THE EFFECT OF THE USE OF A SIX WEEKS VISUAL PERCEPTUAL TRAINING COURSE ON THE BEHAVIOR OF CHILDREN WITH LEARNING DISABILITIES

A DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN CHILD DEVELOPMENT AND FAMILY LIVING IN THE GRADUATE SCHOOL OF THE TEXAS WOMAN'S UNIVERSITY

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We hereby recommend that the dissertation prepared under our supervision by Rayma Ditson entitled THE EFFECT OF THE USE OF A SIX WEEKS VISUAL PERCEPTUAL TRAINING COURSE ON THE BEHAVIOR OF CHILDREN WITH LEARNING DISABILITIES

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (Continued)

CHAPTER I

INTRODUCTION

History has produced an extensive amount of literature, on the child and his development, enabling parents to follow the physical and emotional patterns of the growth of their child. Little has been left to the imagination. The effects of heredity and environment have been carefully examined and reveal a prototypical profile of the child as a developing organism in the American culture of today.

The development of the normal child can be readily identified and predicted. There are basically inherent patterns of normal growth and maturation in the average young male and female. Within certain limits he will walk, talk, ride a bicycle and attend school. Later he will join clubs and recognize the opposite sex. His behavior in the group tends to characterize his environment.

Out of the mass of children, however, there appears a large number who deviate from the normal profile. The characteristics which identify the normal child make it possible to recognize the child who does not conform to the normal patterns of development. This child is irregular because of genetic retrogression or as a result of prenatal, natal, or postnatal insult. Among the members of this group are those children with learning disabilities due to perceptual disorders.

REVIEW OF LITERATURE

The organism is surrounded by energy in various forms. According to Mueller (16), light and sound from numerous transmitting and reflecting sources impinge upon the sensitive receptor cells of the eye and ear. Mechanical pressures and heat activate the receptor cells of the skin, and airborne gases dissolve in the mucous lining of the nasal cavity. Movements of the organism itself, in response to these patterns of energy, in turn stimulate the deeply embedded receptors of the joints and muscles. Energy reaching the sensory areas from the environment, and generated by the organism's own activities, is transformed by the receptors and their associated structures and transmitted to the higher centers of the nervous system in the form of electrical impulses. Reception and coding of energy and its transmission through the nervous system pathways to the brain is the starting point for the discussion of perception in this paper.

Perception as an area of psychological inquiry can most usefully be thought of as the processes by which the individual maintains a contact with his environment. Boring (1) stated that to survive in an environment of physical objects and events the individual must continually adjust to the changing array of energy with which he is surrounded. The totality of processes involved in maintaining contact with this fluctuating energy array is perception.

It is important to realize, at this point, that there is no firm agreement on which data are more relevant to the understanding of perception. Discussion and research must be viewed from those sources relating to the area of perception being investigated.

Historical Background to the Study of Perception

Singling out particular investigations is arbitrary. There are certain experiments which have had a profound influence on the study of perception and on contemporary theories involving the approaches of child development and special educative procedures for children exhibiting perceptual disabilities. Some of these are presented here.

According to Boring (1), the measurement of sensory experiences began in 1830 with Weber's proposal that the just noticeable difference (JND) between two stimuli was a constant ratio of a standard stimulus against which comparisons were made. But, as Boring (1) stated, it was Fechner who in his _Elements of Psychophysics_ in 1860 named the basic measures of sensory experience and revised, then extended Weber's principle. Skramlik (23) argued that the intensity of a sensation (S) is a function of the logarithm of stimulus intensity (1) so that S=K log I, where k=a constant. He conceived the smallest intensity necessary for sensation (absolute limen) and the smallest difference between two intensities (difference limen) as a basic to the study of sensation as it pertains to perception.

Boring (1) stated further that man has been involved with the study of perception, in one form or another, since Heraditos, Fifth Century B. C., stated that "knowledge comes to man through the door of the senses." It might be said of Heraditos that he was the first person admitting to the belief that man had abilities which he could not explain. Seemingly he was exceptional in his vision since it was not until 1651 that this hypothesis was explored by Hobbs. Hobbs, Boring (1) stated, embraced the theory that there was no conception in man's mind which had not first, totally or by parts, been "begotten" upon the organs of sense.

Mueller (16) pointed out that Locke, in his Essay Concerning Human Understanding, proposed that ideas are learned rather than given. Locke advanced the view that the mind at birth is a blank page and that experience impresses its record on this "tabula rasa." All knowledge was thought of as reaching the individual through the sense organs. As a result there was an intensification of interest in the structure and functioning of the sense organs and the relative contributions of past experiences and innate processes to perceptual experiences.

Seemingly, the heart of the problem of perception was reached when scientists undertook to exhibit the transformation that the sensory basis undergoes in the making of a perceptive complex. Hopefully the transformation is not regarded as a genetic process of temporal development out of sensory material. Fantz (5) stated that the perception comes first in time; the sensation is the outcome of scientific abstractions. What is necessary, therefore, is to analyze psychologically the already formed perception, and to explicate the conditions under which the integration of the analytical factors obtain.

According to Geldard (9), it would be a mistake to suppose, because its origins are closely bound up with the study of sensation, that experimental psychology thereby has the sole proprietary right to this field. Any inventory, of the influences leading to experimental psychology's founding, must include the very considerable one exerted by studies of nervous functions. From the beginning, psychologists have been intensely interested in the workings of the nervous system, and with good reason since it is the "organ of mind" and, presumably, no fact concerning its operation is without some value or interest in aiding the interpretation of psychological data.

The years that were formative for experimental psychology were also significant for experimental physiology. Geldard (9) reported that the first years of the nineteenth century had seen revealed the most basic principles of operation of the nervous system; especially Sir Charles Bell's discovery that the spinal nerves were arranged in accordance with function, sensory fibers entering the posterior and motor fibers the anterior portions of the spinal chord. Morgan (15) stated that Bell's "law of forward direction" in the nervous system has been considered to be as fundamental as Harvey's discovery of the circulation of the blood. In 1822 Magendie joined Bell and, according to Mueller (16), within his theories concerning sensation, they found that the nerves are of two kinds: sensory, which lead to the posterior roots of the spinal chord, and motor, which lead from the anterior roots. This dichotomy of nervous action into sensory and motor reminded the physiologists that the mind's sensations were as much their business as the muscular movements. Interest then grew in the Bell-Magendie Law, and drew the fields of experimental psychology and physiology together, paving the way for the multi-disciplinary approach to perception.

Mueller (16) divided the sensory field into five areas by his doctrine of the specific energies of nerves. Aristotle had already made the division; but Mueller (16) gave physiological meaning to the difference by asserting that each sense has its own specific energy and can respond only with its own peculiar quality.

Nowhere in science, explained Titchener (26), is there content having more points of impingement on human interests than that provided by the senses of man. All knowledge, as the Sophists of ancient Greece knew, comes only through the senses, and those who would "know how to know" turn quite naturally to the contemplation of the senses as the originators of experience. "The eye," Locke noted in his Essay Concerning Human Understanding and described by Mueller (16), "whilst it makes us see and perceive all other things, takes no notice of itself," and it becomes the special business of the senses arranged about the circumference of Titchener's great "circle" to furnish the means whereby an understanding of the visual process--and those of the other senses--can be attained.

According to Shagrass (22), the range of interests brought to bear on sensation and the senses is of prodigious extent, especially vision. The study of what and how an individual sees is not alone the business of scientific man, though he is doubtless in the most favored position to supply a full and impartial description. The visual process is also of importance to man when considered medically, economically, artistically, politically, or educationally. Nor is the visual channel the sole one of import in human affairs. The fields of communication, entertainment, and education make almost incessant demands on the hearing apparatus. The housing and clothing industries are monuments to the cutaneous senses, just as food technologies are to the chemical senses. Little wonder, stated Carr (2), that philosophers throughout the ages, when they have not been exalting <u>Reason</u>, have been extolling <u>Sensation</u> as the very essence of <u>Truth</u>.

It is not too great an over-simplification to say that the genetic lines, in the history of thinking as described by Morgan (15), led eventually to modern scientific psychology and involved sensation, learning, and motivation. Overlapping and developmental irregularities emerged and grew with sensation first, and learning following close behind. According to Davis (3), it is difficult to say whether there may have been genetic necessity for this progression. It was natural for experimental psychology to emerge from British empiricism, and equally natural for empiricism to concern itself with sensation, the avenue by which experience gets into the mind. For the philosophers to understand experience it was necessary for them to describe it, and any description becomes analytical. In some ways British empiricism became sensationistic and elementistic, and that process was abetted by the coincidental emergence of sensory physiology. Since the field of physiology had established the distinction between sensory and motor nerves, it then became quite involved in the specification of the qualities that categorize the departments of sense. It followed that the physiological approach, as reported by Morgan (15), led to the sensory functions in the process of learning, and the area of psychology of learning became the concern of the philosophers and scientists.

The experiments described by Ittelson (13) set the pattern for most research on learning, appearing within the span of less than two decades, 1885 to 1904. What explanation is recorded for this sudden emergence of a new experimental discipline? It seemingly was not because of technical advance, as in the case of the study of hearing; for study in this area progressed after the invention of electronic devices such as amplifiers and oscillators. The experimental techniques for research on learning were seemingly simple enough to have been created a century sooner, for the interest in learning process is antique (18). The sudden emergence of interest, surrounding theories on learning, was a result of the growing faith in scientific research in general and scientific psychology, in particular, had encouraged men to experiment on learning.

Western philosophy had developed the classical doctrine of association, which was a theory of how learning takes place. The earliest experimental attempt to investigate learning, by Ebbinghaus (4) in 1885, was a transformation of the philosophical doctrine of association by contiguity into a group of experimental procedures, some of which are still in use today.

Ebbinghaus (4) in his paper concerning "memory" transformed the classical principle of association by contiguity into an empirical hypothesis and thus initiated the experimental study of learning and memory. The logic of his approach is relatively simple:

> If ideas are connected by the frequency of their contiguities, then the number of repetitions of contiguous ideas can be used as the independent variable of which memory, or learning is a function.

This approach, although relatively simple, is certainly novel. Ebbinghaus (4) invented the procedure of memorizing a series of nonsense syllables, which allowed him to trace the formation of new association, uncontaminated by old associations of the subject. Not only goals, but even the methods of this epoch-making work are still current and in use.

Thorndike's (25) contribution in 1898 consisted of the merging of the associationistic tradition and the much newer doctrine of organic evolution. Thorndike (25) devised techniques for studying the learning process in animals and felt, on the basis of the continuity of species, that his findings would have some bearing on human learning. He thought that the classical law of association by contiguity had to be modified. The author stated that learning takes place more readily when the learner is rewarded for a correct performance than when he merely practices. In 1901, Thorndike (25) and Woodworth (27) published their first paper on the problem of how training in one skill influences performance in another, a problem about which the speculative psychology of the nineteenth century contained conflicting views. There was the doctrine of formal discipline which held that practice in certain skills is broadly beneficial. There was also the doctrine of association which implied that one skill influences another only to the extent that the two skills are partially identical. Educational practices in schools tended to operate on the assumption that the first alternative was correct; Woodworth (27) and Thorndike (25) obtained data to support the second view. There was set up a standard area of research for experimental psychologists who initiated a virtual revolution in American education.

Pavlov (18), distinguished for his work on digestion, announced to the world on the occasion of receiving the Nobel prize (1904) that he had undertaken a program of research on conditioned reflexes, his term for behavior that is learned and not inborn. Although Pavlov (18) saw himself as part of a tradition in Russian physiology, his theory of learning strongly resembles the classical principle of association by contiguity despite his explicit championing of objectivism and vigorous opposition to the mentalism of classical associationism. His dedication to a biological approach was to play a significant role in the shifting emphasis of modern psychology from mind to behavior.

The three major contributors in this early period were Ebbinghaus (4), Thorndike (25), and Pavlov (18). Though they differed in very important ways, they had a common desire to reduce the complexity of thought and behavior to a simple concatenation of events, concerning both learning and perception. Of these three, Thorndike (25) seemingly was most profound with reference to the problems of learning. His theories involving learning curves of animals and humans have led to the present theories of controlling learning and are the basis of many present methods utilized in teaching the child with learning disabilities. There is some danger of misunderstanding a systematic writer's influence when attention is confined to the more abstract and generalized laws which he proposes. Thorndike (25), as early as 1913, gave more attention to the dynamics of learning than a formal consideration of his works suggests. Within the framework of his primary laws, he saw three major considerations which affect the teacher's problem in using them in the classroom:

1) ease of identification of bonds to be formed or broken;

2) ease of identification of the states of affairs which should satisfy or annoy;

3) ease of application of satisfaction and annoyance to the identified state of affairs.

According to Thorndike (25), the teacher and the learner must know the characteristics of a good performance in order that practice may be appropriately arranged. Further, errors must be properly diagnosed to guard against repetition. "When there is lack of clarity about what is being taught or learned, practice may be strengthening the wrong connections as well as the correct ones." The importance of specificity runs throughout Thorndike's works, but his advice is not limited to the application of his major laws. He also refers to a number of motivational features. Hilgard (11) listed five aids with relation to the student's interest level during the learning process:

1) Interest in the work

2) Interest in improvement

3) Significance

4) Problem-attitude

5) Attentiveness

To the above five he added two more which he felt to be open to some dispute. They were the absence of irrelevant emotion and the absence of worry.

> In the case of improvement in skill, the balance turns again toward freedom from all the crude emotional states and even from all the finer excitement, save the intrinsic satisfyingness of success and a firm repudiation of errors which can hardly be called exciting.

When one considers learning critically, it is possible to see a process in which a given cause has many effects. Seemingly, Thorndike (25) was hard pressed in view of such a continuum to design laws to fit every deviation from the normal. Perhaps such exactitude as Thorndike (25) sought in his design is not attainable. As Skramlik (23) noted, Vaihinger, the German philosopher, stated:

> We all proceed by simply assuming that the facts at hand are indeed the true ones. We act as if the truth were apparent despite all our hesitations and uncertainty. If this were not so we would be unable to act in any assured manner.

