any facts about the dyslexic learner which might be of value both in teaching him and in understanding where his strengths and weaknesses lie. If, in the field of art education, it can be discovered whether or not the dyslexic child's reading difficulties affect his general realistic drawing abilities, this knowledge could be used to further the search for causes of dyslexia as well as possible means of treatment.

A child may perform well in an art classroom for several reasons including interest in the subject, previous good experiences with particular teachers or success with a certain medium, and the fact that the child is not usually required to do a great amount of reading or writing. He can, instead, explore many avenues of creativity not available in most other classes. He can earn praise and recognition for creating outside the realm of the written page. It therefore would seem possible that the dyslexic child, or any other child with a learning disability, might take an interest in art and excel in it to compensate for qualities lacking in his academic subject area. Also, if the main problem of dyslexic children is, as some researchers believe, the inability to connect the written symbol with its meaning, or the difficulty of integrating the auditory word with the visual word; art (and

more specifically, realistic drawing) could conceivably not present this obstacle to them since a realistic drawing does not represent a word but rather a whole, concrete entity.

The disabled reader is usually intelligent enough to realize his shortcomings and to suffer frustration in many cases. Teachers and parents criticize and press for better performance, because reading and writing skills have become the basis of any education today. If the dyslexic child can do as well, or better, with realistic drawings on the whole than the non-dyslexic child, the art teacher should know which students have this reading problem and encourage their efforts in art. If art does nothing more than build the self-esteem of dyslexic children, they should be encouraged to take it when it becomes an elective in the schools, usually in the seventh or eighth grades.

Before concentrating on how the dyslexic adolescent draws, it is necessary to understand how the normal adolescent expresses himself visually at this age. Lowenfeld (4, p. 218) calls the period of eleven to thirteen years of age the stage of reasoning, in which the first concept of naturalistic representations in drawing the human figure appear and during which the concept of depth and space take on a new significance for the child. In the period of adolescence, from thirteen years onward, which he calls the period of decision, the child acquires a critical awareness of his artwork and wants to perfect his ability to draw realistically; a drawing must look "real"

in order to be "good". There is a tendency to depart from the use of symbolism and exaggeration as a means of expression, and so-called "modern art" has little appeal for the adolescent (4, pp. 282-289).

Because the widespread problem of dyslexia has been unsolved during its comparatively short recognized existence, it should again be stressed that it is important to obtain all the information possible about it through all available means. The concept for this study was formed during personal observation of the drawings by junior high school students over a period of three years. Many of the students from the developmental reading program were also involved in the art program. From a casual comparison between these students and the other students, it appeared that the ones with reading difficulties were often better able to draw realistically than the students without reading problems. Since much research has been done about how adolescent children draw, it seems worthwhile in this study to compare drawings by dyslexic adolescents with drawings by non-dyslexic adolescents to discover more about the nature of the learner in art education and to discern if the difficulties encountered by the dyslexic students in reading and writing have any relation to their realistic drawing ability.

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CHAPTER II

REVIEW OF RELATED LITERATURE

In reviewing the related literature for this investigation, it was necessary to examine first the definitions and characteristics of the dyslexic child, and second, to determine what has been discovered about the drawing abilities of both the dyslexic and non-dyslexic adolescent.

Although the perceptual difficulty of children called dyslexia was specifically identified in 1877 (11, p. 173), it was not recognized in this country until the last forty to fifty years. Sometimes referred to as word-blindness, the primary characteristic of dyslexia is the inability to read because of the visual reversal of symbols. The problem is sometimes compounded by speech or hearing disorders, although it should be noted again that these children are not retarded, mentally deficient, or brain-injured. It appears instead to be of a genetic nature, at least partially, with at least four out of five of its victims being male (16, p. 23). Socio-economic factors do not appear to be a cause, although emotional difficulties may be an end result after continued reading difficulty (16). Some other characteristics are

1) Lack of left-right dominance in many cases (6, p. 123).
2) Reversal of letters, difficulty in forming letters, confusion of similar letters, occasional "mirror"

writing shown in handwriting (6, pp. 43-50).

3) Difficulty in maintaining long-term spelling or the memory of appearance of letters (16, p. 4).

4) Worsening of the condition without treatment. Examples of the rate of cure are:

   a. 1st or 2nd grade - 82%

   b. 3rd grade - 46%

   c. 7th grade - 5-10% (16, p. 127)

5) High degree of logical thinking ability often noted. Some individuals thought to have had the disability include Albert Einstein, Woodrow Wilson, William James, and Auguste Rodin (6, p. 135).

In an early study by Kussmaul (6, p. 12), a phenomenon which he called "word-blindness" was discovered. He referred to a patient who was unable to learn to read although his vision, speech, and intellect were normal. Unfortunately, people of this sort had previously been considered possessed by demons, laziness, or insanity, and had been shut away without treatment. "Word-blindness", although not used in most of the more modern vocabularies concerning the learning disabled, still has followers in research of reading problems. An example is the Word Blind Institute in Copenhagen, Denmark, which prompted Hermann's publication, Reading Disability; A Medical Study of Word-Blindness. (10) In it, Hermann makes note of the fact that the condition of word-blindness is synonomous with dyslexia, although the latter term could be further expanded to include difficulty in writing as well as reading (10).

In 1897, Morgan (14) introduced the case of a normally intelligent boy who had a great difficulty in learning the letters of the alphabet and only with the greatest effort could spell out monosyllabic words. Hinshelwood (6) in 1917 presented findings in a monograph in which he defined the problem as being an individual with normal vision who is not able to interpret written or printed language. He thought the cause to be a failure of the left cerebral hemisphere in a certain area where he assumed the visual memory images of letters and words to be stored. In a more modern study by Goldberg and Schiffman, the principal criteria of dyslexia have been defined as these:

1) The reading disability is specific. The acquisition of reading skill lags behind the other scholastic achievements and reading does not measure up to the expectations normally justified by age and intellect.
2) The confusion extends over all reading. Sometimes, the child may spell words correctly but is unable to read them, or he may show a complete disability in spelling as well.
3) There is a tendency to reverse letters and words. Many children normally reverse letters and mirror-write in the first and second grades, but the reader with a specific defect retains these characteristics (6, pp. 13-14).

However, there is not a uniform etiology for dyslexia (6, p. 14). The general agreement is that dyslexia refers to those who have normal or above normal intelligence, who have an absence of sensory deficits, an absence of gross neurological impairment, and who have had the conventional teaching thought to be necessary for the acquisition of reading skills (6, p. 14). Since studies on dyslexia have been approached from an educational, psychological, and medical viewpoint, there unfortunatly is a wide variation of labels and opinions. The following terms are some of those which are used synonomously with dyslexia: primary reading disability (17), developmental dyslexia (4), congenital word-blindness (2), strephosymbolia (15), specific reading disability (19), and perceptual handicap (19). For the purposes of this paper, only one of these terms, dyslexia, will be used. It should be emphasized that dyslexia is not actually an inability, but rather a disability. There are two types of dyslexia--visual, which is difficulty in interpreting the written language, and auditory, which is the problem of transferring the heard language to written symbols (6). Dysgraphia (inability to write or spell) and dyscalculia (inability to form numerical notations) may also be involved in the problems of the dyslexic (6, p. 67). Seldom is there a clear-cut pattern. For the purposes of this paper, no discrimination is made between the different types of dyslexics, with

the exception that all of the ones used in the study were of average or above average intelligence.

The ability to read is probably more important today than in anytime in history, especially in this day of universal education. Within the last five years, dyslexia has become even more of a pressing problem for educators. It is estimated that from 20 percent to 40 percent of the school population is handicapped by dyslexia, and there may be as many as eight million to twenty million of our school population who have reading problems (6, p. 14). Because so little is actually known about the causes of the dyslexic condition, the child's inability to interpret written material successfully has been blamed upon many things, none of which have been adequately substantiated. Critchley (4, p. 143) felt that there is no environmental factor involved, since the symptoms of dyslexia often have a familial background for generations. In one major study by Hallgren (9, p. 65), who examined 116 dyslexics, it was found that 160 secondary cases existed in the families of these. In addition, Hermann (10) studied 45 sets of twins, of whom at least one twin had a reading disability. Since the twins had been raised by the same parents under the same conditions, his findings also seem to indicate that dyslexia could be genetically determined and not dependent on environmental factors.

The role of vision has also been emphasized as a possible cause of dyslexia, but the fact is that there is no evidence

of any relationship between visual problems and reading ability. Beyond the mechanical functioning of the eye, the process of "seeing" is not complete until what is seen is interpreted by the observer. This is called perception, which is entirely a function of the brain (6, pp. 80-85). In comparisons between normal readers and dyslexic readers, researchers have found that none of the physical factors of vision have a higher incidence in one group than the other (7).

The factor of dominance has also come under consideration as an element of dyslexia and other reading disturbances. Dominance of the left hand occurs in approximately 5 - 10% of the population of the United States. Left-hand dominance is twice as common in males (who are five times more likely to be dyslexic) than females. In mentally retarded children, boys are four times liklier than girls to be left-handed. Among dyslexics, the incidence of left-handedness is also higher than in non-dyslexics, but the question is unanswered as to whether it is because they are dyslexic or because there are more boys than girls who are dyslexic (30). In the relationship between "handed-ness" and "eyed-ness", one-third of all individuals have a mixed dominance of eye and hand. In a study by Subriana (20), 143 children out of a total of 316 had a lack of left-right dominance. In the 143 children, learning disabilities were found in sixteen percent.

While a review of literature dealing with the drawing abilities of the adolescent dyslexic did not turn up any

specific investigations of the subject, certain material does seem to have significance to the problem of this study. For instance, an abundance of date relating to the developmental stages in drawing has already been collected and analyzed. One researcher, Kerchensteiner (12, pp. 46-57), whose efforts still influence thoughts in this field, believed that older elementary children try to draw objects as they appear to the eye. To explain the renderings of pre-school children, he asserted that they, on the other hand, draw objects as they know them rather than as they see them. He also felt that the absence of perspective in children's drawings is due to a failure to observe the formation of perspective in nature. Then, at some point in the child's development, he believed, the phenomenon is discovered, and the impact of perspective upon drawing becomes so conspicuous that an inspection of drawings would disclose at the age this event occurred. His basic principles were established as these: young children draw what they know; older children draw what they see.

Arnheim (1, p. 408) distinguished between the physical act of seeing and visual perception. Images fall upon the eye as in a photographic plate. The mind, however, assimilates and interprets these sense experiences. In drawing, the child refers to his visual conception of an object rather than to his retinal image of it. For example, a child will usually draw a table as a rectangular shape with two or four legs

attached to it, without effort to narrow the top at the far side which his retinal viewpoint shows. The problem confronting a child in drawing is that of describing a three-dimensional structure through flat medium. Discovery of a more adequate means of doing so constitutes progress.

In a study of elementary school children's drawings, Hilda Lewis tested the validity of Arnheim's definition of developmental progress in drawing (12, pp. 69-76). She tested the means by which children draw sperical space, cubical space, and spatial depth. The children drew various objects after observing them from several positions in space. Even preliminary inspection of the drawings revealed that those of the older children tended to resemble more closely what they depicted than the drawings of their juniors. The findings of this study supported the theory that there is a relationship between grade level in school and the means through which spatial characteristics are indicated in drawings. This implies that the proportion of naturalistically correct drawings increases with age.

Differences in drawing style among adolescents have also been observed by art educators. Since 1939, Lowenfeld's visual and haptic type students have been accepted by many art teachers as existing within the normal range of classroom subjects. The visual person, according to Lowenfeld (13, pp. 233-234), perceives the total vision stimuli and later analyzes the details. The haptic person responds

strongly to the emotional elements in the visual experience. Lowenfeld felt that these differences were not caused by physical visual ability but rather by psychological factors. Most people appear to fall between the two extremes of the haptic and visual styles. In a study by Gutteter (8, p. 15), an attempt was made to discover whether different types of psychological functioning exist for students whose drawings exhibit more haptic characteristics. His study also investigated the factors of age, sex, and previous art experience.