Skramlik (23) stated, according to Vaihinger, the preferred procedure would be to acknowledge the complexity of the problem of learning and to deal with the facts at hand in a flexible manner. The field of Education has not accepted this procedure completely and many methods still employ Thorndike's "trial-and-error" approach to learning.

Nevertheless, it is Thorndike (25) who is responsible for the stability of learning data and the verification of such data through scientific means. He studied the factors in learning with precision rarely equalled. Thorndike's (25 patience and courage have become a byword in psychological circles and his approaches to the process of learning are employed by those involved with specialized educational procedures. His influence is apparent in the present approaches to perception and the disorders of perception in children with learning difficulties.

A discussion of learning would be incomplete without a statement concerning the agreement of theorists in relation to the learning process. As reported by Schmuller (21) in speaking of Hebb, Piaget, and Bandura

> Theorists such as these are agreed that learning:
>
> 1) involves both the mind and body in a unified process;
>
> 2) is a process directed toward some goal;
>
> 3) begins in experience and is colored by our hopes, beliefs, emotions, etc.;
>
> 4) includes higher mental processes i.e., is subject to logical ordering.

Learning Disabilities in Cerebral Dysfunction

Increased attention has been given to children with learning disorders due to cerebral dysfunction since Strauss and Lehtinen co-authored the first volume of Psychopathology and Education of the Brain-Injured Child in 1947. The interest was furthered by the second volume written by Strauss and Kephart (24) in 1955. Before this interest, experimental psychologists, neurologists, bio-chemists, and physiologists were trying to increase the sum of knowledge about the function of the central nervous system. As it happened, results were too limited to be of significant value to educators, developmentalists and others concerned with environmental modification for the children with cerebral dysfunction.

Kirk (14) stated that, although scientific instruments have undergone dynamic improvement, information about the structure and function of the central nervous system does not adequately explain the learning abilities and behavior of the individual. Strauss (24) did help in solving the problem when he revealed common psychological characteristics among a number of children diagnosed as having cerebral palsy, epilepsy, aphasia, and exogenous mental retardation without any motor disability. According to Peter (20), Cruickshank, Tannhauser, Bentzen, and Ratzeburg developed a program based upon similar educational treatment for both brain-injured children and emotionally disturbed children who showed no evidence of generalized neurological damage.

A group of children who have considerable kinship in their observable characteristics are referred to by many as brain injured and hyperactive. These children are consistently hyperactive, especially in a normal environment and increase this activity as a result of stimulation. They also exhibit poor motor control and disorganized behavior. They are said to have high rates of disinhibition of motor activity and pronounced distractibility. Strauss (24) stated that these children become attracted to detail and are unable to respond effectively to the total stimulus with which they are concerned. Gesell (10) reported that:

> . . . the diagnosis of cerebral injury in a minimal form should be reserved for those cases in which the symptoms have a definite neurological import. The diagnosis is strengthened if the child is firstborn, premature, if the birth history is at all adverse, or if there is an obscure episode suggesting encephalitis.

The problems of learning disabilities require dealing with a field where the signs are slight and not necessarily well-defined. To quote Gesell (10) further, ". . . one may arrive at the diagnostic classification of minimal injury by the process of exclusion." Gesell (10) explained that symptomatic behavior is an indicator of cerebral dysfunction in children. This statement is in accordance with the contention of Shagrass (22) that a lack of integrity of the nervous system is most clearly expressed in the main developmental task during any phase of development. In their study of the evaluation of consistency and predictive value of the 40-week Gesell (10) developmental schedule, they report that exclusion of causes other than cerebral dysfunction serves as a diagnostic procedure concerning those children who exhibit symptoms related to minimal brain damage (cerebral dysfunction).

Frostig (8) reported that among children with cerebral dysfunction, disturbances in visual perception were by far the most frequent symptoms and seemed to contribute to the learning disabilities of these children. Those children who had difficulty in writing seemed to be handicapped by poor eye-hand coordination, and children who could not recognize words often seemed to have disturbances in figure-ground perception. Other children were unable to recognize a letter or word when it was written in different sizes or colors, or if it was printed in upper-case print when they were used to seeing it in lower-case. These children were thought to have the greatest amount of difficulty in the area of form constancy. Reversals or rotations, such as in mirror writing, indicated a difficulty in perceiving position in space, while interchanging the order of letters in a word suggested great amounts of difficulty in analyzing spatial relationships. Frostig (6) defined these areas of greatest difficulty in terms of visual perception and breaks down each problem in the following manner with respect to a developmental program:

1) Perception of Position in Space--need for the development of the child's ability to recognize the formation and directionality of figures and characters.

2) Perception of Spatial Relationships--need for development of the child's ability to perceive positional relationships between various points of reference.

3) Perceptual Constancy--need for development of the child's perception and identification of forms, regardless of differences in size, color, texture, position, background, or angle of viewing.

4) Visual-Motor Coordination--need for development of printing, writing, and drawing skills through the practice in such tasks as tracing, drawing from point to point, and reproducing some basic strokes used in printing.

5) Figure-Ground Perception--need for development of the ability to identify relevant stimuli from distracting influences, as well as, isolation and recognition of overlapping or interesting figures (42).

With the above needs of children with visual-perceptual difficulties, in mind, Frostig (6) devised and standardized the Marianne Frostig Developmental Test of Visual Perception. This instrument was standardized with a sampling of over 2100 unselected nursery and public school children above three years of age. The test contains five test areas which assess relatively distinct function in the areas of eye-motor coordination, perception of figure-ground, perception of form constancy, perception of position in space, and perception of spatial relationships. It may be administered in groups or individually; the scoring is objective. The child's Raw Score for each test area may be converted to a Perceptual Age Equivalent which represents the age at which the average child achieves this score. Although a total Perceptual Quotient can be derived, in a manner similar to that used for determining an intelligence quotient, the Raw Score can be utilized when measuring an individual's responses with his own responses at a later date. The pre-test and post-test approach can be utilized with this test in a reliable manner. Although the Frostig (6) test has a ceiling between eight and ten years of age, Myklebust (17) stated that it can also be utilized for older children, or even for brain damaged adolescents or adults, if there is a suspicion of a disturbance in the areas of language or visual perception; in as much as older children with learning disabilities and brain damaged adults may perform below the eight or ten year level perceptually.

Educators, psychologists, and behavioral scientists have vigorously pursued the study of learning as a process. During the last decade, inroads have been made with reference to the inability of certain persons to learn in the manner once thought to be the only approach. Today, the problems relate to what subject matter to teach, especially to those individuals differing in their learning processes. As described previously by Frostig (6), the emphasis on learning as a process has made a far-reaching impact on the field of learning disabilities. No longer is the existence of this phenomenon questioned. Rather, effort is focused toward the nature of the disturbance and the overall cause seems related, in part, to perceptual disorders with the majority of problems centering around the areas involving visual-perception.

THE PROBLEM

This study was undertaken to ascertain the effects of a six-week visual-perceptual training program on the perceptual behavior of children with cerebral dysfunction. While working with families of children exhibiting poor visual-perceptual skills during a summer program, it became apparent to the writer that although there exists many studies with relation to the field of special education and cerebral dysfunction, there were a limited number of studies pertaining to actual perceptual-training of young children or adolescents. It was also noted that no existing studies offered a basis of evaluation as to the amount of time necessary to obtain reportable results. For this reason, it was impossible to plan a summer program with any degree of assurance as to improvement in the child. As the need existed and since there is a growing concentrated federal and state effort plus financial support to develop comprehensive plans for service to children manifesting symptoms of learning difficulties and perceptual lags, the decision was made by the writer to attempt to carry out and evaluate a summer program of specific perceptual development for children between the ages of 5 and 15 years. Some consideration was given to children involved in Head Start programs and Job Corps positions who are thought to have learning disabilities due to perceptual lag. The primary purposes of the study were:

1) To evaluate the hypothesis that a six-week visual perceptual training program will elevate the perceptual performance in children exhibiting visual perceptual disabilities.

2) To evaluate the import of hand-eye relationships as related to visual perceptual performance in children with diagnosed learning disabilities.

3) To determine if diagnosed exogenous, endogenous, or idiopathic conditions are causative factors in visual perceptual problems in children with learning disabilities.

4) To determine if sex and age are determinants in low perceptual performance of first, second, and third born with learning disabilities.

5) To ascertain the level of probable difference between father's occupation categories and test area performance involving perception in children with learning disabilities.

The underlying hypothesis of the study was that through a visual perceptual training program utilizing "normal" developmental activities and special educative principles, the perceptual performance level could be eleviated in children with learning disabilities.

For purposes of the present study, the following definitions of terminology were utilized:

1) Cerebral dysfunction: any neurological syndrome which involves areas of learning or behavior and presents problems such as hyperactivity, perseveration, poor impulse control and visual-motor perceptual lag.

2) Visual perception: the term used to recognize and discriminate visual stimuli and to interpret those stimuli by associating them with previous experience.

3) Behavior: any observable physical actions or verbalizations which might imply cognition.

4) Visual perceptual training: the program which concentrates on the problem areas such as:

    a) perception of position in space
    b) perception of spatial relationships
    c) perception constancy
    d) visual-motor coordination
    e) figure-ground perception

5) The Developmental Test of Visual-Perception: a standardized test by Marianne Frostig, Ph. D., published in 1963 by Consulting Psychogist Press which tests the areas of:

    a) Eye-motor coordination
    b) Figure-ground
    c) Form constancy
    d) Position in space
    e) Spatial relationships

6) Learning disabilities: the condition involving the deficiency in learning despite adequate intelligence, hearing, vision, motor capacity, and emotional adjustment.

7) Endogenous diagnosis: cerebral dysfunction resulting from pre-natal causes.

8) Exogenous diagnosis: cerebral dysfunction resulting from peri-natal and post-natal causes.

9) Idiopathic diagnosis: having no discernable cause for resulting cerebral dysfunction.

CHAPTER II

PROCEDURE

There is increasing concentrated federal and state effort with financial support to develop comprehensive plans for service to children with problems in learning areas and other disability groupings. Educators in the fields of child development and early childhood education are met by problem situations which involve such children. Perceptual deficits which mask themselves as retardation or behavioral problems make discovery and management of these children difficult.

At the present time, the exceptional child is viewed, by many, in terms of his inabilities and the extent to which he differs from the "normal" child. Many hours are expended to ascertain the level of function of the exceptional child. Several of the intelligence tests utilized are standardized using "normal" children as subjects. The scoring, as a rule, does not include any special consideration of the exceptional child and the findings are utilized to establish a starting point for training and remediation. Few individual differences such as language barriers,lack of physical ability to handle materials, or inability to perceptually visualize the task at hand are given consideration. An intelligence quotient is ascertained. The parents are informed and encouraged to place the child in a training or remedial situation where children are trying to fill their specific needs through programs lacking individualized planning. The child is spoken of in terms of his "I. Q." and expected to do no more than the psychometric evaluation findings have indicated. Alarming numbers of children are subjected to this evaluative labrynith. Because the number of exceptional children is rising, less time is available. Children with disabilities are receiving less individual time. Today's exceptional child seems to be without a totalistic approach to his difficulties. Among this group are those children with perceptual problems and subsequent learning disabilities. Specific approaches to perceptual problems involving normal developmental activities to explore short term methods which might be utilized during summer programs are needed.

The possibility that perceptual lags can be diminished in children with learning disabilities through the utilization of a six-week visual-perceptual training program of recreational and educational activities was explored. Relationships between sex, ordinal placement, diagnosis, dominance, age equivalency and father's occupation of children were measured. The pre-test and post-test performance scores of the five test areas were computed by use of the t-test to ascertain the level of possible significant difference.

Sample

Data for the study were attained from 53 children, 31 boys and 22 girls all with diagnoses of learning disabilities with neurological etiology. The children were enrolled in an eight-week summer residential camping program at Camp Randi, Milford, New Jersey.

The 53 children selected to participate were 5.0 to 16.0 years of age. The mean age was calculated as 11.0 years of age. Each child lived at home while attending a specialized school during the academic year. The subjects had participated in some type of perceptual training program previously with little success in perceptual lag improvement. All participating children were within normal limits in physical ability and lack of handicapping orthopedic conditions. Only children whose attention span and perceptual ability enabled them to participate in the diagnostic testing sessions were included in the study group.

Test Instrument

Data relating to perceptual levels of each child were collected through group testing sessions using the *Frostig Developmental Test of Visual Perception*. Additional information relating to the subjects was obtained from files at Camp Randi. The instrument, the *Frostig Developmental Test* of *Visual Perception*, was divided into five test areas which, when administered, on a pre-test to post-test basis established raw scores and age equivalents for all age levels in all test areas of visual perception. Every child received a score in each of the five test areas and a total score for the entire test. The test areas were:

> Sub-test I, eye-motor coordination, contained 16 items involving motor ability. These items required ability in reproduction of some basic strokes utilized in cursive writing.
>
> Sub-test II, figure-ground relationships, contained eight items requiring ability to identify relevant stimuli from distracting backgrounds.
>
> Sub-test III, perceptual constancy, contained two separate parts. Part A contained 14 items which required recognition of squares and circles. Part B contained 18 items which involved recognition of form.
>
> Sub-test IV, position in space, contained eight items. These items evaluated the subject's ability to recognize the formation and directionality of figures and characters.
>
> Sub-test V, spatial relationships, contained eight items which established the subject's ability to perceive positional relationships between various objects or points of reference.

The Visual-Motor Perceptual Training Course

Between pre-test and post-test, a visual-motor training course was introduced. Daily recreational activity programs were planned to accompany the training course.

Each child spent 40 minutes per day in the academic program working on special educative materials sent by the child's school teacher during the previous academic session. Familiarity of materials and procedures was stressed and new materials were not introduced. When the assigned work was completed, all children began working on the individually planned practice sheets which were included in the training course. These practice sheets were prepared according to individual need areas as revealed by the Frostig Developmental Test of Visual Perception. (See Appendix A.) The five areas of the sub-test of the Frostig Developmental Test of Visual Perception (Appendix B) were used as a guide for the development of 35 millimeter film slides (Appendix C). For each sub-test area there were slides which corresponded to the practice sheets. These slides were used in the training program to develop ability in the areas of directionality, form constancy, spatial relationships, figure-ground recognition and position in space. Use of the materials are described as follows.