Gutteter's study concluded with the following findings:

1) Drawing styles may be related to differences in psychological make-up suggesting that Lowenfeld's concern that visual motivation for art experience must take these differences into consideration seems unnecessary.

2) Students expressing a haptic orientation toward drawing may have psychological characteristics different from those with visual orientation. Haptics appear to be more impatient, changeable, complicated, imaginative, restless, and confused. They might be more likely to have internal problems and conflicts. In responding to others, they appear to be more observant, talkative, resourceful, verbally fluent, and rebellious toward rules.

3) It would appear that the visual and haptic styles in drawing are not affected by age.

4) It would appear that the visual and haptic drawing styles are not affected by sex.

5) It would seem that as intensive art experience in school increase, the occurrence of haptic orientation increases.

In a study by Elliott Eisner (5, pp. 5-19) in which he compared drawings by culturally disadvantaged children with drawings by the non-culturally disadvantaged, he noted the increasing phenomena that as the children got older, their respective skills in drawing became more equalized to each other, while in other subjects such as reading, math, science, and social studies, the gap in performance widened. He concluded that it might be that the culturally advantaged student has no particular advantage in drawing after a period of time, because art instruction in the elementary grades does not greatly emphasize the development of drawing skills and because drawing skill is not necessarily an automatic consequence of maturation.

Such a study points out that there could be similarities in performance between the culturally deprived student and the disadvantaged reading student, because most subjects use reading as the basic instrument in the classroom - an area in which both the dyslexic student and the culturally deprived student are lacking. However, with specific drawing instruction not emphasized in most elementary schools, the deprived student, the dyslexic student, and the average advantaged student

remain at about the same level. Eisner quotes John S. Clark as having said (5, p. 16):

> I am forced to the conclusion that there is not and cannot be for children any purely natural method of learning to draw . . . In this form of art expression by drawing nature takes children a very short way out to sea, as it were, and then leaves them helplessly adrift. Something more than nature's endowment, something more than instinctive interest, something more than reflex motor-activity, must be brought to bear on the problem of the right development of the power to draw.

Eisner continues, "The ingenious devices that children employ to deal with spatial syntax exemplify their efforts to learn how to cope more effectively with visual problems as they see them" (6, p. 17). The dyslexic student when confronted with a visual problem in drawing has no cumulative deficit in this area as he does in reading related ones. He could then, as the culturally deprived student, draw as well on the whole as the average student.

In a study by Marvin Grossman (7, pp. 51-54), it was hypothesized that a particular way of examining and experiencing one's environment (an analytical orientation) would facilitate more accurate perceptions and as a result enable one to represent his perceptions more accurately in his drawings. The results of this study supported the hypothesis. Grossman stated:

> Aesthetic value is not synonomous with accuracy of representation. Nevertheless, few would question that representational drawing skills are among the many skills and attitudes utilized by children to express themselves

> through art. Since this study suggests that representational drawing skills may be related to a child's perceptual orientation, this implies that art instruction should include strategies which develop the child's abilities to observe his environment analytically (7, p. 53).

In Grossman's study, four kindergarten classes were given the Draw-A-Clown Test, the Figural Form A of the Torrance Tests of Creative Thinking, and the Children's Embedded Figures Test. Some of the more significant correlations concerned elaboration, which Torrance described as a person's ability to develop, embroider, embellish, or otherwise elaborate ideas (7, pp. 52-53). He believed that elaboration is associated with keeness or sensitivity in observation, a hypothesis which seemed to be supported by the data in this study. If the elaboration is also described as detail, then it is also a necessary factor in realistic drawing which may be associated with an analytical orientation.

Drawings based on realism (accurate representation and/or details) were used for the study described in this paper because they are characteristic of the developmental stage of the adolescent. In the later stages of this age level, the child wants to include more details and concentrate more on appearance. Lowenfeld (3, p. 260) said that the student will be eager to include "correct" proportions and use exaggeration less frequently as a means of expression. There is a definite tendency "to replace mere symbols ("oval" for "body") by a representation which is more related to reality" (13, p. 229). Also, the adolescent stage is one in which the child develops

a critical awareness of his work. The need arises for a more complex technique, and the work must look as "real" to the student as possible in order for him to feel that he is competent. Lowenfeld continues by saying that "Generally, the first indication of critical awareness is in the inability to establish close correlations between imaginative thinking and the final product" (13, p. 230). This would seem to be why the student at this age has initially more difficulty in accepting the fact that a contour drawing, which looks distorted, can be "good" or as valid as a closely rendered stillife.

In another study, Brittain (3, pp. 5-12) explored the natural or normal forms of art expression for the 13-15 year old age group. He observed that their art work, although showing ranges of skill and interest, did have a pattern which was typical of a junior high school population. His findings showed

1) Abstract art was looked upon by the students as being unrelated to serious art production; blotting or shaking a brush over a page created "modern art".
2) The pencil seemed a favorite means of expression - perhaps because "mistakes" could be altered with an eraser.
3) There was a strong tendency to draw forms that set with peer approval. (Cars for boys, animals and nature for girls.)
4) The few children who had had special art lessons

outside the public school level showed no significant difference in the quality of their productions of artwork in the classroom.

5) For the adolescent, art consisted of the world around them: fire hydrants, lightposts, buildings, cars, animals, etc. For boys there was an emphasis on mechanized objects; for the girls, nature.

6) No common technique was noted in the sketches of the students. Some were large and bold while others were drawn small and timidly. There was a desire for an abundance of details (3, pp. 7-8).

One characteristic of the dyslexic child is that he is of average or above average intelligence. It seems worthwhile to note that in another study done by Grossman (7) in which he investigated relationships among children's perceptual styles, drawing skills, and certain creative abilities, that he found correlations between realistic drawings and intelligence. When the drawings in his study were rated on a basis of accuracy of representation (realism), the correlation with measure of intelligence was higher than when the drawings were rated on an aesthetic basis only. This suggested that correlations between children's drawings and intelligence tests are probably related to their ability to observe accurately and recall detail. The dyslexic child's difficulty in observing letters and words (symbols) correctly and in retaining memory of them presents a different problem than in

observing an object which represents exactly what it is. This could seem to be a factor in why dyslexic children can draw realistically at the adolescent stage when they cannot read or write with ease. Similarly, research by Witkin (21) indicates that a child's perception influences his ability to accurately perceive environmental detail, i.e., "the more analytically oriented child has more accurate perception" (21, p. 52). According to some researchers in the field of dyslexia, another characteristic of the dyslexic child is, in many cases, his ability to think logically (analytically) which seems to be evidenced by the high percentage of such children who are exceptional in math and science.

In summary, research indicates that the adolescent is at the stage of development in which he desires to render drawings realistically, to make what he draws look "right", and to abandon the use of symbols for expression in his drawings that he used as a child. He is interested in the world around him and usually considers "abstract" art not serious or valid. He wants to develop more complex techniques and begins, often for the first time, to become critically aware of his artwork, preferring it to be like that of his peers.

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CHAPTER III

METHODS AND PROCEDURES

Statement of Problem

It has been my personal observation in teaching junior high school students that dyslexic children seem to possess a high degree of proficiency in the area of realistic drawing, realism being defined as accurate representation of proportion. This observation prompted me to want to investigate further the drawing abilities of dyslexic students and then compare them with the drawings of non-dyslexic children.

The purpose of this pilot investigation was to compare realistic drawings from children with dyslexia to discover if there are any significant differences in the drawing abilities of the two groups. More specifically, the questions to be examined are

1) Is there a significant difference in the ability to render realistic drawings between the two groups as evidenced in three standardized drawing tasks?
2) Is the early adolescent child with dyslexia better able on the whole to render a drawing more realistically (accurately) than the early adolescent child who does not have this reading problem as evidenced in three standardized drawing tasks?

Based on these concerns, the following hypotheses were formulated:

1) The adolescent child with dyslexia is better able on the whole to render realistically a stillife drawing in a standardized drawing task than the adolescent child without dyslexia.
2) The adolescent child with dyslexia is better able on the whole to render realistically a contour drawing in a standardized drawing task than the adolescent without dyslexia.
3) The adolescent child with dyslexia is better able on the whole to render realistically a perspective drawing in a standardized drawing task than the adolescent without dyslexia.

Sources of Data

Subjects selected for the study were from the Bedford Junior High School in the Hurst-Euless-Bedford School District, Bedford, Texas. The school has a developmental reading program to which students with severe reading problems such as dyslexia are referred. A random sample was taken from the seventh, eighth, and ninth grades. The group of dyslexic students was taken from the five classes in developmental reading and the group of students without dyslexia was randomly selected from other available classes. The age group ranged from the seventh grade through the ninth grade, with five ninth graders in each group, five eighth graders in each

group, and ten seventh graders in each group. The total number of children in the sample studied was fifty and included twenty-five dyslexic students and twenty-five non-dyslexic students. Some of the students in the dyslexic group had been diagnosed clinically; however, all had been diagnosed by the two special reading teachers in the school, both of whom are learning disability certified.

Except for an equal distribution of students' grade levels in the respective groups, it was not possible to equalize the groups or pair the subjects in relation to other variables. Therefore, the study can be viewed only as a pilot investigation, and the findings must be viewed with some reservation.

Methods of Data Collection

The data were collected during April and May of 1975. Three standardized drawing tasks were devised and systematically administered to the subjects in groups no larger than ten students at a time. Every effort was made to standardize the conditions during each administration. The following instructions were given:

> Today you will be asked to participate in three drawing activities. Your drawings will be compared with other students' drawings in your age group. Your names will not be used in this study, and your grade in class will not be affected. Your drawings will be looked at for their "realism" meaning that you should try to make your drawings seem as "life-like" and "real" as you can. You will each be given a drawing pencil and paper. Please listen to the directions for each drawing carefully and ask any questions that you feel you need to.

1. Still life--For this first drawing, you will draw the group of objects that is placed in front of you on the table. (These consisted of a bottle, a woven straw ladle, a rolling pin, and a woven piece of material.) Draw what you see as well as you can and remember to make your drawing as "realistic" as you can. First, put your name on the back of the paper in the upper right hand corner. You will be given twenty minutes for this drawing. If you feel that you have finished before the time is up, please sit quietly. If you cannot finish your drawing, that is not important. Does anyone have a question?

2. Contour--A contour drawing is one in which you use a continuous pencil line to outline the edge of whatever you're drawing. Concentrate on the object that you are drawing without looking at the paper. One way to think of it is to pretend that your eyes are guiding your hand. (A contour drawing was demonstrated at this point) The drawing will probably look strange and distorted to you, but this is natural.

   You will draw the person sitting before you. You can begin the drawing anywhere on the paper, but remember that once you start, you should not lift the pencil from the paper. Since this is a line drawing you do not need to add shading or details. Before you begin, write your name in the upper right hand corner on the back of the paper. You will have fifteen minutes for this drawing. Are there any questions? (A student model was used for this drawing)

3. Perspective--For this last drawing, you are asked to draw the box on the table. Draw how you see the box and try again to make it look as real as possible. You do not need to include the table although you may if you wish. You will be given ten minutes for this drawing. Before you begin, put your name on the back of the paper as you did before. Are there any questions?

Rulers were also available for those who wished to use them on the perspective drawing.

Analysis of Data

The collected drawings were evaluated by an expert panel comprised of five art educators, all of whom were in a teaching position at the time. The art background of the educators are presented in Figure 1. Included as the evaluators were two college art educators and three public art teachers of both the elementary and secondary levels.

The test drawings were divided into three groups of fifty each: one group of still-life drawings, one group of contour drawings, and one group of perspective drawings. The students' names which had initially been placed on the backs of the papers were coded by number onto a master list. The corresponding number was then placed on the front of the paper. The drawings by the dyslexic children were randomly mixed with the drawings by the other students. Therefore, the evaluators were not aware which drawings were made by the dyslexic students and which were not.

TABLE I

BACKGROUND OF ART EDUCATORS

Judge	Teaching Position	Major, Minor
1	Elementary	Education, art
2	Secondary, college	Fine Art
3	Secondary	Art, education
4	Secondary	Fine art, education
5	College	Fine art, education

Before making the judgments, each evaluator read the directions which had been given the students and was given a sheet of directions (see Table 2). Each evaluator was briefed on the purposes of the study.

Each judge individually recorded his or her response for each drawing on an evaluation sheet (Table 3), utilizing the following criteria

1) very realistic for the age group represented,

2) more realistic than average for age group represented,

3) average in realism for the age group represented,

4) below average in realism for age group represented,

5) not acceptable for the age group represented.

The reliability of the judges' ratings was determined by utilizing a Pearson's Product Moment Correlation. This method establishes the correlation of variables, such as the ratings

on two different scales or the scores on two different tests. After these correlations were completed, the drawings by the dyslexic students were compared with the drawings by the non-dyslexic students. Because underlying assumptions for the t-test could not be met, i.e., normal distribution of the dependent variable, and equal variances for the populations, the Mann-Whitney U-Test was utilized. The Mann-Whitney U-Test is a nonparametric test that is especially useful with small samples (1). It requires that the measures used be continuously distributed and that the data be suitable for ranking, as was the case with the data in this study. The test is based on the assumption that, if the total set of scores for two groups are ranked together (as though the groups were a single group), there will be much intermingling of the ranks for the two groups whenever their values are similar. However, if one group's scores significantly exceed the other, then most of the higher group's rankings will be higher than those of the lower group. The value of U is calculated by concentrating on the lower-ranked group and determining the number of ranks of the higher group that fall below the lower group. The lower the value of U, the more significant the difference between the groups will be.

On page 31 are reproduced the instructions given to the judges, and on page 32 is a sample of the evaluation sheet which each judge completed.

Definition of Terms

Dyslexia--A learning disability which prevents a child from reading adequately even though he is of average intelligence, or in many cases, above average intelligence, has adequate vision and hearing, adequat emotional adjustment, and adequate motor integration.

Realistic drawing--A drawing possessing accurate representation of proportion and/or detail.

Contour drawing--For the purposes of this study a continuous line blind contour line drawing was used as one of the drawing tasks. A continuous line blind contour drawing requires the student to draw a continuous line around the edges of the forms which he sees, without lifting his pencil from the page and without looking at his paper. Details within the contour edge are drawn by overlapping lines.

Directions for Evaluators

First read the typed directions which were read to the students before they began. Then scan the group of drawings which you were given to get an overall impression of the kind of work which was done by the students. You will be judging the drawings as follows:

Still-life drawing--Rate this from the standpoint accuracy of proportion in the objects used, use of shading (value), use of appropriate detail, and any other factors which you consider

to contribute to "realism" (accurate rendering).

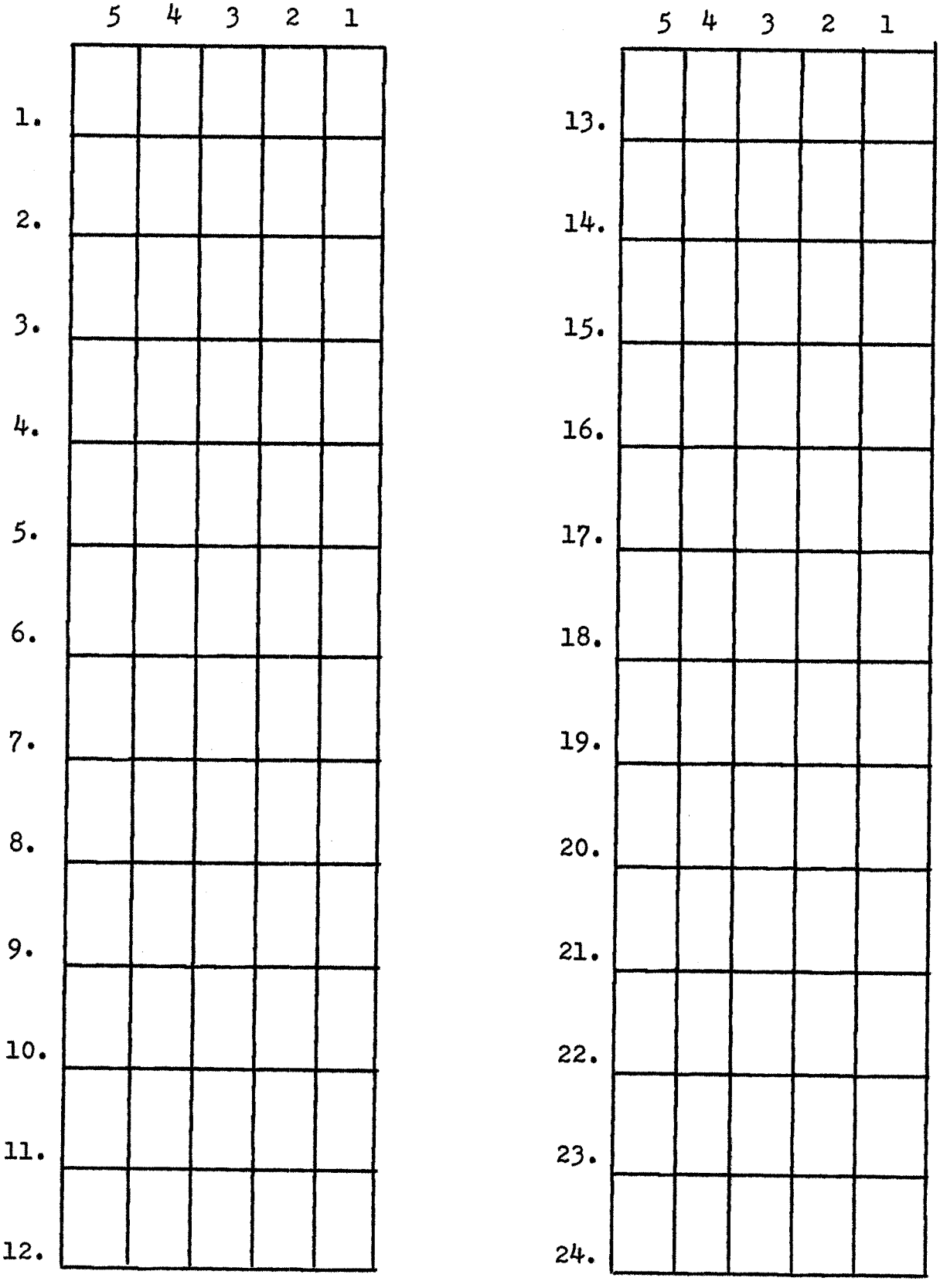
Contour drawing--Judge this drawing from the standpoint of accuracy of proportion in the human figure and use of detail.

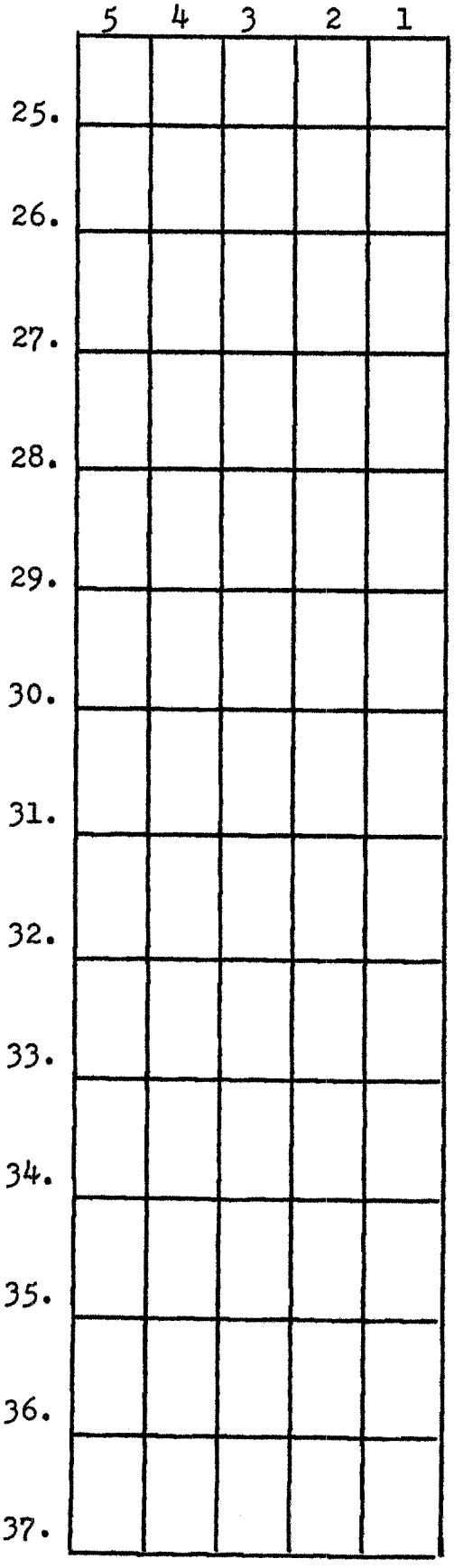
Perspective drawing--Rate this drawing for accuracy of proportion and appropriate shading, if any.

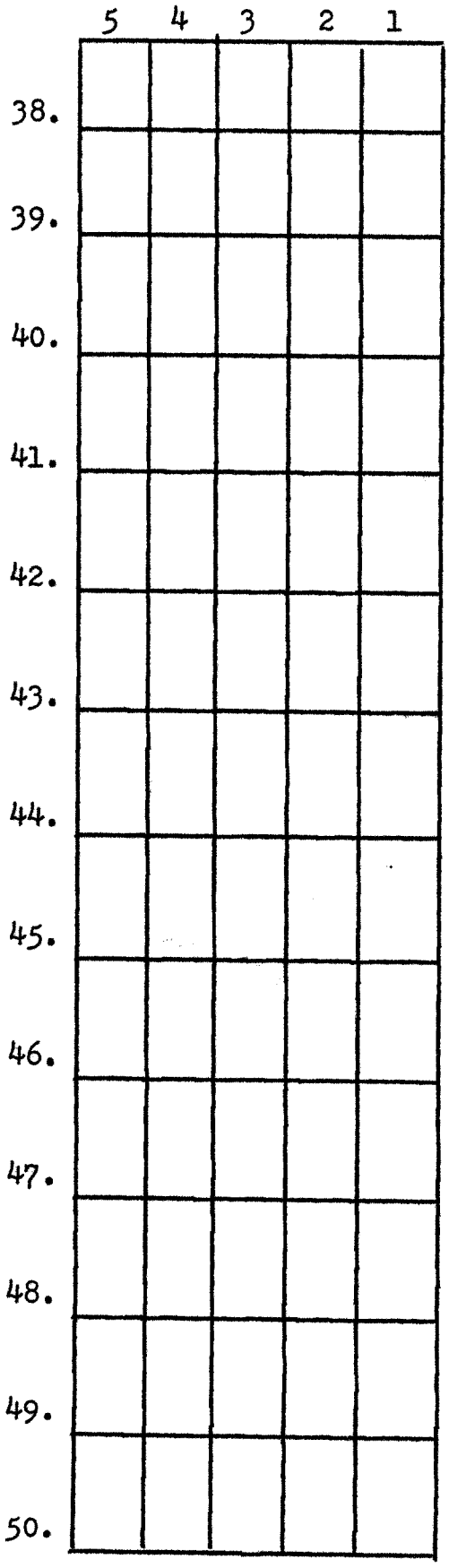
Each drawing is numbered on the front. These numbers correspond with the numbers on the judging sheets. You will rate the drawings on a scale of 1--5 on the following criteria:

1 - Very realistic for the age group represented
2 - More realistic than average for age group represented
3 - Average in realism for the age group represented
4 - Below average in realism for age group represented
5 - Not acceptable for the age group represented

Evaluation Sheet







Type of drawing_____

Judge No._____

CHAPTER BIBLIOGRAPHY

1. Siegal, Sidney, Nonparametric Statistics for the Behavioral Sciences, New York, McGraw-Hill Book Co., 1956.

CHAPTER IV

STATISTICAL ANALYSIS

The data in this investigation were accumulated for the purpose of testing specific hypotheses as stated in Chapter 3. These hypotheses concerned comparisons between adolescent dyslexic subjects and adolescent non-dyslexic subjects in regard to three standardized drawing tasks: a realistic stillife drawing, a contour drawing, and a perspective drawing. The findings resulting from the statistical analysis are presented in this chapter.