Each child spent 45 minutes daily participating in the perceptual training course. During this time, the 35 millimeter film slides were utilized. Each child was asked to view a slide, identify the corresponding figure reproduced on the wall with textured tape and to draw the same figure on an 8" x 11-1/2" piece of white paper with a black felt pen. If he were able to accomplish this task, he was then instructed to draw the figure again within the structured space provided, and the drawing area was slowly decreased thereby demanding more exacting reproduction within the limits. In some instances, the child was questioned concerning the forms and figures drawn. The child was encouraged to answer such questions as: 1) "Which circle is larger?", 2) "How many diamonds to you see?", or 3) "Show me the square."

Work in one test area was continued until the examiner observed positive progress in that particular area. Then the next area was introduced until all five test areas had been covered. The subjects were asked to participate in the informal rating procedure. Many times the child would decide for himself that more time was needed in one specific area. Throughout the entire program, practice sheets which were related to the five test areas were provided for "free time" usage by the subjects. This was done to guard against regression of attainment levels in the areas of greatest need. In an attempt to arouse recognition in the child of such forms as are present in his daily life, constant references and comparisons were made during the day's activities to such shapes as circles, triangles, squares, and diamonds. The child was rewarded for his endeavors through appropriate praise and continuous encouragement of efforts. Recreational activities were programmed and scaled as to chronological ages and normal developmental standards. Constant encouragement and praise were given for every effort. Gross motor activities were utilized daily. Bicycle riding, swimming, hiking over an obstacle course related to geographical terrain, physical fitness exercises, and music rhythms were activities frequently utilized.

This was the extent of programmed activities. No special equipment or techniques were used. Materials at hand related to normal developmental abilities and needs of all children were utilized.

The totalistic approach to the visual perceptual training course was one of ableness of all the children to participate in research activity to some degree. All efforts were accepted. Encouragement, empathy, and praise were given and were in never-ending supply.

Analysis Techniques

The pre-test and post-test raw scores and age equivalents were tabulated and the mean and standard deviation computed for each individual. The t-test was used to determine the possible significance of differences between pre-test and post-test performance levels. Every child received a score in each of the five test areas described. A total score was given for the entire test for both the pre-test and post-test sessions. The total pre-test and post-test scores were utilized to investigate possible relationships. Variables described earlier were compared with pre-test and post-test performance scores of males and females to ascertain the significant level of difference.

For purposes of this study, the .10 level will be considered important in trend analysis in order to place more emphasis on existing levels of difference in individual performance. In an area such as cerebral dysfunction and learning disabilities, all findings are pertinent to the establishment of trends.

CHAPTER III

ANALYSIS OF DATA

Individuals vary one from the other no matter when or where they are found. Observation of group differences establishes this point, but individual differences may be judged scientifically or unscientifically. This is especially true in the case of the child with a learning disability. The child should be expected to function on a level of which he is capable. A diagnostic treatment program will allow the child to have functional levels developed for him.

Because behavior varies with the individual, an attempt was made to measure the effect of a six-week visual perceptual program on the pre-test to post-test change in performance with respect to variables such as age equivalents, dominance, diagnosis, ordinal placement, father's occupation, and sex-age relationships. Data collected included information relevant to some factors influencing the visual-perceptual performance levels of children with cerebral dysfunction. The children were enrolled in Camp Randi, Milford, New Jersey, a camp for children with learning disabilities, for the Summer 1967 Session. The information was collected by means of camp files and the pre-test and post-test administration of the <u>Frostig</u> <u>Developmental</u> <u>Test</u> <u>of</u> <u>Visual</u> <u>Perception</u>. The data were analyzed through the use of the t-test. Findings were analyzed, interpreted, discussed, and found to be significantly related in influencing the visual-perceptual performance levels of children with learning disabilities on a pre-test to post-test basis.

There were 53 children selected as subjects, 22 girls and 31 boys. They were divided into four age groups, 5 to 7 years, 8 to 10 years, 11 to 13 years, and 14 to 16 years. The number and percentage of the subjects in each group classification is as follows:

Age	Sex: Female (N=22)		Sex: Male (N=31)	
	Number	Per cent	Number	Per cent
5 to 7 years	3	14	1	3
8 to 10 years	5	23	8	26
11 to 13 years	8	37	14	45
14 to 16 years	6	26	8	26

The t-test was utilized to ascertain the level of significance between male and female test area performance on a pre-test to post-test basis, as a result of a visual-perceptual training program. The pertinent data revealed that no significant difference existed between male and female performance on a pre-test to post-test basis for any test area.

Of the 53 children involved in the study, 26 were males. The overall mean difference between pre-test and post-test performance was 9.2, a significant difference ($P<.02$). The mean improvement for females was also significant ($P<.02$) as shown in Table I. Three males showed a pre-test to post-test performance regression. One male and one female maintained the same level of performance. Overall data revealed more improvement in total test performance for females than for males.

The difference between means for the two test periods was highly significant for Test Area I (eye-motor coordination) for males and for Test Area III (form constancy) for females. For Test Area II (figure-ground), although differences were not significant, an improvement trend from pre-test to post-test was evident, with a pre-test mean of 13.9 and a post-test mean of 15.8. For Test Area I (eye-motor coordination) an improvement trend was evident for females. In both male and female subjects, test area performances demonstrated a marked improvement of visual perceptual performance from pre-test to post-test. Boys improved more in the area of eye-motor coordination, whereas girls improved in form constancy performance. Both groups showed a significant improvement in entire test performance. Results were not significant except for the two areas mentioned.

TABLE I

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO SEX

Test* Area	Children											
	Females						Males					
	Pre-test		Post-test				Pre-test		Post-test			
	Mean	Standard Deviation	Mean	Standard Deviation	t-Value	Probability	Mean	Standard Deviation	Mean	Standard Deviation	t-Value	Probability
I	14.9	4.9	17.5	3.7	1.9	.10	13.3	4.6	16.6	3.3	3.10	.01***
II	14.5	5.3	16.3	3.9	1.1	n.s.	13.9	4.5	15.8	4.1	1.70	.10
III	4.8	5.2	9.6	4.0	3.2	.01***	6.8	4.9	8.5	5.3	1.20	n.s.
IV	5.2	2.1	6.2	2.0	1.6	n.s.	5.5	2.3	5.9	2.3	.68	n.s.
V	4.1	2.4	5.2	1.9	1.4	n.s.	4.7	2.4	5.6	2.1	1.50	n.s.
Entire test	44.1	15.6	55.1	13.5	2.3	.02**	43.5	14.6	52.7	12.8	2.50	.02**

*I - Eye-motor coordination II - Figure ground III - Form constancy
IV - Position in space V - Spatial relationships

**significant ***highly significant n.s.-non-significant

Age Equivalency

Any so-called definitive evaluation of the overall developmental level of the individual child with cerebral dysfunction is still conjectural. A suitable guideline to such assessment should, therefore, be based on the developmental level of the "normal" child. The degree and kind of deviation from the developmental level of the "normal" child will mark the boundaries of the developmental level of the child with cerebral dysfunction. As Woodward (27) stated, Galton demonstrated with insight that distinct clues to individual difference are found in correlation by matching human beings individually, one with the other, and within the group.

An attempt was made to determine the "normal" developmental levels of children included in the study by means of a standardized test. The Frostig Developmental Test of Visual-Perception was administered as a pre-test and post-test instrument. The Frostig Developmental Test of Visual-Perception was chosen because it involves a multi-disciplinary evaluative approach to primary functioning levels of children with learning disabilities. The test has, to date, been translated into French, German, Polish, Czech, Spanish, Portuguese, Japanese, and Scandinavian languages, and results can be sent to the Marianne Frostig Center of Educational Therapy in Los Angeles, California, for computation.

Perceptual quotients were not computed for this study as a nine years age level barrier existed. Permission to utilize age equivalents was granted by Marianne Frostig (6), author of the <u>Developmental Test of Visual Perception</u>. Such permission was necessary as a wider age range was involved than that on which the Frostig test was standardized.

Table II illustrates the breakdown between male and female age equivalent levels between performance of pre-test and post-test administration. In the study, the female pre-test to post-test test area performance on Test III (form constancy) was found to be highly significant at the .01 level. Test Area IV (position in space) was not significant, but established a trend at the .10 level toward improvement. Male comparison studies, illustrated in Table II, on a pre-test to post-test basis, compared test area performance levels to age equivalents. The test area performance was found to be highly significant at the .01 level on Test I (eye-motor coordination). Test II (figure-ground) was significant at

TABLE II

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO AGE EQUIVALENTS

Test Area*	Age Equivalents											
	Females						Males					
	Pre-test		Post-test		t-Value	Probability	Pre-test		Post-test		t-Value	Probability
	Mean	Standard Deviation	Mean	Standard Deviation			Mean	Standard Deviation	Mean	Standard Deviation		
I	7.3	1.9	8.1	1.4	1.5	n.s.	6.5	1.6	7.8	1.4	1.50	.01***
II	6.3	1.5	6.8	1.7	1.0	n.s.	5.9	1.3	6.6	1.4	2.00	.05**
III	5.4	1.6	7.0	1.7	2.8	.01***	5.9	1.7	6.4	2.1	.98	n.s.
IV	6.0	1.5	6.9	1.6	1.8	.10	6.2	1.4	6.8	1.9	1.10	n.s.
V	6.3	1.4	6.9	1.1	1.3	n.s.	6.7	1.4	7.2	1.2	1.50	n.s.

*I - Eye-motor coordination II - Figure ground III - Form constancy
IV - Position in space V - Spatial relationships

***highly significant n.s.-non-significant **significant the .05 level. Males illustrated more age equivalent gain from pre-test to post-test performance than did females. All other test area scores were non-significant.

Mean Age

The mean age was calculated and found to be between 10.9 and 11.0 years of age. For purposes of comparison. 11.0 years of age was accepted as the mean age.

An attempt was made to investigate the level of significant difference between the children 11 years and over and those under 11 years of age with respect to rate of perceptual performance development. The age groups were divided into four categories, 5 to 7 years, 8 to 10 years, 11 to 13 years, and 14 to 16 years of age. A comparison was made of the older and younger children with relation to test area performance. Table III illustrates the levels of significant differences between pre-test and post-test levels with respect to children under 11 years and those 11 years of age and over.

As illustrated in Table III, data revealed that children under 11 years of age displayed a significant level of difference between pre-test and post-test performance on Test I (eye-motor coordination) at the .05 level of significance; Test Area III (form constancy) at the .05 level, and the

TABLE III

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE ACCORDING TO AGE GROUP

Test* Area	Age Group											
	Less than 11 years of age						Eleven years or older					
	Pre-test		Post-test		t-Value	Probability	Pre-test		Post-test		t-Value	Probability
	Mean	Standard Deviation	Mean	Standard Deviation			Mean	Standard Deviation	Mean	Standard Deviation		
I	14.2	5.3	17.5	3.3	2.00	.05**	13.9	4.5	16.8	3.5	2.9	.01***
II	14.9	4.9	16.9	3.9	1.20	n.s.	13.8	5.1	15.6	4.0	1.6	n.s.
III	7.3	4.7	10.6	4.2	2.00	.05**	5.3	5.2	8.2	4.9	2.3	.05**
IV	5.8	1.9	6.1	2.5	.35	n.s.	5.1	2.3	6.0	2.0	1.6	n.s.
V	4.2	2.3	5.5	2.1	1.50	n.s.	4.6	2.4	5.4	2.0	1.4	n.s.
Entire test	47.0	14.1	57.8	12.4	2.20	.05**	42.2	15.2	51.8	13.0	2.7	.01***

*I - Eye-motor coordination II - Figure ground III - Form constancy
IV - Position in space V - Spatial relationships

**significant ***highly significant n.s.-non-significant entire test at the .05 level of significance. Data for those children over 11 years of age revealed a highly significant difference between means for Test Area I (eye-motor coordination) and for the entire test ($P<.01$). The difference between means for Test Area III (form constancy) was significant at the .05 level. For all other test areas differences were non-significant. A similarity in test item significance between both age groups establishes a parallelistic trend in perceptual performance. For Test Area I (eye-motor coordination) differences were highly significant for children 11 years and over and significant for those under 11 years of age. It is possible that neurological maturity accounted for the greater amount of improvement in the overall test scores and the Area I test scores for the older group. It is of interest to note that differences for Test Area III were significant for both groups. For those children 11 years of age and over a higher level of significance was evident.

Occupational Classification of Fathers

The father's occupational classification involved two distinct groups. Group A contained 32 fathers with professional or semi-professional occupations; Group B contained

16 fathers with skilled or semi-skilled occupations. Five children had fathers who were divorced or deceased.

Occupational Classification	Fathers Number	Fathers Per cent
Group A		
Professional and semi-professional (doctor, lawyer, architect, minister)	32	60
Group B		
Skilled and semi-skilled (bookkeeper, service station owner, delicatessen owner, fireman)	16	30
Divorced or deceased	5	10

The improvement in pre-test to post-test performance was analysed on the basis of the father's occupation utilizing the t-test. The overall test performance mean of the pre-test was compared to the mean for the overall test performance on the post-test to determine the significance of differences.

The summation of pre-test to post-test performance was compared with the father's occupation. For Group A, the professional or semi-professional group, differences were non-significant. For Group B, the skilled or semi-skilled workers, differences were highly significant. The five men who were divorced or deceased had children who showed no significant difference on a pre-test to post-test basis. Children whose fathers were in Group A demonstrated an improvement trend on Test Area IV (position in space) and Test Area I (eye-motor coordination). Children whose fathers were in Group B had a highly significant level of performance improvement from pre-test to post-test on Test Area I (eye-motor coordination) and the overall test score. Test rea III (form constancy) was significant at the .05 level. All other test areas were non-significant.