The three standardized drawing tasks were evaluated on the basis of accuracy of representation, i.e., realistic quality. This was determined by five judges who independently rated the results of the drawing tasks. The ratings were made on the basis of a five-point scale with 1 representing the most realistic and 5 representing the least realistic.

Utilizing the Pearson Product Moment Correlation, each judge's rating of each drawing task was compared with every other judge's rating. The correlations ranged from a low of .264 to a high of .990 (see Tables 2-3). Because of the relatively low correlations generally, it should be considered that by its very nature, evaluation of artwork retains a degree of subjectivity, even in the judgment of accuracy of representation. The correlations, as might be suspected, were highest

in the evaluations of the perspective drawings, in which a drawing is either proportionally correct or incorrect.

A score for each drawing was calculated by combining and averaging the judges' evaluations for each drawing. For example of the drawings for each group, see Appendix. The scores were then utilized to compare the two groups. The Mann-Whitney U-Test was used to test the hypotheses stated in Chapter III and which are restated in the null form for the purposes of statistical analysis. They are as follows:

1) There is no significant difference in the abilities of the dyslexic adolescent and the non-dyslexic adolescent to render a stillife drawing realistically.
2) There is no significant difference in the abilities of the dyslexic adolescent and the non-dyslexic adolescent to render a contour drawing accurately.
3) There is no significant difference in the abilities of the dyslexic adolescent and the non-dyslexic adolescent to render a perspective drawing realistically.

To test each of these hypotheses, the Mann-Whitney U-Test was applied. The two sets of scores (from both the dyslexic and non-dyslexic subjects) were combined for each drawing task and then ranked, with each rank identified according to its sample (See Tables 4-6). The following procedure was used to compute U and to check for significance between samples:

Step 1: The measures of the two groups were combined

and ranked, using subscripts a and b to identify the ranks according to sample.

Step 2: The sum of the ranks of Sample A and Sample B was determined.

Step 3: The Ua and Ub values were computed, and the smaller value represented U.

Utilizing this procedure, a z value was calculated for each set of data, using the following formula:

$$z = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{(n_1)(n_2)(n_1 + n_2 + 1)}{12}}}$$

The computed z value for the stillife drawing data was .9701413. Reference to a table of Probabilities associated with values of extremes or observed values of z in the normal distribution (1, p. 247). revealed that $z \geq .9701413$ has a two-tailed probability under Ho of $p < .3320$. Since the p is greater than $\alpha = .05$, the null hypothesis was accepted and the conclusion was that there are no significant differences between the ability of dyslexic and non-dyslexic adolescents to render a stillife drawing in a realistic fashion.

The computed z value for the contour drawing data was .5917869. Reference to a table of Probabilities associated with values of extremes or observed values of z in the normal distribution revealed that $z \geq .5917869$ has a two-tailed probability under Ho of $p < .5532$. Since the p is greater

than $\alpha = .05$, the null hypothesis was accepted and the conclusion was that there are no significant differences between the ability of dyslexic and non-dyslexic adolescents to render a contour drawing in a realistic fashion.

The computed z value for the perspective drawing data was -1.78. Reference to a table of Probabilities revealed that $z \leq -1.78$ has a two-tailed probability under Ho of $p < .0750$. Since the p is greater than $\alpha = .05$ the null hypothesis was rejected, it was concluded that there is no statistically significant difference between the ability of the dyslexic and non-dyslexic adolescent to render realistic perspective drawings.

In view of these findings, it can be stated that hypotheses one, two, and three cannot be supported; in other words, there is no significant difference between dyslexic and non-dyslexic adolescents in their ability to render realistically either stillife, contour drawings or perspective drawings.

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1. Siegal, Sidney, Nonparametric Statistics for the Behavioral Sciences, New York, McGraw-Hill Book Co., 1956.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study was initiated in order to determine if there are any significant differences in the realistic drawing abilities of dyslexic adolescent students and non-dyslexic adolescent students. Because no available research in this area could be located, it was hoped that one outcome of this investigation would be the initial discovery of differences or similarities, which in turn might lead to further study in this specific area.

The interpretations and conclusions, which are included in this chapter, are developed from the analysis and summarization of the data of the entire study. The following hypotheses stated in the null were tested by the application of the Mann-Whitney U-Test and accepted or rejected:

Hypothesis One: There is no significant difference in the abilities of the dyslexic adolescent and the non-dyslexic adolescent to render a still-life drawing realistically. This hypothesis was accepted.

Hypothesis Two: There is no significant difference in the abilities of the dyslexic adolescent and the non-dyslexic adolescent to render a contour drawing realistically. This hypothesis was also accepted.

Hypothesis Three: There is a significant difference in the abilities of the dyslexic adolescent and the non-dyslexic adolescent to render realistically a perspective drawing. This hypothesis was also accepted.

The group of dyslexic and non-dyslexic students were selected from an existing junior high school population of a suburban junior high school. The twenty-five dyslexic students, representing grades seven through nine, were chosen from the developmental reading program within the school upon the recommendation of the two specialized reading teachers. The twenty-five non-dyslexic students were selected at random from other available classes. They also represented grades seven through nine.

All subjects received the same oral instructions and participated in three standardized drawing tasks, including a realistic still-life drawing, a realistic contour drawing, and a realistic perspective drawing. Each set of drawings were then numbered and arranged before being presented to a panel of evaluators. The evaluators individually judged each drawing on a scale of 1--5. They were instructed to judge on a basis of realism which was agreed upon as being accuracy of representation.

After the Pearson-Product Moment Correlation Test was used to determine the reliability of the evaluator's judgments, the Mann-Whitney U-Test was applied to discover if any significant differences existed between the two groups of students on

each of the drawing tasks. The results indicated that there were no significant differences in the abilities of the two groups to render realistically either the still-life drawing, the contour drawing, or the perspective drawing.

Conclusions

Because of their reading problems, it might be initially suspected that the dyslexic adolescent would have difficulty within the realm of realistic drawing, especially if the dyslexia is a problem of perception or the transferring of what is seen to what is put down on paper. The results of this study would not indicate such. Since there were no significant differences in the abilities of the dyslexic adolescent and the non-dyslexic to render the still-life drawing, the contour drawing or the perspective drawing, this point itself is of interest because of the incongruity between the dyslexic student's reading ability, in which words are often perceived as backwards or upside down, and their drawing performance, in which the objects used in the standardized drawing tasks were drawn facing the correct direction and placed as nearly correct in proportions as the drawings from the other group of non-dyslexic students. One might speculate from the results of this study that a reading problem such as dyslexia does not stem from a general perceptual deficiency, but perhaps with the forms of printed words or letters. Also, the results tend to support another theory concerning the causes of dyslexia--that there could be a difficulty in hearing correctly the

sound of a letter, which would be a handicap for the dyslexic student in knowing how a word should be read or written.

Recommendations

Based upon the analysis of this initial study, it is hoped that more investigation in this area will yield more conclusive answers to the question of what is the basis of dyslexia. It is also indicated by this study that the dyslexic adolescent is able to draw as realistically as the non-dyslexic adolescent. Since realistic drawing at the adolescent's stage of development is what is usually strived for, the dyslexic should be encouraged to pursue art as an elective in the upper grades for both the benefit of his feeling of personal success and the possibility that art itself might be an appropriate course to follow in later life.

TABLE II

STILL LIFE

	1	2	3	4
2	.476			
3	.670	.804		
4	.468	.395	.490	
5	.264	.286	.394	.484

TABLE III

CONTOUR

	1	2	3	4
2	.589			
3	.605	.647		
4	.495	.583	.648	
5	.497	.636	.577	.470

TABLE IV

PERSPECTIVE

	1	2	3	4
2	.587			
3	.706	.990		
4	.851	.697	.719	
5	.582	.497	.623	.628

TABLE V

STILL-LIFE DRAWINGS

Dyslexic Students	Average Judge's Rating	Rank	Non-Dys. Students	Av. J.R.	Rank
1	1.2	1	3	1.6	6.5
2	1.4	2	4	1.6	6.5
5	1.6	6.5	6	1.6	6.5
7	1.6	6.5	10	1.6	6.5
8	1.6	6.5	12	1.8	13.5
9	1.6	6.5	13	1.8	13.5
11	1.8	13.5	16	1.8	13.5
14	1.8	13.5	17	2.0	18.5
15	1.8	13.5	19	2.0	18.5
18	2.0	18.5	20	2.0	18.5
21	2.2	22.5	23	2.2	22.5
22	2.2	22.5	28	2.4	26.5
24	2.2	22.5	29	2.6	30.5
25	2.4	26.5	30	2.6	30.5
26	2.4	26.5	31	2.6	30.5
27	2.4	26.5	33	2.8	33.5
32	2.6	30.5	35	3.0	37.5
34	2.8	33.5	37	3.0	37.5
36	3.0	37.5	38	3.0	37.5
39	3.0	37.5	40	3.0	37.5
41	3.2	41.5	46	3.8	46
42	3.2	41.5	47	4.0	47
43	3.4	43.5	48	4.2	48.5
44	3.4	43.5	49	4.2	48.5
45	3.6	45	50	4.4	50

TABLE VI

CONTOUR DRAWINGS

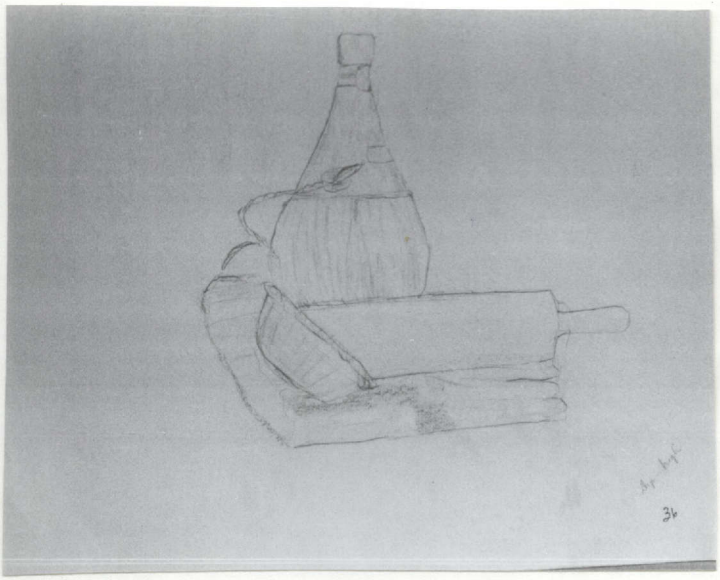
Dyslexic Students	Average Judge's Rating	Rank	Non-Dys. Students	Av. J.R.	Rank
1	1.0	3.5	3	1.0	3.5
2	1.0	3.5	4	1.0	3.5
5	1.0	3.5	6	1.0	3.5
7	1.2	8	10	1.4	11.5
8	1.2	8	12	1.4	11.5
9	1.2	8	13	1.4	11.5
11	1.4	11.5	16	1.6	15.5
14	1.6	15.5	17	1.6	15.5
15	1.6	15.5	19	1.8	19.5
18	1.8	19.5	20	1.8	19.5
21	1.8	19.5	23	2.0	25
22	2.0	25	28	2.0	25
24	2.0	25	29	2.4	30
25	2.0	25	30	2.4	30
26	2.0	25	31	2.4	30
27	2.0	25	33	2.6	33.5
32	2.6	33.5	35	2.6	33.5
34	2.6	33.5	37	2.8	36.5
36	2.8	36.5	38	3.0	39.5
39	3.0	39.5	40	3.0	39.5
41	3.0	39.5	46	3.6	45.5
42	3.2	43	47	3.8	47
43	3.2	43	48	4.0	48
44	3.2	43	49	4.8	49
45	3.6	45.5	50	5.0	50