Table IV illustrates that the children of fathers in Group B, skilled and semi-skilled occupations, showed a highly significant level of improvement from pre-test to post-test periods. The higher level of significance for the latter group may be attributable to more hours in the home and a structural work schedule for fathers in Group B.

Comparison of Group A and Group B, with respect to entire test performance, revealed no significant differences between the pre-test and post-test performance. Pre-test to post-test comparison of the two groups revealed differences within Group B for the overall test performance were highly significant. All other comparisons were non-significant.

TABLE IV

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO FATHER'S OCCUPATION

Father's Occupational Group	Test Area	Pre-test Mean	Pre-test Standard Deviation	Post-test Mean	Post-test Standard Deviation	t-Value	Probability
A Professional and semi-professional	I-Eye-motor	16.1	4.7	18.9	3.0	1.70	.10
	II-Figure-ground	16.1	4.5	17.3	3.4	.74	n.s.
	III-Form constancy	5.7	4.9	10.0	3.5	2.40	.05*
	IV-Position in space	5.7	2.2	7.2	1.5	1.80	.10
	V-Spatial relationship	5.4	1.9	6.1	1.4	1.00	n.s.
	Entire test	48.8	13.9	58.5	10.2	1.90	.10
B Skilled and semi-skilled	I-Eye-motor	12.8	4.5	16.3	3.4	3.40	.01**
	II-Figure-ground	13.7	4.7	15.6	3.9	1.60	.10
	III-Form constancy	5.7	2.1	8.5	5.2	2.10	.05*
	IV-Position in space	5.2	2.1	5.6	2.3	.67	n.s.
	V-Spatial relationship	4.1	2.6	5.2	2.2	1.70	.10
	Entire test	41.9	15.0	51.8	13.5	1.70	.01**

*significant **highly significant

<u>Ordinal Placement in the Family</u>

The data investigated concerning the ordinal placement of the children in their respective families revealed that all subjects were either Group I, first born, Group II, second born, or Group III, third born. Group-sex relationships were as follows:

Ordinal Placement	Sex: Females (N=22) Number	Females (N=22) Per cent	Males (N=31) Number	Males (N=31) Per cent
Group I (first born)	9	49	17	55
Group II (second born)	8	37	8	26
Group III (third born)	5	14	6	19

The greatest number of children were included in Group I (first born) category. The second largest number were in Group II, and the smallest number of children were from families where the child was the third born. Data investigated concerning sex-ordinal placement reveal that more first born males evidenced problems arising from cerebral dysfunction than females and that second born males and females in the study were equally divided. The findings do not support the premise that learning disabilities "run in families." Only two subjects belonged to families where learning disabilities were suspected in other family members, one male and one female.

Table V shows the analysis of pre-test and post-test performance on the basis of ordinal position of the children in the family. Data reveal that for Group I, first born children, the differences between the pre-test and post-test means were highly significant for Test Area I, eye-motor coordination,and for the overall test scores. Although differences for all other areas for Group I were non-significant, an improvement trend was evident for Area III, form constancy, and Area V, spatial relationships.

Data analysis for Group II, second born children, and for Group III, third born children, revealed differences were non-significant. Although some improvement was evident in all areas for these two groups, the mean differences were small.

Reasoning concerning causative factors for such results would be specious. It is possible that contributing factors could include more concern and time given to first born children causing over-dependency or lack of time for individual attention when there are three children in a family unit. Lack of pressure within the eight weeks research period could account for a more relaxed approach by a first born child toward performance.

TABLE V

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO ORDINAL PLACEMENT IN THE FAMILY

Ordinal Placement	Test Area	Pre-test Mean	Pre-test Standard Deviation	Post-test Mean	Post-test Standard Deviation	t-Value	Probability
Group I First born	I-Eye-motor	13.3	4.2	11.5	2.8	3.80	.01**
	II-Figure-ground	14.2	4.7	16.8	3.4	1.60	n.s.
	III-Form constancy	5.4	5.1	15.9	4.6	2.70	.10
	IV-Position in space	5.3	2.3	5.9	2.3	1.00	n.s.
	V-Spatial relationship	4.2	2.4	5.2	2.1	1.70	.10
	Entire test	42.2	14.1	53.1	13.1	3.30	.01**
Group II Second born	I-Eye-motor	15.2	5.9	17.5	3.4	1.00	n.s.
	II-Figure-ground	12.9	5.6	15.8	4.5	1.20	n.s.
	III-Form constancy	7.7	5.1	10.1	4.4	1.10	n.s.
	IV-Position in space	5.4	2.1	6.5	1.9	1.20	n.s.
	V-Spatial relationship	5.0	2.5	6.0	1.8	1.00	n.s.
	Entire test	46.0	17.6	54.9	13.3	1.20	n.s.
Group III Third born	I-Eye-motor	16.2	5.1	17.2	3.7	.23	n.s.
	II-Figure-ground	17.0	2.1	17.5	2.5	.22	n.s.
	III-Form constancy	6.5	3.5	9.0	7.1	.46	n.s.
	IV-Position in space	6.0	1.5	6.2	1.4	.17	n.s.
	V-Spatial relationship	5.5	1.1	5.7	1.0	.24	n.s.
	Entire test	51.2	11.0	55.7	12.1	.41	n.s.

**highly significant

Diagnostic Classification

The diagnostic classification groups involved three diagnoses, whose etiology was believed to include those children with endogenous, exogenous, and idiopathic causes for cerebral dysfunction. Exogenous diagnoses included those children with cerebral dysfunction from causes resulting after birth, endogenous diagnoses included those children who were thought to have cerebral dysfunction at the time of birth, and those with idiopathic, or unknown causative factors for their cerebral dysfunction. The age-sex groupings in each diagnostic classification are illustrated in Table VI.

A percentage comparison of diagnoses and sex-age relationships revealed that more 11 to 13 year old males had an endogenous diagnosis than did any other age group in the study. More males from 8 to 10 years of age had endogenous diagnoses than did females of any age group. This is not surprising since the incidence of cerebral dysfunction is greater in males than females at a 4 to 1 ratio, according to Myklebust (17). Data reveal that more males in the 14 to 16 year old group had endogenous diagnoses than did females within the same age group. A higher proportion of females than of males had cerebral dysfunction diagnosed as exogenous. Idiopathic diagnoses were evident for only two children, both females in the 8 to 10 years of age group. Prior

TABLE VI

DIAGNOSTIC CLASSIFICATION OF CHILDREN ACCORDING TO AGE AND SEX GROUPINGS

Age in Years	Diagnosis					
	Females			Males		
	Endogenous	Exogenous	Idiopathic	Endogenous	Exogenous	Idiopathic
	Number	Number	Number	Number	Number	Number
5- 7	2	1	0	1	0	0
8-10	3	0	2	7	1	0
11-13	3	5	0	9	5	0
14-16	2	4	0	5	3	0

research has shown a trend toward higher incidence of cerebral dysfunction in males than in females. Data obtained for this study support this statement.

An attempt was made to ascertain the significance of differences in the means for the pre-test and post-test scores when analyzed on the basis of diagnostic classifications. Since only two children were diagnosed as having cerebral dysfunction in the idiopathic classification, this category was eliminated in the data analysis.

Table VII illustrates the t-test analysis of pre-test and post-test performance with respect to exogenous and endogenous diagnosis. For the endogenous group, the mean differences for the total test scores were highly significant. In Test Areas I (eye-motor coordination), Test Area II (figure-ground), and in Test Area III (form constancy) mean differences were significant. For Test Area V (spatial relationships) the differences were non-significant but with a probability of .10.

The exogenous diagnosis was compared on a pre-test to post-test basis. Data reveal that mean differences for Test Area I (eye-motor coordination) and Test Area III (form constancy) were significant at the .05 level. The means for Test Area IV and for the total test scores depicted a trend toward performance improvement.

TABLE VII

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO TYPE OF NEUROLOGICAL DIAGNOSIS

Test* Area	Type of Diagnosis											
	Endogenous						Exogenous					
	Pre-test		Post-test		t-Value	Probability	Pre-test		Post-test		t-Value	Probability
	Mean	Standard Deviation	Mean	Standard Deviation			Mean	Standard Deviation	Mean	Standard Deviation		
I	13.8	5.7	17.0	3.5	2.50	.02**	14.5	2.8	16.9	3.4	2.10	.05**
II	14.1	5.2	16.5	4.0	2.00	.05**	13.7	4.4	14.7	3.9	.68	n.s.
III	6.1	5.6	8.9	4.8	2.00	.05**	5.3	4.1	8.6	4.7	2.10	.05**
IV	5.5	2.3	5.9	2.4	.65	n.s.	5.0	1.9	6.2	1.9	1.80	.10
V	4.6	2.4	5.6	2.0	1.60	.10	4.4	2.2	5.1	2.1	.96	n.s.
Entire test	43.5	17.2	54.2	13.1	2.60	.01***	43.5	11.1	51.5	12.7	1.90	.10

*I - Eye-motor coordination II - Figure ground III - Form constancy
IV - Position in space V - Spatial relationships

**significant n.s.-non-significant

Greater improvement was evident for the exogenous than for the endogenous group. Significant differences in pre-test and post-test performance were evident for both groups in eye-motor coordination and in form constancy.

Dominance Classification

In an attempt to understand more fully the impact of dominance as it is related to visual perceptual problems, an investigation was made of data involving hand-eye relationships of 53 children. A higher percentage of females than of males evidenced left hand-right eye and right hand-left eye dominance. Conversely, a higher proportion of males than of females were found to have left hand-left eye and right hand-right eye dominance. The distribution of children according to sex are shown below.

Dominance	Sex: Females (N=22)		Sex: Males (N=31)	
	Number	Per cent	Number	Per cent
Left-left	4	18	7	23
Right-right	5	24	9	29
Left-right	8	34	9	29
Right-left	5	24	6	19

Table VIII illustrates sex-age dominance groupings of the subjects. Age group 5 to 7 years included four subjects, one boy with a right hand right eye relationship and three girls, one with a left hand right eye dominance and two with a right hand right eye relationship. In the 8 to 10 year old age group, there were eight boys and five girls. Two boys were left-right dominant, two had left-left, one had right-left, and three had right hand right eye dominance. One girl had left-left dominance, two had right-left dominance in eye-hand coordination, and two girls had right-right dominance. Fourteen boys and eight girls made up the 11 to 13 year old age group. Seven boys in this age group had left-right dominance. One boy had left-left dominance, four had right-left dominance, and two had right hand right eye coordination. The girls in this age group were divided for hand-eye dominance. Five had left-right dominance, one had left-left dominance, one girl had right-right hand-eye dominance, and one had right-left dominance.

An attempt was made to determine the significance of differences of pre-test to post-test performance levels on the basis of hand-eye dominance. The same dominance combinations listed above were included in the analysis. Both sexes were combined in the data analysis based on hand-eye dominance classifications.

TABLE VIII

HAND-EYE DOMINANCE RELATIONSHIPS OF CHILDREN ACCORDING

TO AGE AND SEX GROUPINGS

Age in Years	Type of Dominance							
	Females				Males			
	Left Hand Left Eye	Left Hand Right Eye	Right Hand Left Eye	Right Hand Right Eye	Left Hand Left Eye	Left Hand Right Eye	Right Hand Left Eye	Right Hand Right Eye
	Number	Number	Number	Number	Number	Number	Number	Number
5- 7	0	1	0	2	0	0	0	1
8-10	1	0	2	2	2	2	1	3
11-13	1	5	1	1	1	7	4	2
14-16	2	2	2	0	3	0	2	3

As illustrated in Table IX, significant differences were evident for three pre-test to post-test comparisons. For left hand-right eye dominance, the mean score in Area I (eye-motor coordination) and the overall mean score were significantly higher following the six weeks training program. For the right hand-right eye dominant group, only one comparison revealed differences were significant. In Test Area II (figure-ground) the perceptual training produced a significant improvement. All other test area comparisons yielded non-significant results.

Test areas for which a definite but non-significant trend was apparent were in Test Areas I (eye-motor coordination) and III (form constancy) for right hand-left eye dominance; for Test Area III (form constancy) and for the overall test score for left hand-left eye dominance; and for Test Area I (eye-motor coordination) for right hand-right eye dominance.

The left hand-right eye versus the left hand-left eye relationships were investigated (Table X). On the pre-test the mean for the left-left type of dominance was significantly higher in Test Area IV. For the post-test comparisons, the means for Areas III and IV were significantly higher for left hand-left eye dominance group. Non-significant differences were found for all other comparisons.

TABLE IX

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO HAND-EYE DOMINANCE

Type of Dominance	Test Area	Pre-test		Post-test		t-Value	Probability
		Mean	Standard Deviation	Mean	Standard Deviation		
	I-Eye-motor	12.9	4.90	16.4	3.90	2.10	.05*
Left hand	II-Figure-ground	12.2	5.90	14.2	4.90	.99	n.s.
	III-Form constancy	5.2	4.40	7.7	4.00	1.50	.20
Right eye	IV-Position in space	4.6	2.70	5.4	2.40	.86	n.s.
	V-Spatial relationship	3.7	2.80	5.0	2.30	1.40	.20
	Entire test	37.5	17.20	49.5	14.30	2.00	.05*
	I-Eye-motor	14.5	4.30	18.0	3.60	2.00	.10
Right hand	II-Figure-ground	15.3	4.80	16.2	3.80	4.60	n.s.
	III-Form constancy	4.2	5.10	8.1	4.90	1.70	.10
Left eye	IV-Position in space	5.5	1.90	6.5	1.80	1.20	n.s.
	V-Spatial relationship	4.9	2.30	5.9	1.90	1.00	n.s.
	Entire test	44.5	14.70	55.2	14.30	1.60	.20
	I-Eye-motor	15.6	5.60	17.8	3.20	.96	n.s.
Left hand	II-Figure-ground	15.1	3.70	16.8	3.40	.95	n.s.
	III-Form constancy	7.3	4.70	11.5	3.20	2.00	.10
Left eye	IV-Position in space	6.8	.74	7.3	.78	1.30	n.s.
	V-Spatial relationship	5.4	2.40	6.1	1.50	.68	n.s.
	Entire test	49.7	11.80	59.5	9.20	1.80	.10
	I-Eye-motor	13.7	4.00	16.4	2.50	.19	.10
Right hand	II-Figure-ground	14.7	3.40	17.5	2.50	2.10	.05*
	III-Form constancy	7.5	5.60	9.6	5.80	.88	n.s.
Right eye	IV-Position in space	5.2	2.00	5.5	2.40	.30	n.s.
	V-Spatial relationship	4.5	1.70	5.2	2.00	.84	n.s.
	Entire test	46.6	11.30	53.4	11.90	1.40	.20

*significant n.s.-non-significant

TABLE X

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO HAND-EYE DOMINANCE RELATIONSHIPS

Test Area	Hand-Eye Dominance Relationships											
	Left-Right Hand-Eye Relationships				Left-Left Hand-Eye Relationships				Combined Groups			
	Pre-test		Post-test		Pre-test		Post-test		t-Value		Probability	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Pre-test	Post-test	Pre-test	Post-test
I	12.9	4.9	16.4	3.9	15.6	5.60	17.8	3.20	1.1	.87	n.s.	n.s.
II	12.2	5.9	14.2	4.9	15.1	3.70	16.8	3.40	1.2	1.30	n.s.	n.s.
III	5.2	4.4	7.7	4.0	7.3	4.70	11.5	3.20	1.2	2.30	n.s.	.05*
IV	4.6	2.7	5.4	2.4	6.8	.74	7.3	.78	2.2	2.10	.05*	.05*
V	3.7	2.8	5.0	2.3	5.4	2.40	6.1	1.50	1.4	1.60	n.s.	n.s.
Entire Test	37.7	17.2	49.5	14.3	49.7	11.80	59.5	9.20	1.8	1.80	n.s.	n.s.

*significant n.s.-non-significant

In analyzing pre-test and post-test scores of the right hand-left eye versus the left hand-left eye dominant groups, non-significant differences were found for all comparisons (Table XI). Both groups showed improvement in test scores following the training program.

When comparing left hand-left eye with the right hand-right eye dominance, slight differences were apparent. However, these differences were non-significant (Table XII).

Left hand-right eye versus right hand-right eye dominance was investigated (Table XIII). In the comparisons of the means for the pre-tests, no significant differences were found. For the post-test comparisons, only one t-value was significant, that for Area II (figure-ground).

According to data analyzed, alternating or unresolved dominance relationships were not highly significant between pre-test to post-test performance in the test areas. However, improvement was evident from a pre-test to a post-test basis. The greatest amount of improvement was made by those children with left-right hand-eye coordination problems.

TABLE XI

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO HAND-EYE DOMINANCE RELATIONSHIPS

Test Area	Hand-Eye Dominance Relationships											
	Right-Left Hand-Eye Relationships				Left-Left Hand-Eye Relationships				Combined Groups			
	Pre-test		Post-test		Pre-test		Post-test		t-Value		Probability	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Pre-test	Post-test	Pre-test	Post-test
I	14.5	4.3	18.0	3.6	15.6	5.60	17.8	3.20	.17	.17	n.s.	n.s.
II	15.3	4.8	16.2	3.8	15.1	3.70	16.8	3.40	3.20	.32	n.s.	n.s.
III	4.2	5.1	8.1	4.9	7.3	4.70	11.5	3.20	1.60	1.60	n.s.	n.s.
IV	5.5	1.9	6.5	1.8	6.8	.74	7.3	.78	1.00	1.00	n.s.	n.s.
V	4.9	2.3	5.9	1.9	5.4	2.40	6.1	1.50	.21	.21	n.s.	n.s.
Entire Test	44.5	14.7	55.2	14.3	49.7	11.80	59.5	9.2	.73	.73	n.s.	n.s.

n.s.-non-significant

TABLE XII

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO HAND-EYE DOMINANCE RELATIONSHIPS

Test Area	Hand-Eye Dominance Relationships											
	Left-Left Hand-Eye Relationships				Right-Right Hand-Eye Relationships				Combined Groups			
	Pre-test		Post-test		Pre-test		Post-test		t-Value		Probability	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Pre-test	Post-test	Pre-test	Post-test
I	15.6	5.60	17.8	3.20	13.7	4.2	16.4	2.5	.83	1.00	n.s.	n.s.
II	15.1	3.70	16.8	3.40	14.7	3.4	17.5	2.5	.19	.53	n.s.	n.s.
III	7.3	4.70	11.5	3.20	7.5	5.6	9.6	5.8	.11	.83	n.s.	n.s.
IV	6.8	.74	7.3	.78	5.2	2.0	5.5	2.4	2.0	1.90	.10	.10
V	5.4	2.40	6.1	1.50	4.5	1.7	5.2	2.0	.88	1.00	n.s.	n.s.
Entire Test	49.7	11.8	59.5	9.20	46.6	11.3	53.4	10.9	.58	1.30	n.s.	n.s.

n.s.-non-significant

TABLE XIII

COMPARISON OF CHILDREN'S PRE-TEST AND POST-TEST PERFORMANCE

ACCORDING TO HAND-EYE DOMINANCE RELATIONSHIPS

Test Area	Hand-Eye Dominance Relationships											
	Left-Right Hand-Eye Relationships				Right-Right Hand-Eye Relationships				Combined Groups			
	Pre-test		Post-test		Pre-test		Post-test		t-Value		Probability	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Pre-test	Post-test	Pre-test	Post-test
I	12.9	4.9	16.4	3.9	13.7	4.0	16.4	2.5	.83	.01	n.s.	n.s.
II	12.2	5.9	14.2	4.9	14.7	3.4	17.5	2.5	.19	2.00	n.s.	.05*
III	5.2	4.4	7.7	4.0	7.5	5.6	9.6	5.8	.11	1.00	n.s.	n.s.
IV	4.6	2.7	5.4	2.4	5.2	2.0	5.5	2.4	2.00	.10	.10	n.s.
V	3.7	2.8	5.0	2.3	4.5	1.7	5.2	2.0	.88	1.18	n.s.	n.s.
Entire Test	37.5	17.2	49.5	14.3	46.6	11.3	53.4	10.9	.58	.78	n.s.	n.s.

*significant n.s.-non-significant

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Children learn by experiencing. The kinds of experiences in which a child participates depends upon the sensory-motor mechanism and actualization offered by his environment. Unless the sensory-motor equipment of the child is healthy and unless he is provided with the appropriate stimulation, he will not develop adequately in the areas of emotional, social, or physical direction. This development will permit him to cope with the tasks society sets forth for him. The child with learning difficulties is unable to cope sufficiently with what he is offered by his environment. However, he can be helped by those who intensely involve themselves in acceptance of him as an individual and those who strive to understand him as a person.

To understand learning difficulties, one must have extensive knowledge of normal human develop. There must be an understanding of the diversity in the rates of growth of individuals and the systems within the individuals which affect growth development. There must also be a philosophy that perceives the child as a future adult, more "normal" than "abnormal," more abled than disabled.

The philosophy of this study involved acceptance of the children with learning difficulties as children in terms of normal developmental progression. The philosophy ascribed to centered around the individual child and concern with the overall balance between abilities and disability to promote a positive outlook for life.

The primary purposes of the study were:

1) To evaluate the hypothesis that a six-week visual perceptual training program will elevate the perceptual performance in children exhibiting visual perceptual disabilities.

2) To evaluate the import of hand-eye relationships as related to visual perceptual performance in children with diagnosed learning disabilities.

3) To determine whether diagnosed exogenous, endogenous, or idiopathic conditions are a causative factor in visual perceptual problems in children with learning disabilities.

4) To determine if sex and age are determinants in low perceptual performance of first, second, and third born with learning disabilities.

5) To ascertain the level of significant difference between father's occupation categories and test area performance involving perception in children with learning disabilities.

The underlying hypothesis of the study was that through a visual perceptual training program, utilizing "normal" developmental activities and special educative principles, the perceptual performance level could be elevated in children with learning disabilities.

An eight week summer residential camp session was considered the most desirable place for gathering data. A camp for children with learning disabilities as a result of minimal cerebral dysfunction was selected. The subjects were screened from 85 campers with learning disabilities. All children had participated previously in some type of perceptual training program but with little improvement. All subjects were between 5 and 16 years of age. Children with orthopedic handicapping conditions were not included in the study. A large percentage of the subjects were children who had experienced very little success in attempts at overcoming problems caused by perceptual difficulties. Many of the children were negative toward any task assignment which might result in failure.

Data were collected by use of pre-test and post-test administration of the <u>Frostig Developmental Test of Visual Perception</u>. Additional data were collected from camp files. Each child was scored as to his performance on the test area items as they related to variables such as sex, age, ordinal placement, father's occupation, age equivalent, diagnosis and dominance. The test area items of the _Frostig Developmental Test of Visual Perception_ included: I (eye-motor coordination), II (figure-ground relations), III (perceptual constancy), IV (position in space), V (spatial relations), and the entire test item of all pre-tests and post-tests.

The t-test was utilized on pre-test and post-test performance to calculate the significant level of difference between perceptual performance and variables. The .10 level, although not significant, was accepted as setting trends in performance.

A visual perceptual training course was utilized between the pre-test and post-test sessions. The course involved daily educational and recreational activities with respect to the test area of greatest need as revealed by the pre-test. The course involved recreational activities planned on a chronological developmental level basis and utilizing the materials at hand. The educational program included repeating work sent by the teacher of the child during the previous academic year. No specific materials were utilized, and no substantuated methods employed. The utilization of 35 millemeter slides, as discussed previously, and practice sheets corresponding to the areas of need demonstrated by the *Frostig Developmental Test of Visual Perception* were used to guard against regression.

The philosophy of ableness was employed to eliminate as much stress as possible in failures. Praise and encouragement were used often and unlimited time was given to instruct the child as he needed help.

Conclusions based upon information compiled during an eight week study of children with learning disabilities and resultant perceptual lag are as follows:

1) A six week visual perceptual training program does elevate the perceptual performance in children exhibiting visual perceptual disabilities.

2) Hand-eye relationships were not found to be significantly important in perceptual performance, and an improvement trend was established in a hand-eye relationship groupings. Children with left-right hand-eye dominance did exhibit a greater level of improvement than did other dominance groups.

3) The evaluation of diagnostic conditions as causative factors in visual perceptual problems revealed that diagnoses was not highly significant in the perceptual performance of children with learning disabilities, but that children with endogenous diagnoses exhibited a higher level of improved perceptual performance than did the exogenous group.

4) Data revealed that first born males evidenced more perceptual performance problems than any sex-age group of first born, second born, or third born children with learning disabilities.

5) No significant difference existed between the perceptual performance of children with learning disabilities as a result of their father's occupation.

Data revealed also that no significant difference exhisted between male and female perceptual performance; however, an overall improvement trend was exhibited. Males from 11 to 13 years of age did have a higher percentage of endogenous diagnosis than any other sex-age group, and females exhibited more exogenous diagnoses. Children under 11 years of age and children over 11 years of age exhibited a parallelistic trend in overall perceptual performance. Further analysis revealed that children with left-right hand-eye dominance exhibited a more significant level of improvement than did other dominance combination groups.

It is recommended that additional research be undertaken in the following areas:

1) The planning and broadening of perceptual training experiences for children with learning disabilities to include normal developmental activities and expectations of performance on a positive, rather than negative, basis.

2) Further exploration of dominance factors as being highly significantly related to overall visual perceptual performances in children with learning disabilities.

3) The development of ways of fostering self-acceptance, self-esteem, moral values, and

social competencies in children with learning disabilities through attainment of an overall balance of abilities and personality with the disability to provide a positive outlook for life.

4) The replication of this study utilizing a larger sample, similar test forms including a "normal" group in all activities.

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A P P E N D I C E S

APPENDIX A

P R A C T I C E   S H E E T S

PRACTICE SHEETS

LEGEND OF AREAS

I - Eye-motor coordination

II - Figure ground

III - Form constancy

IV - Position in space

V - Spatial relationships

EXPLANATION OF AREAS

I - Eye-motor coordination--involves the drawing of continuous, straight, curved, or angled line between boundaries of various width, or from point to point without guide lines.