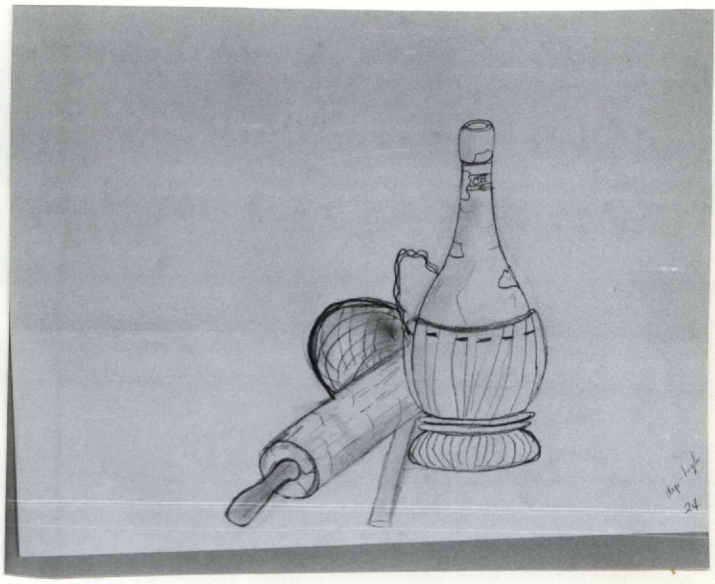
TABLE VII

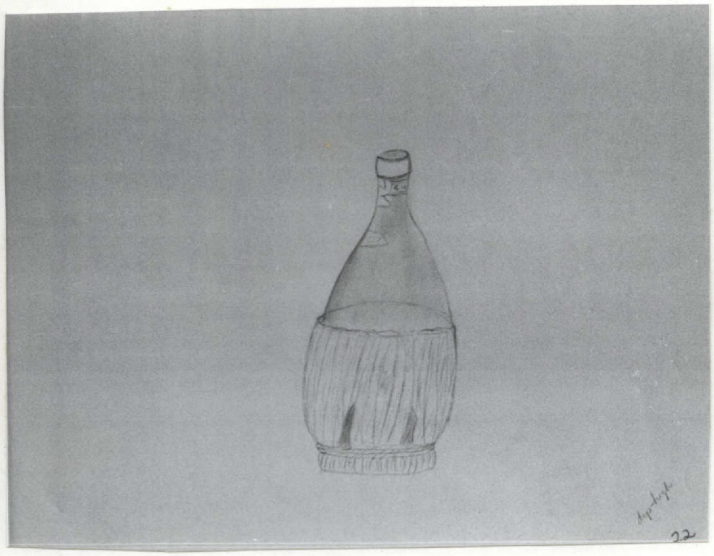
PERSPECTIVE DRAWINGS

Dyslexic Students	Average Judge's Rating	Rank	Non-Dys. Students	Av. J.R.	Rank
1	1.0	1.5	3	1.2	5
2	1.0	1.5	4	1.2	5
5	1.2	5	6	1.2	5
7	1.2	5	10	1.4	9.5
8	1.4	9.5	12	1.6	12
9	1.4	9.5	13	1.8	16.5
11	1.4	9.5	16	1.8	16.5
14	1.8	16.5	17	1.8	16.5
15	1.8	16.5	19	1.8	16.5
18	1.8	16.5	20	1.8	16.5
21	2.0	21	23	2.0	23
22	2.0	23	28	2.2	27
24	2.0	23	29	2.2	27
25	2.2	27	30	2.4	30
26	2.2	27	31	2.6	32
27	2.2	27	33	2.6	32
32	2.6	32	35	2.8	34.5
34	2.8	34.5	37	3.2	36.5
36	3.2	36.5	38	3.4	38.5
39	3.4	38.5	40	3.6	40
41	3.8	43	46	4.0	47.5
42	3.8	43	47	4.0	47.5
43	3.8	43	48	4.0	47.5
44	3.8	43	49	4.0	47.5
45	3.8	43	50	4.0	50

Dyslexic--High







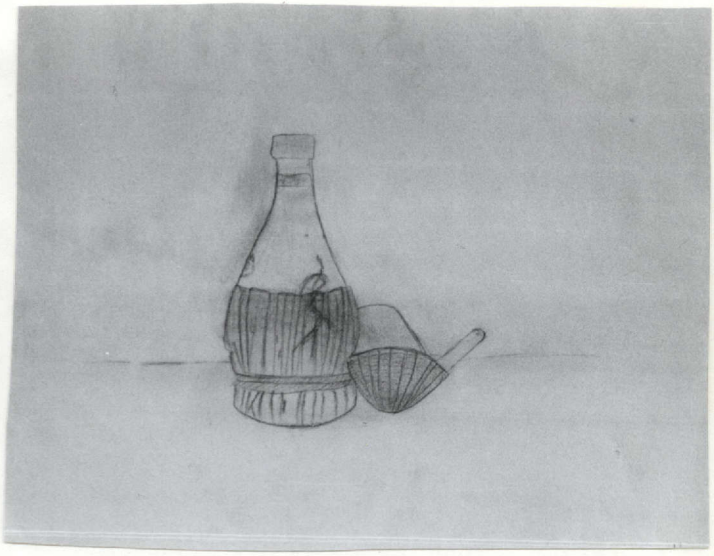
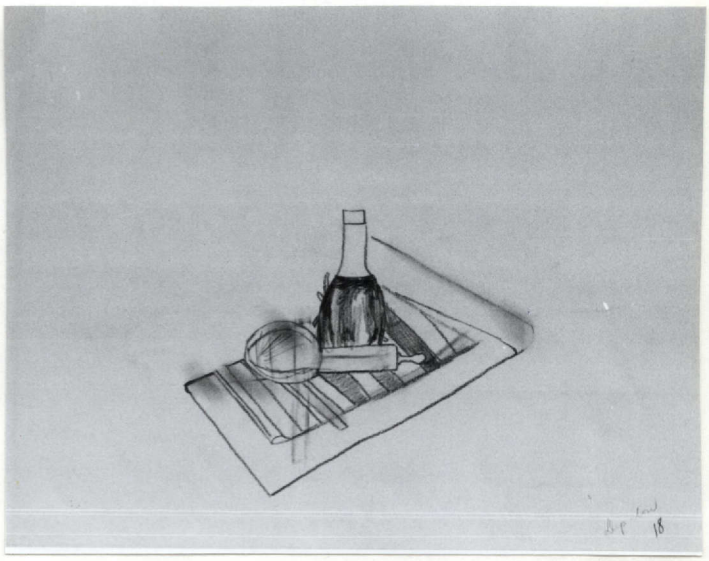
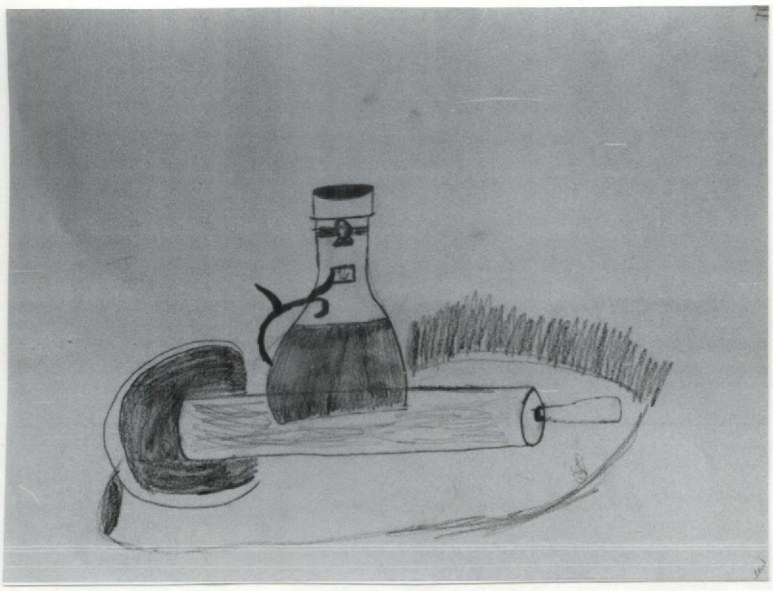


Fig. 1--Examples of both high and low ranked still-life drawings.

Dyslexic--Low





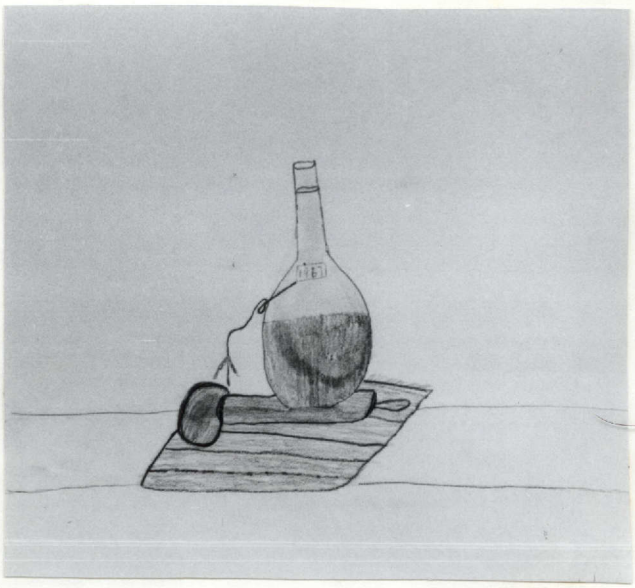
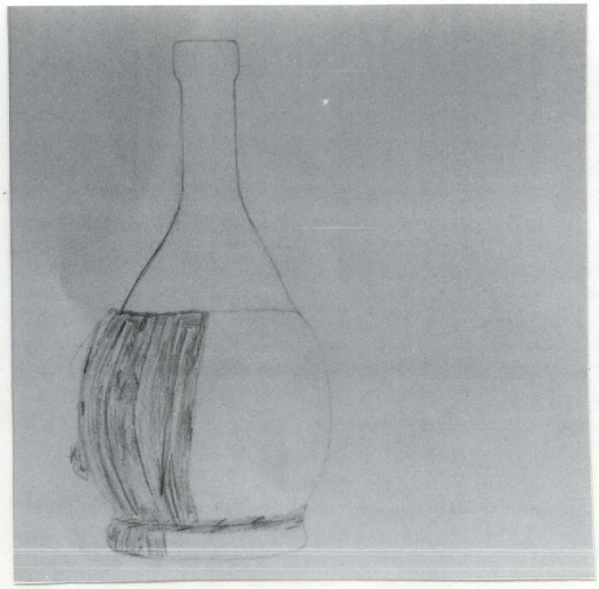
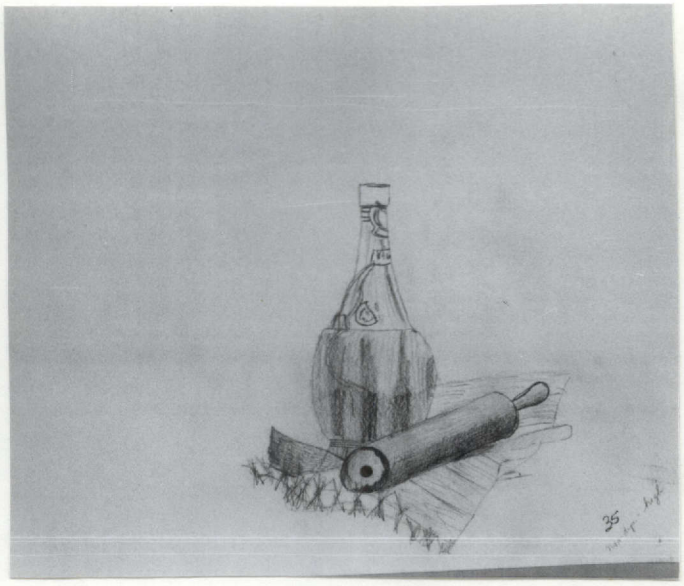