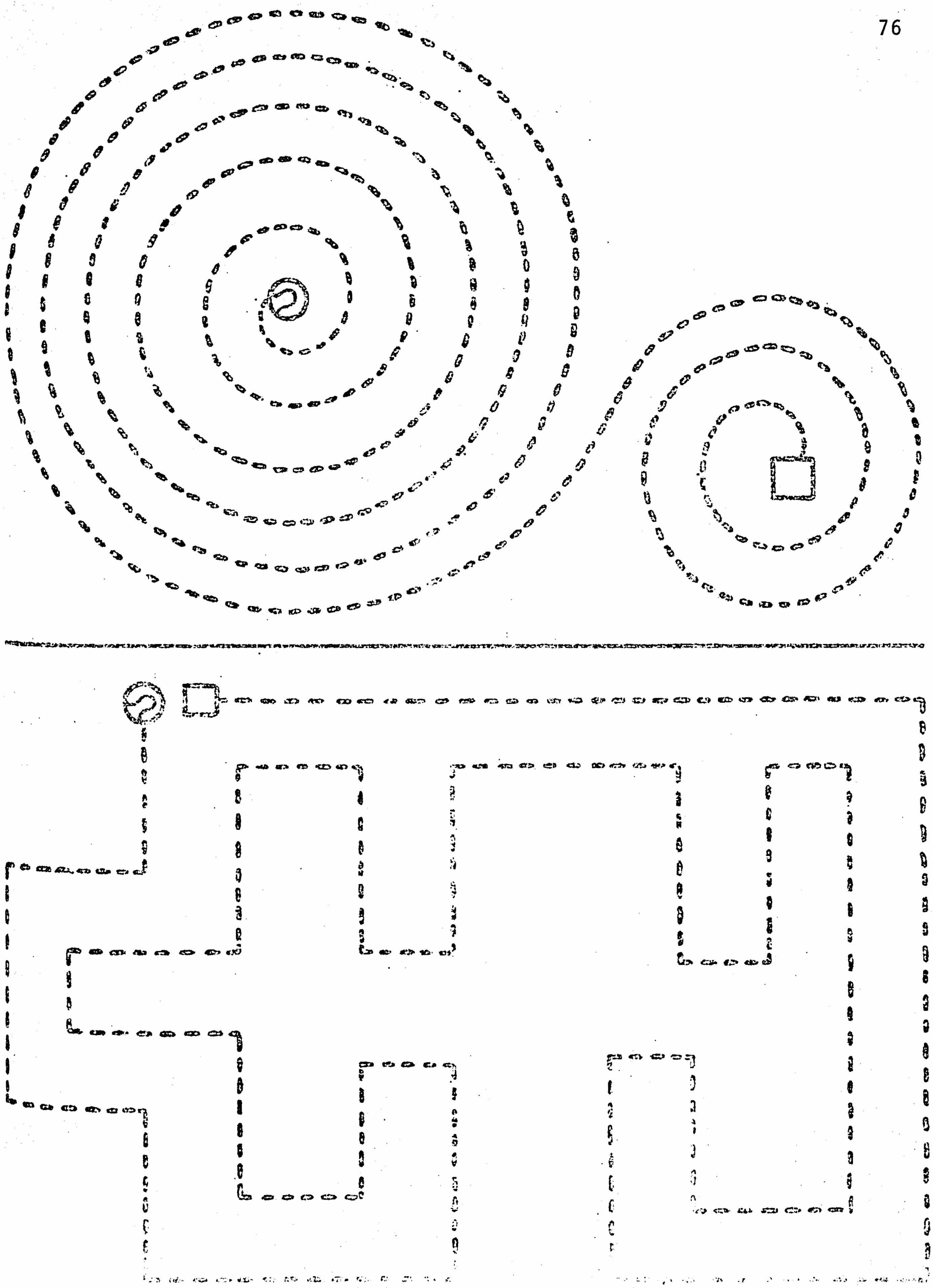
II - Figure ground--involves a shifting in perception of figures against increasing complex grounds. Intersecting and "hidden" geometric forms are used.

III - Constancy of shape--involves the recognition of certain geometric figures presented in a variety of sizes, shadings, textures and positions in space and their discrimination from similar geometric figures.

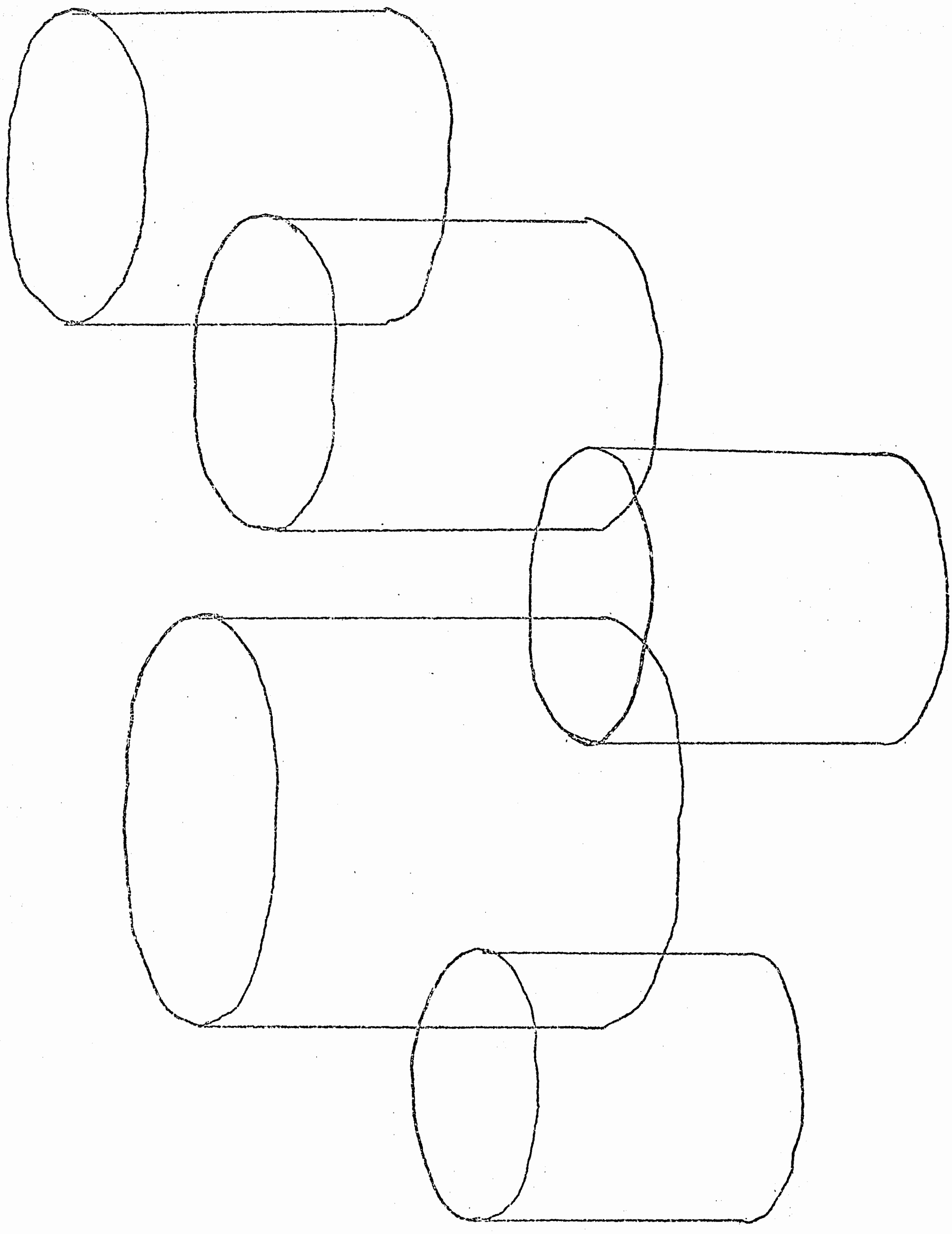
IV - Position in space--involves the discrimination of reversals and rotations of figures presented in series.

V - Spatial relationships--involves the analysis of simple forms and patterns.

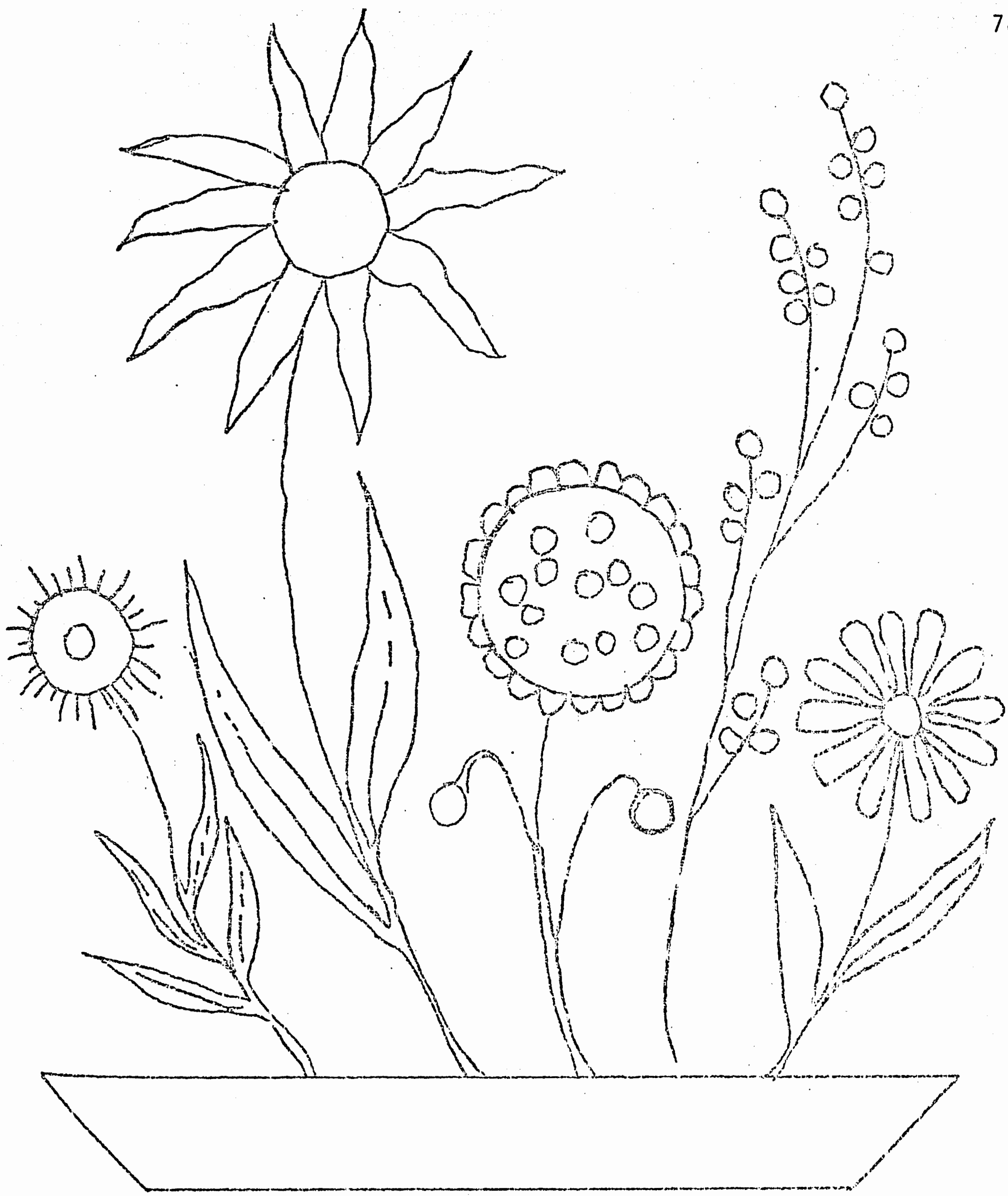
Sample practice sheets used in each test area are shown on the following pages.