Fig. 2

Non-Dyslexic--High





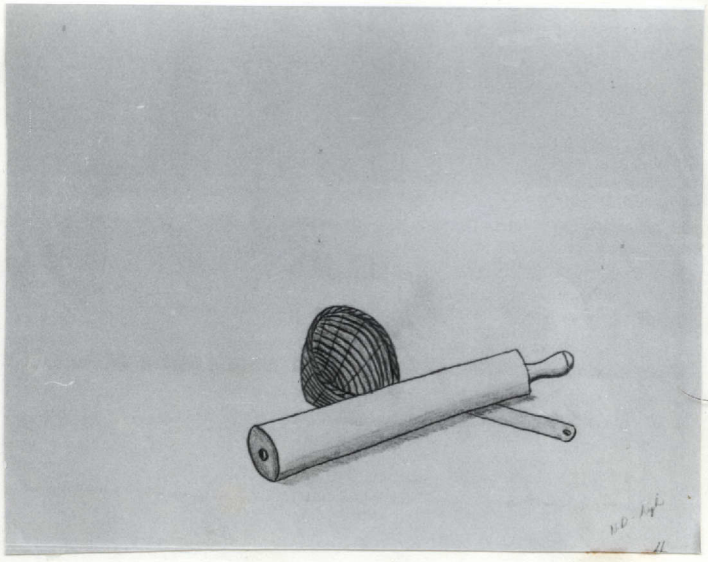
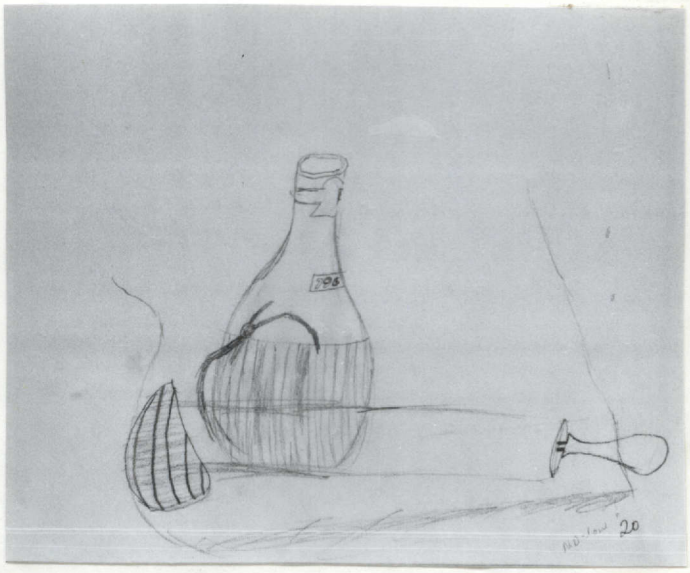


Fig. 3

Non-Dyslexic--Low



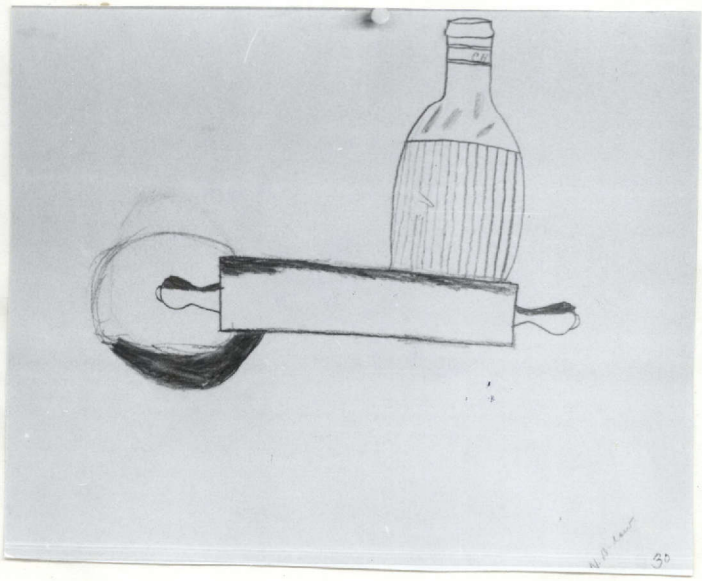
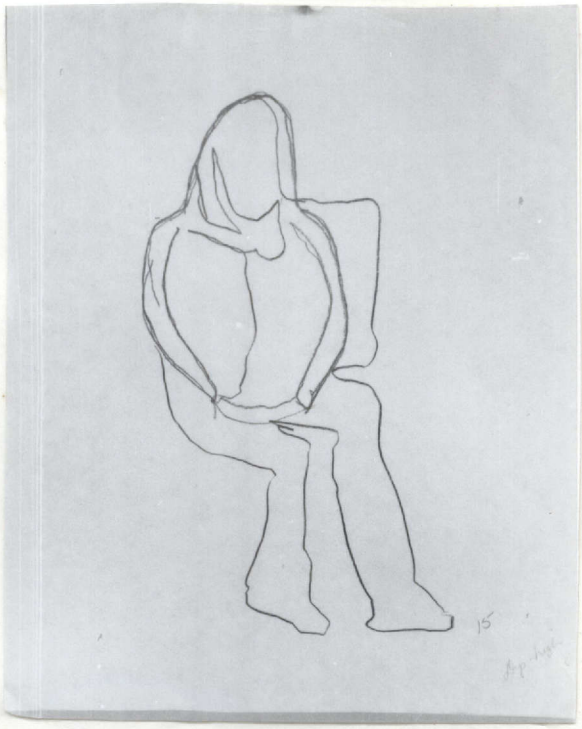


Fig. 4

Dyslexic--High



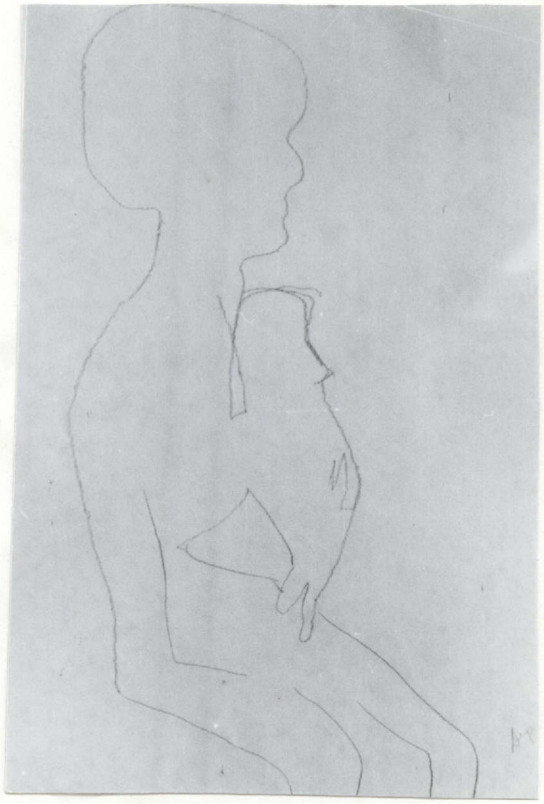
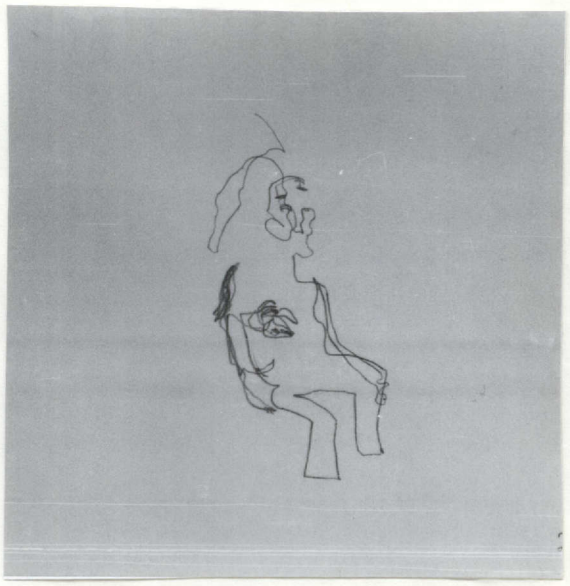
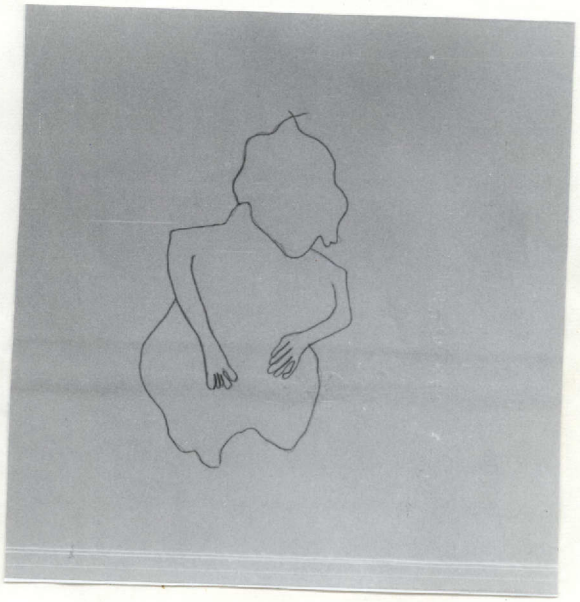


Fig. 5--Examples of both high and low ranked contour drawings

Dyslexic--Low





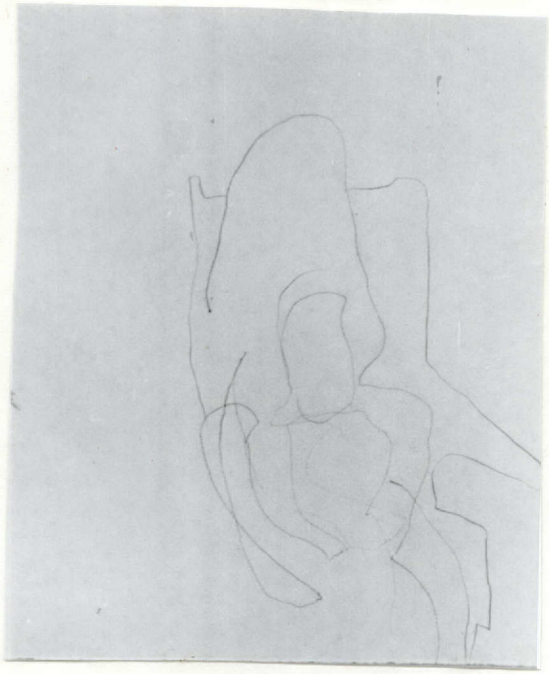
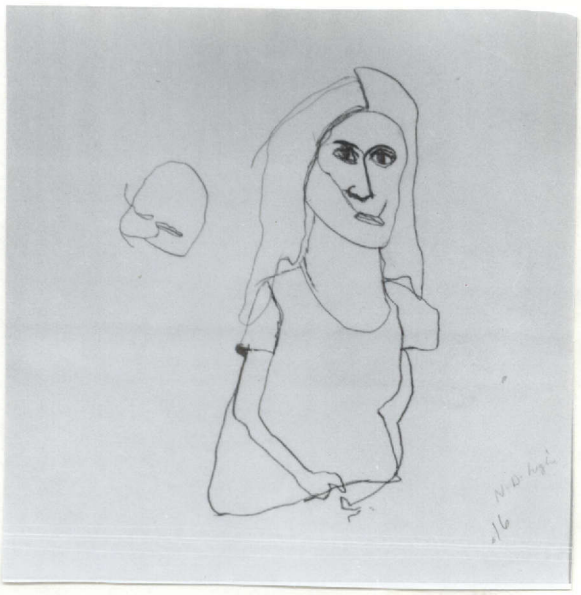
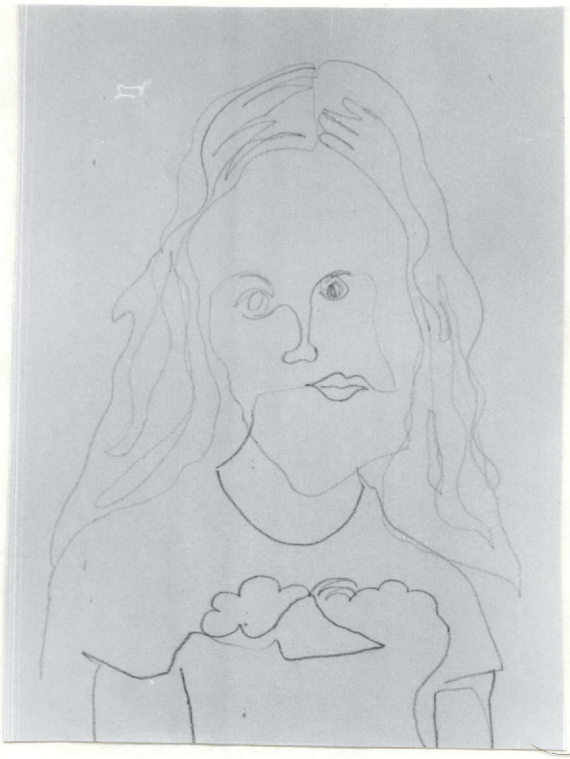


Fig. 6

Non-Dyslexic--High





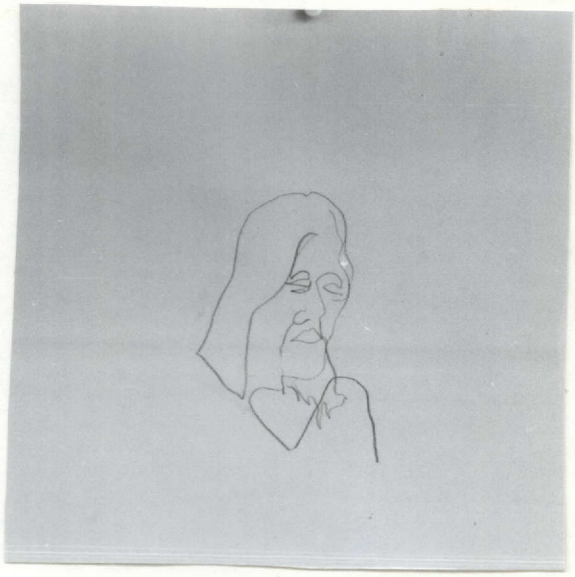


Fig. 7

Non-Dyslexic--Low

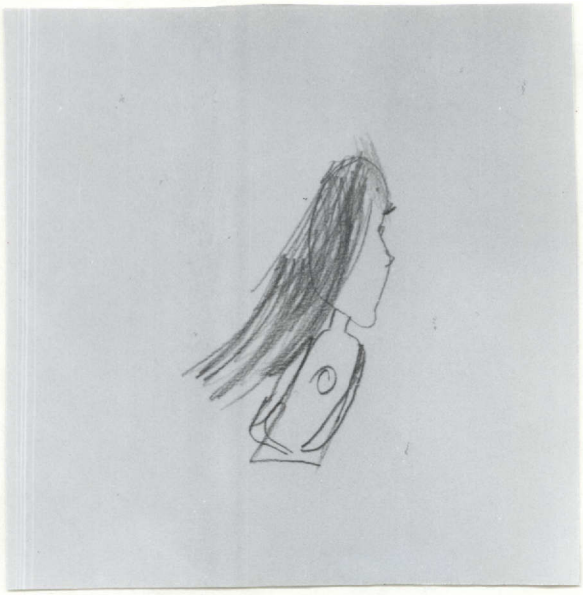
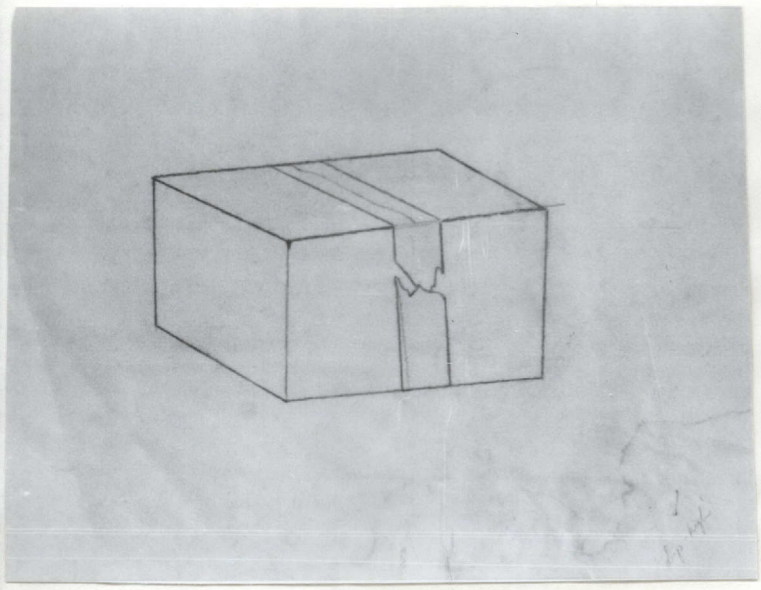
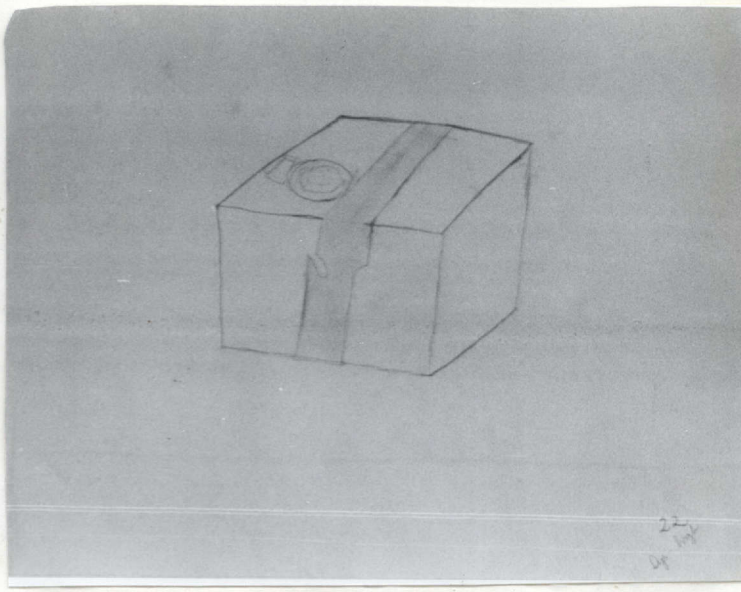
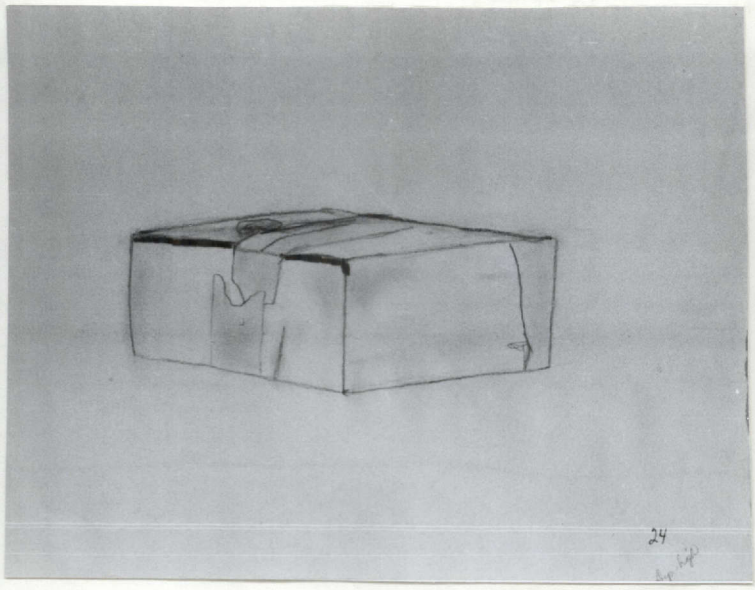


Fig. 8

Dyslexic--High







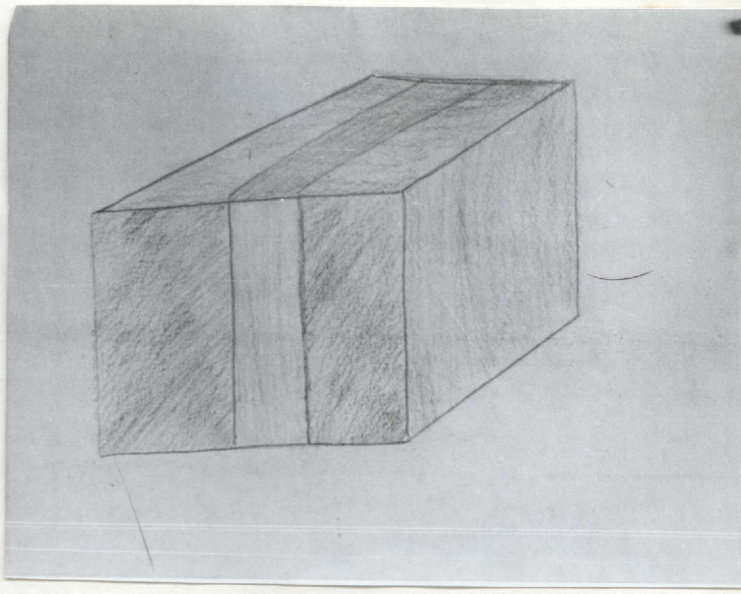
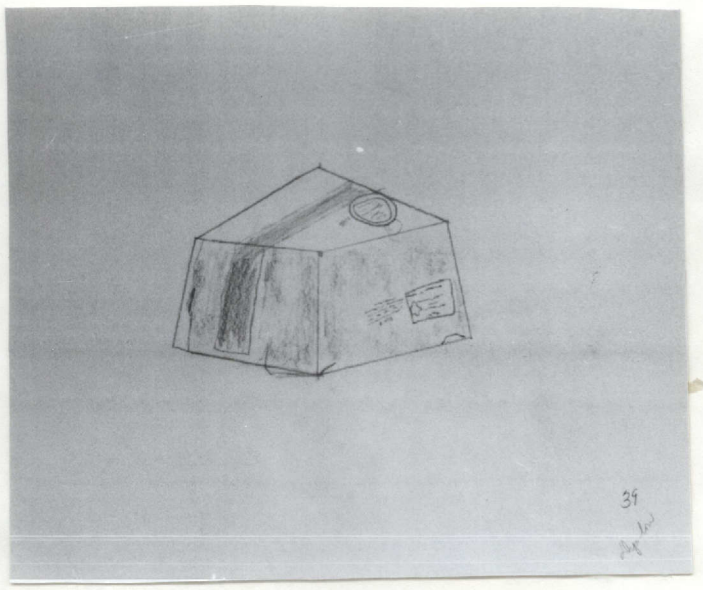
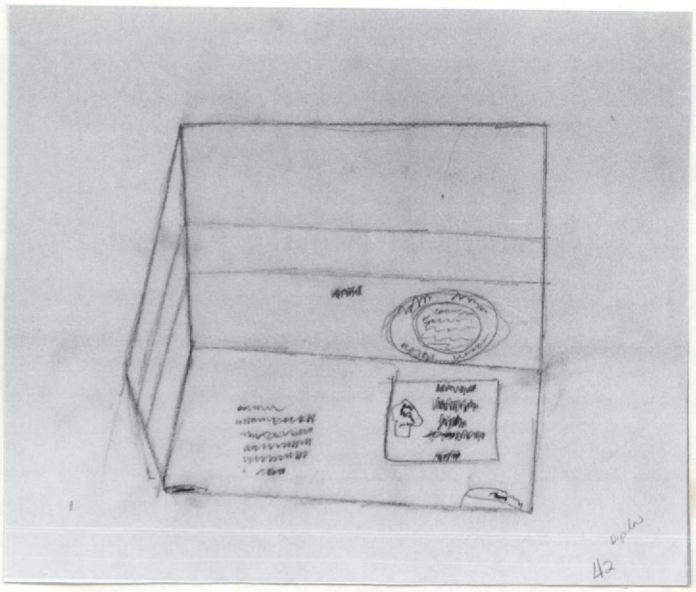
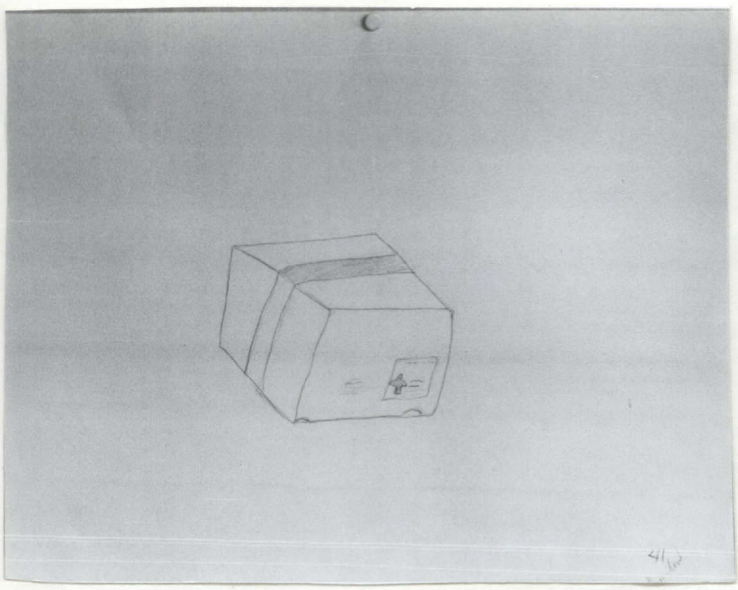


Fig. 9--Examples of both high and low ranked perspective drawings.