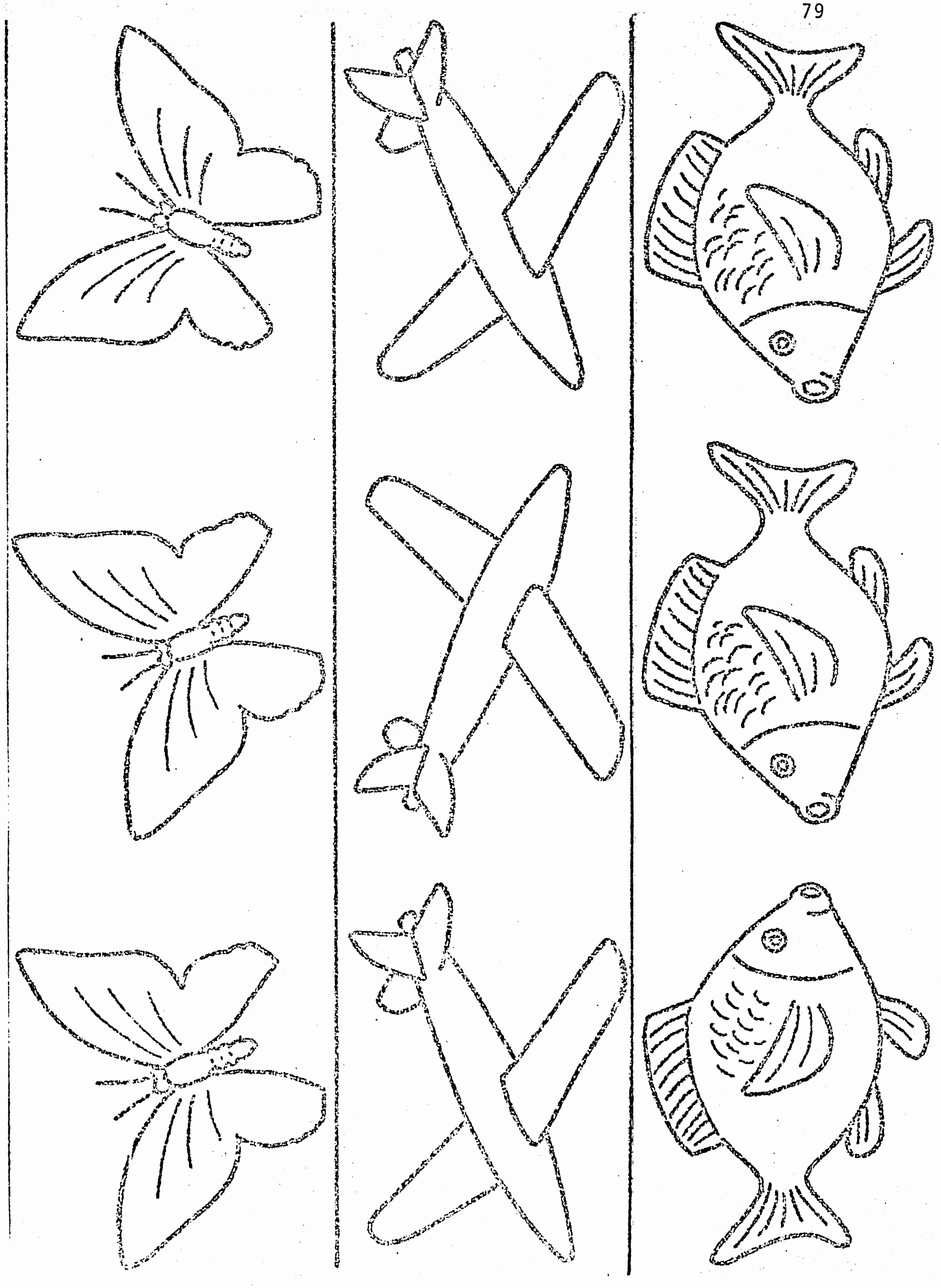


I - Eye-motor coordination

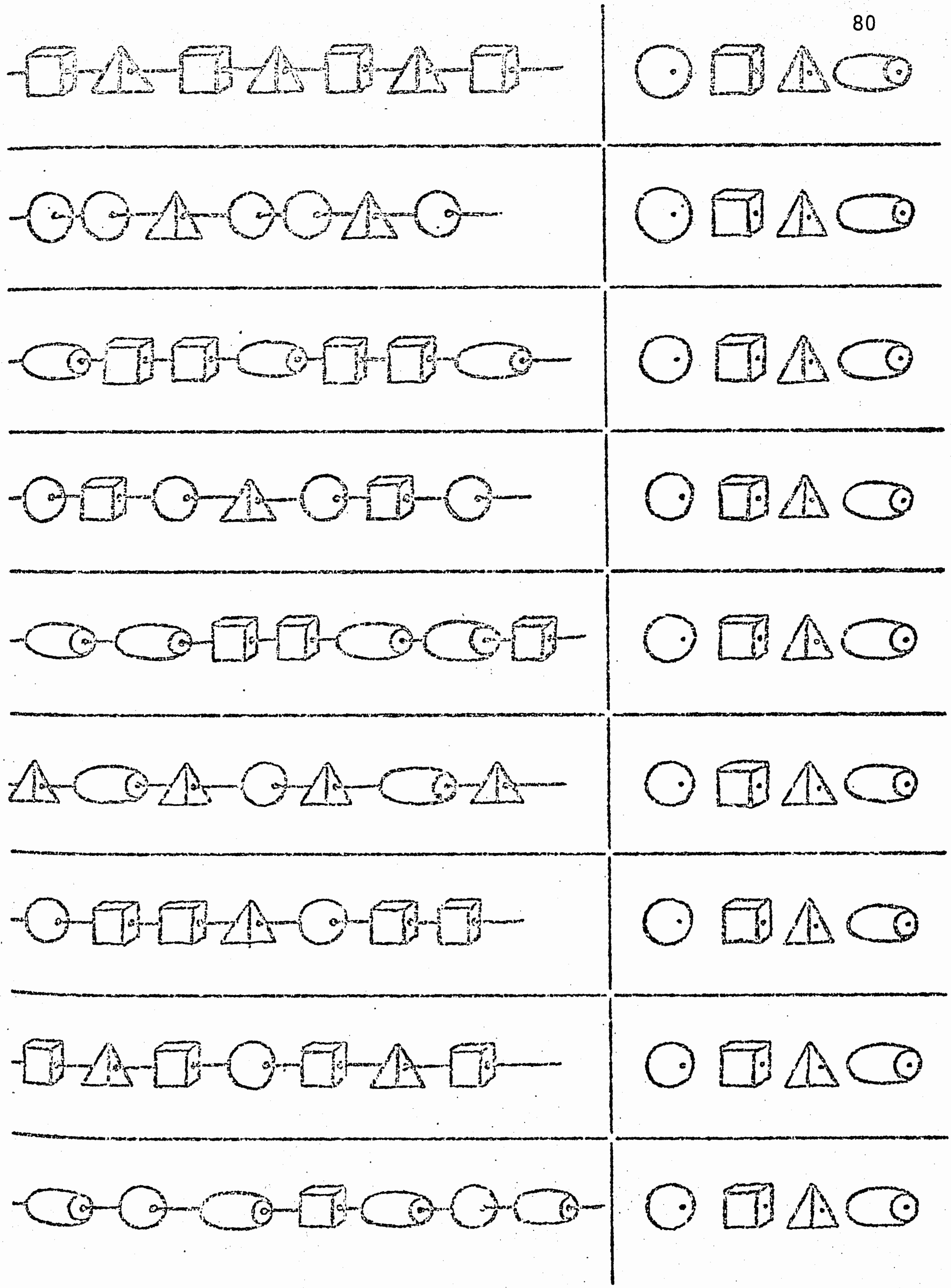


II - Figure-ground





IV - Position in space



V - Spatial relationships

APPENDIX B

FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION

Marianne Frostig

DEVELOPMENTAL TEST OF VISUAL PERCEPTION

In collaboration with: Welty Lefever, Ph.D. and John R. B. Whittlesey, M.S.

T H I R D   E D I T I O N

Name .... Sex.... M.... F...

Age........ Grade....... School..

Date.......................... Examiner..

CONSULTING PSYCHOLOGISTS PRESS 577 COLLEGE AVENUE, PALO ALTO, CALIFORNIA

Marianne Frostig

DEVELOPMENTAL TEST OF VISUAL PERCEPTION

Third Edition

I. Eye-Motor Coordination

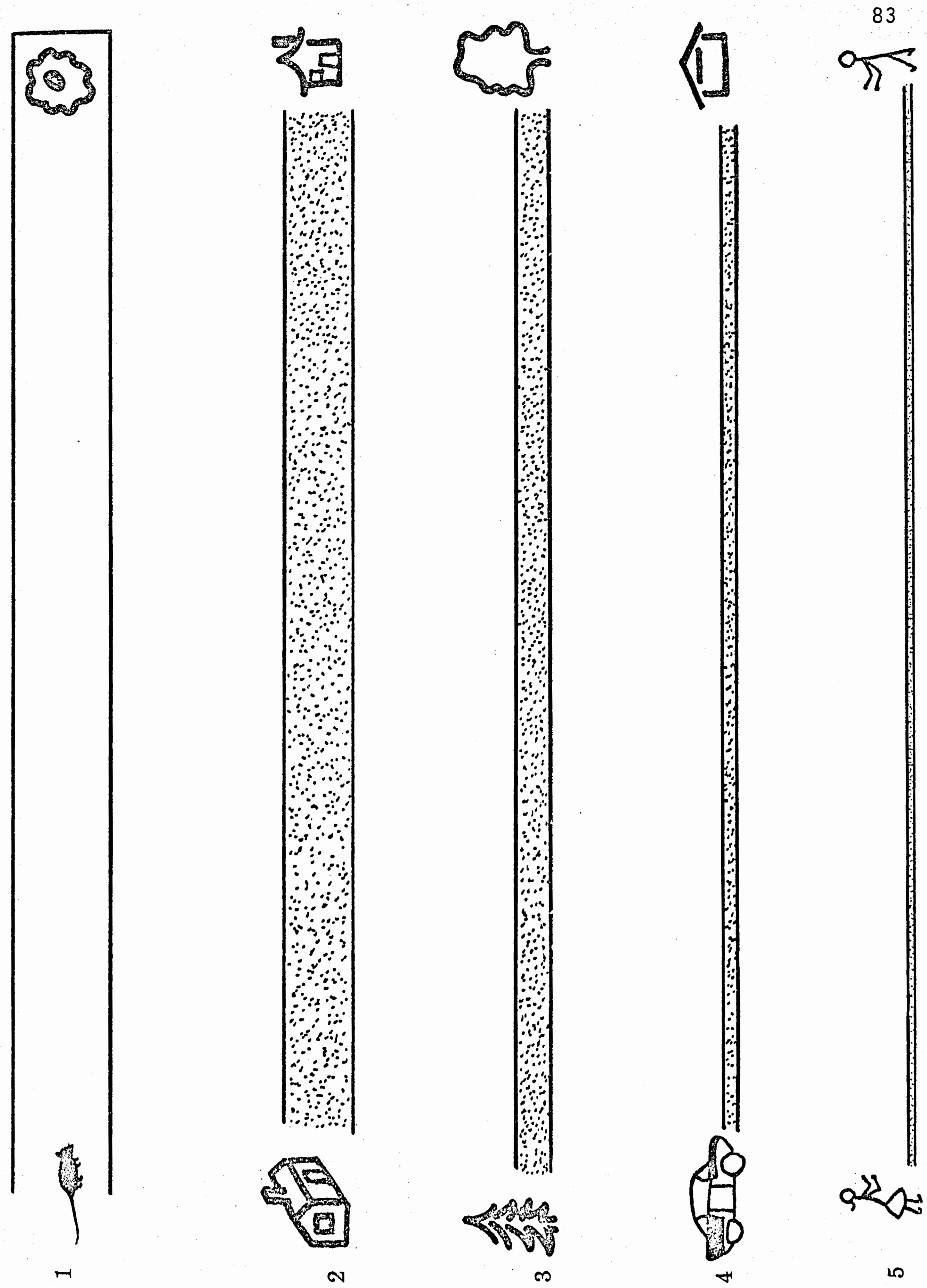
II. Figure Ground

III. Form Constancy

IV. Position in Space

V. Spatial Relations

82a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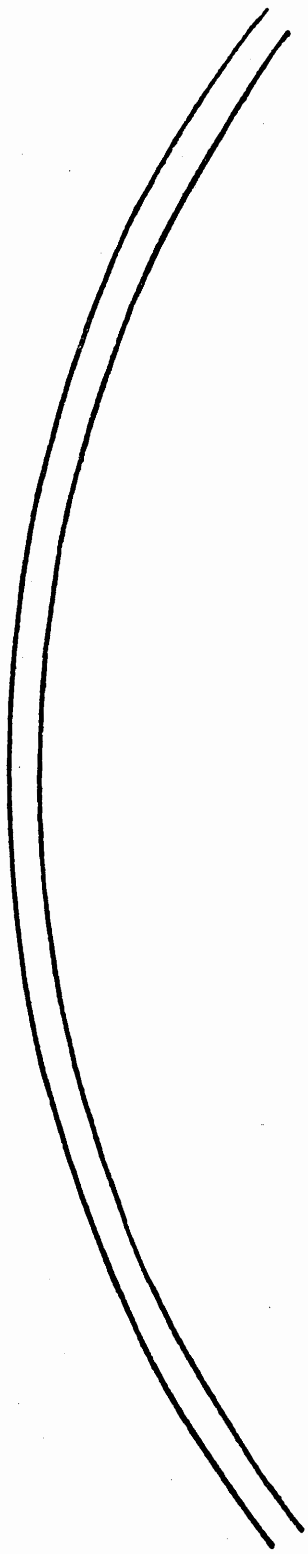

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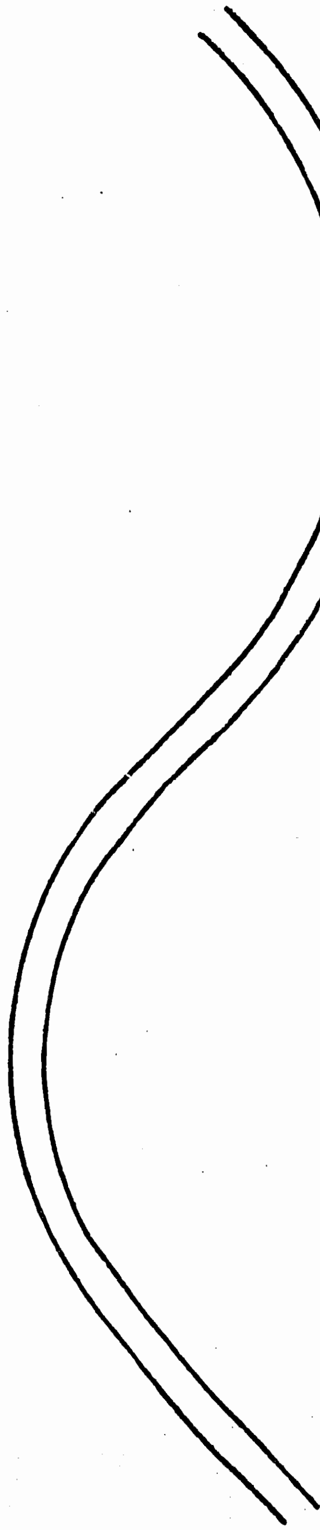

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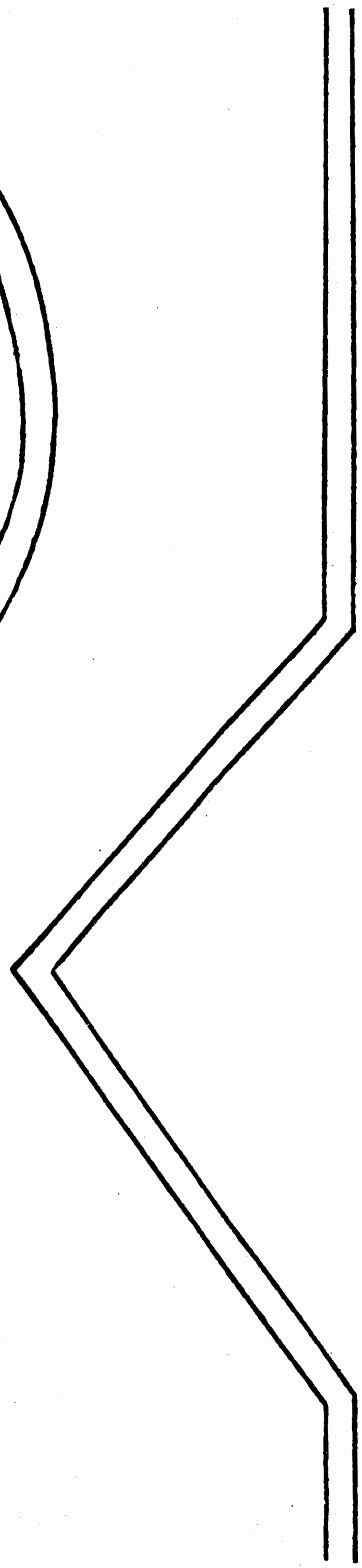

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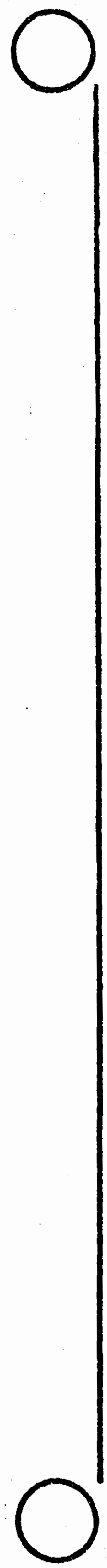