Dyslexic--Low







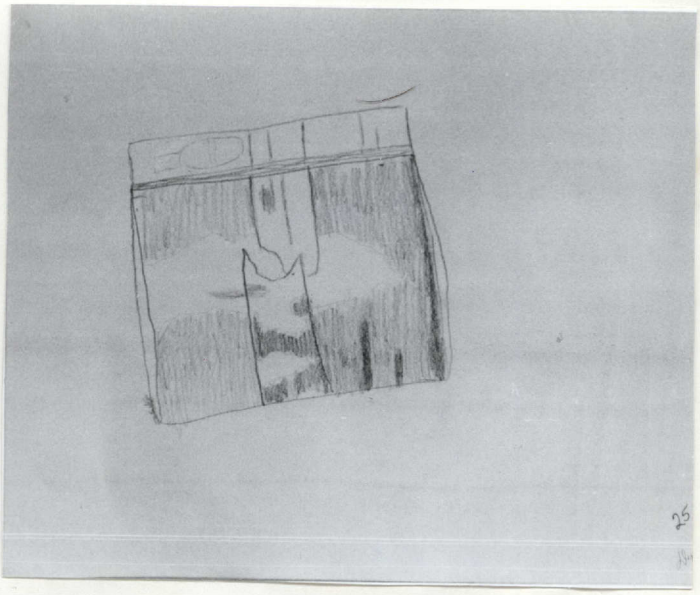
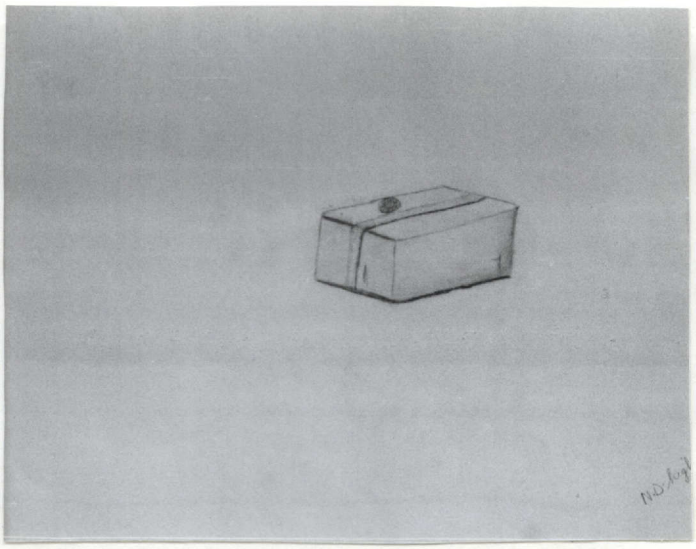
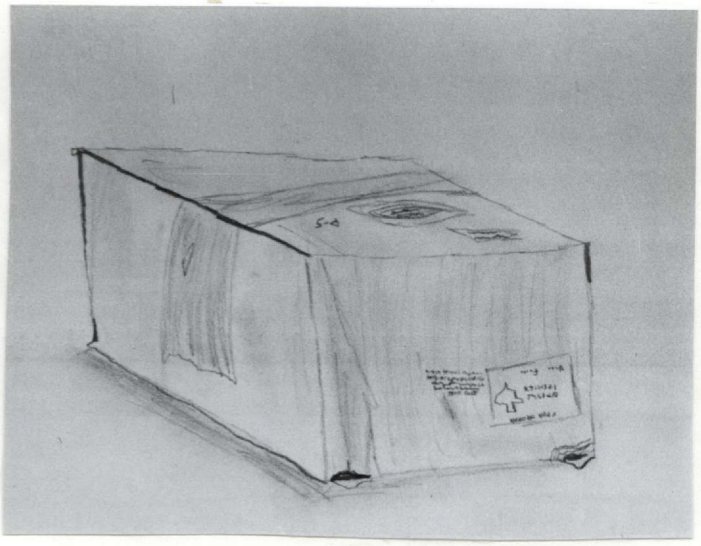
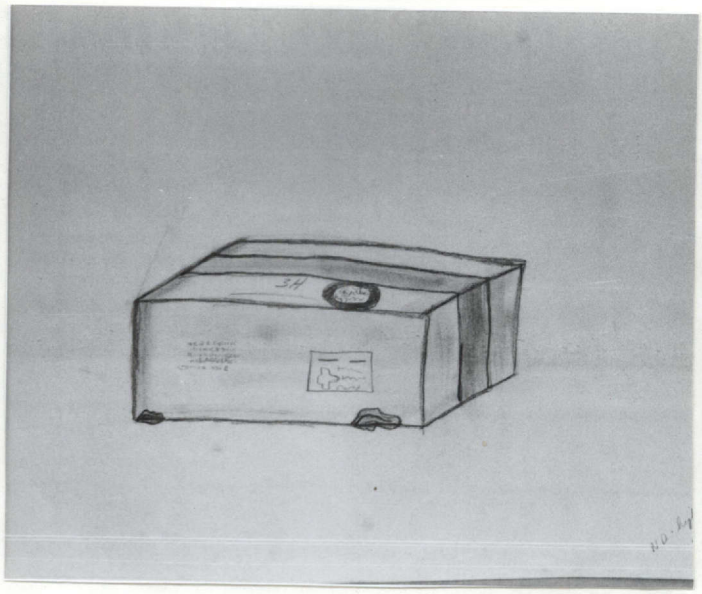


Fig. 10

Non-Dyslexic--High







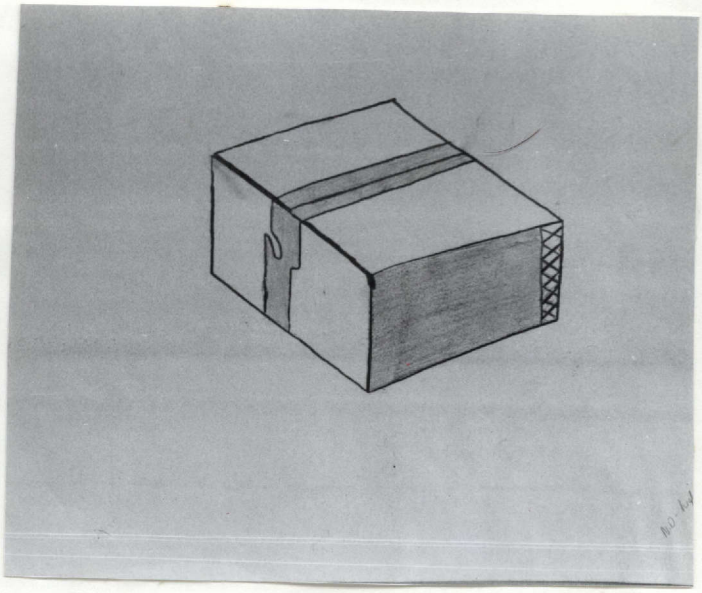


Fig. 11

Non-Dyslexic--Low

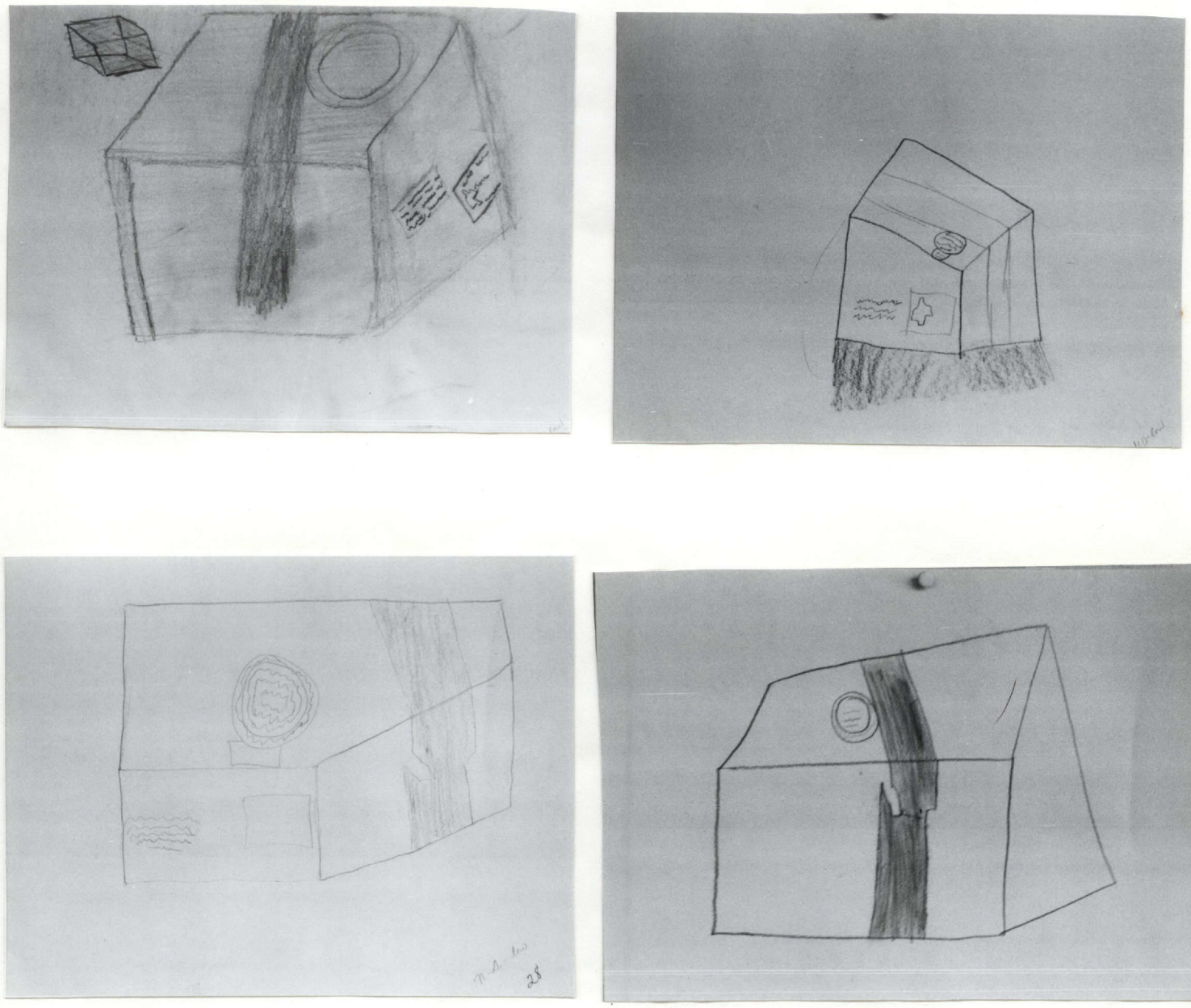


Fig. 12

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