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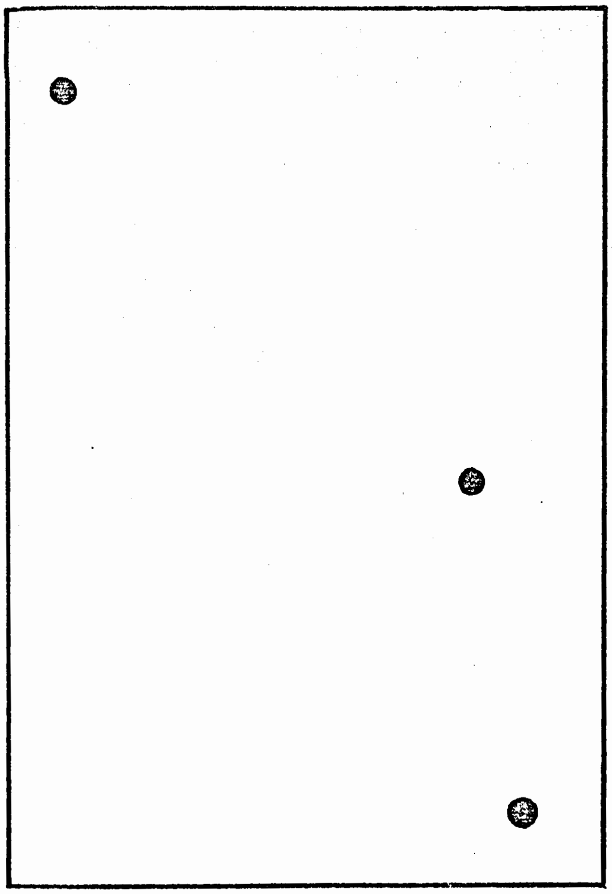

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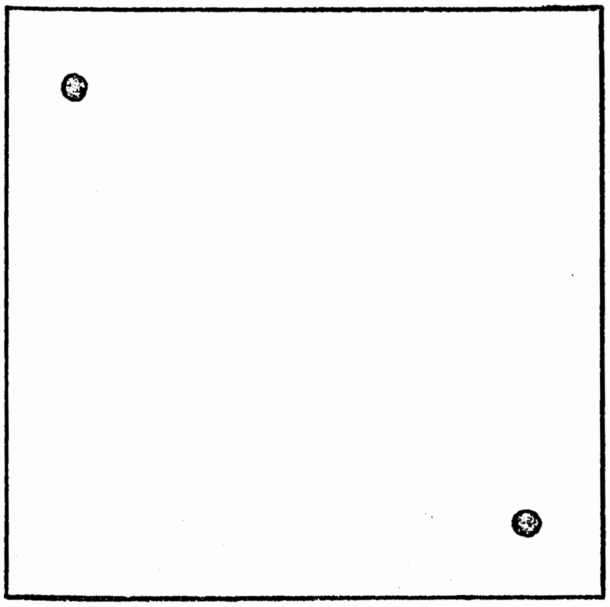

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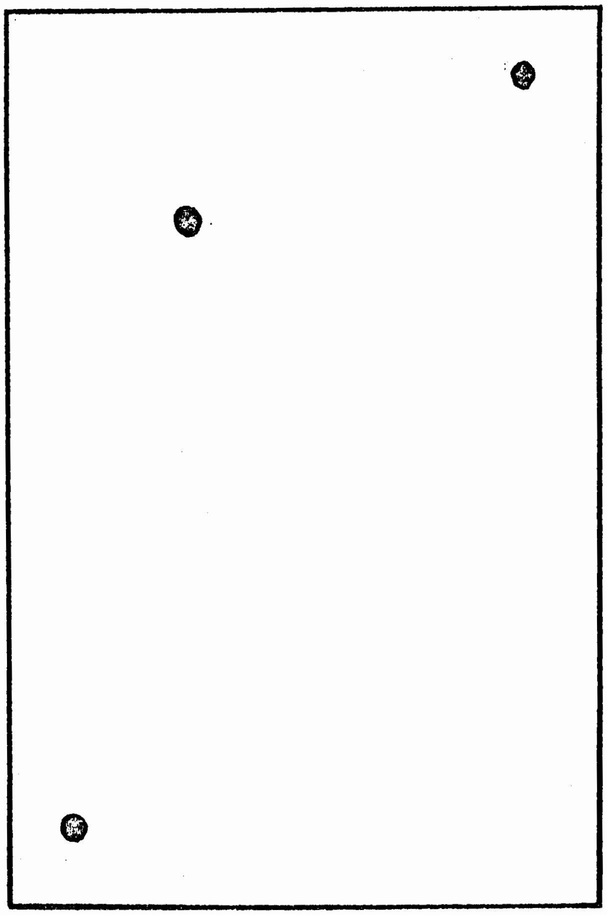

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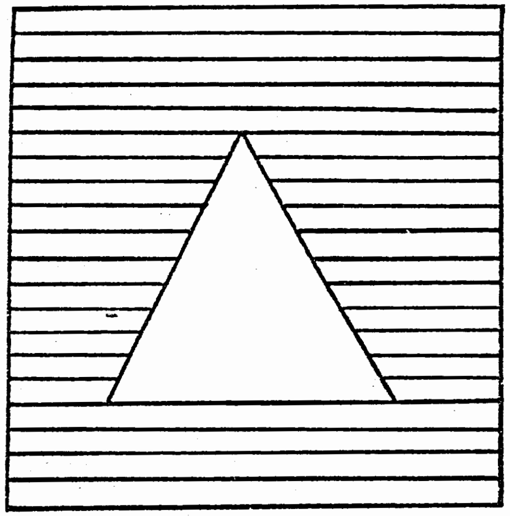

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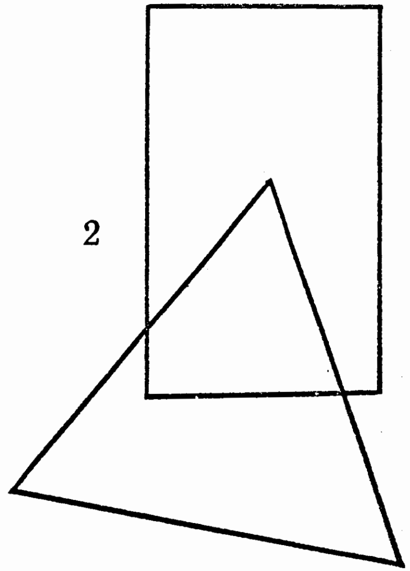

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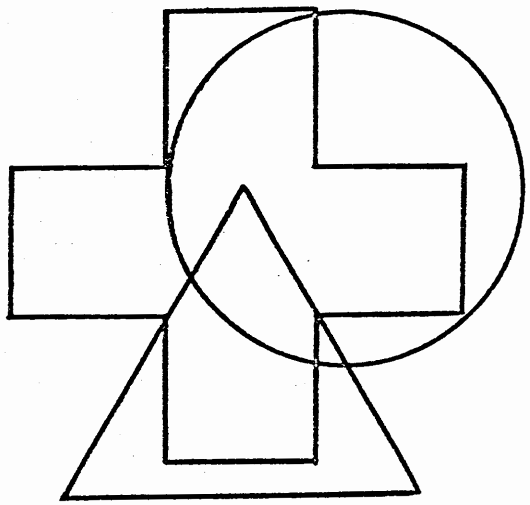

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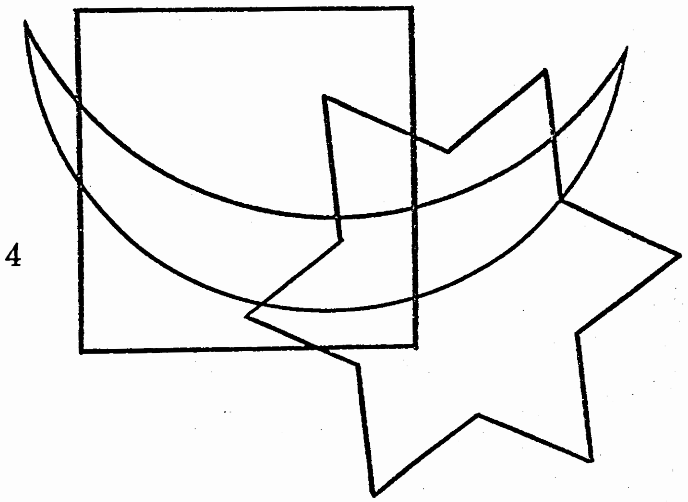

IIb

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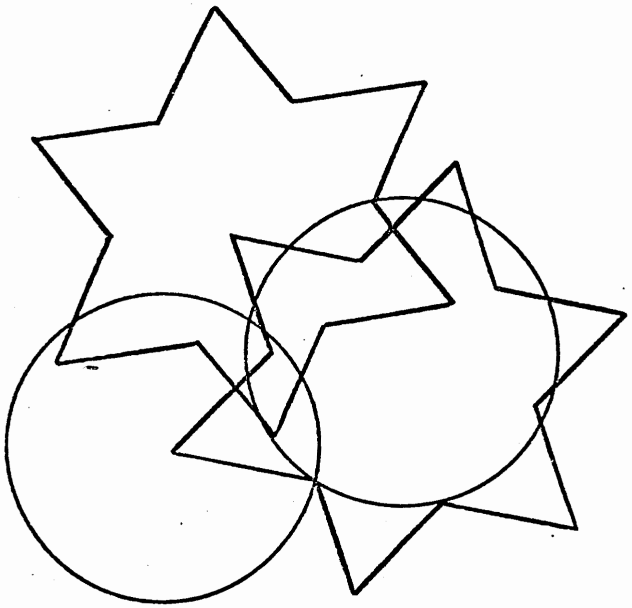

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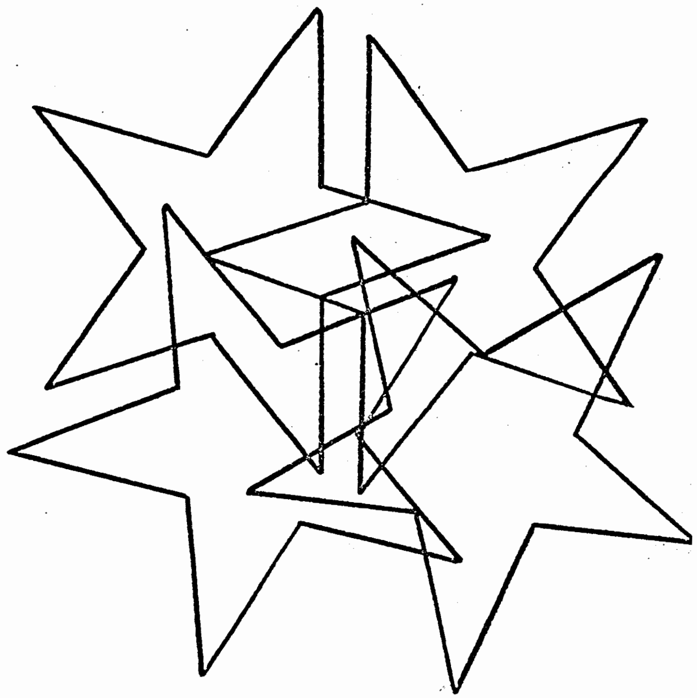

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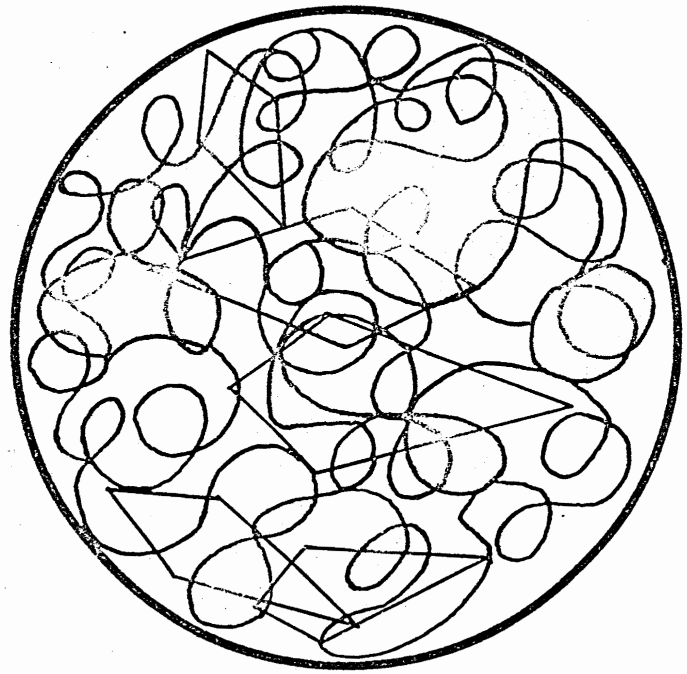

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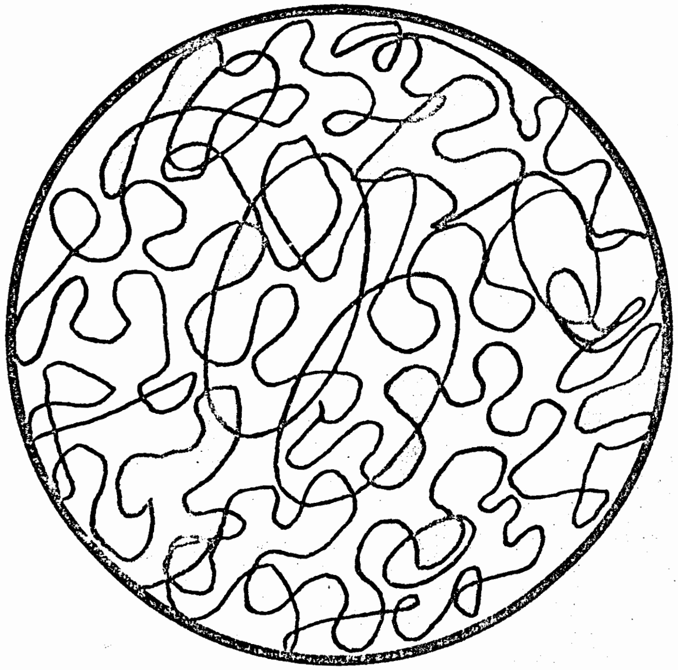

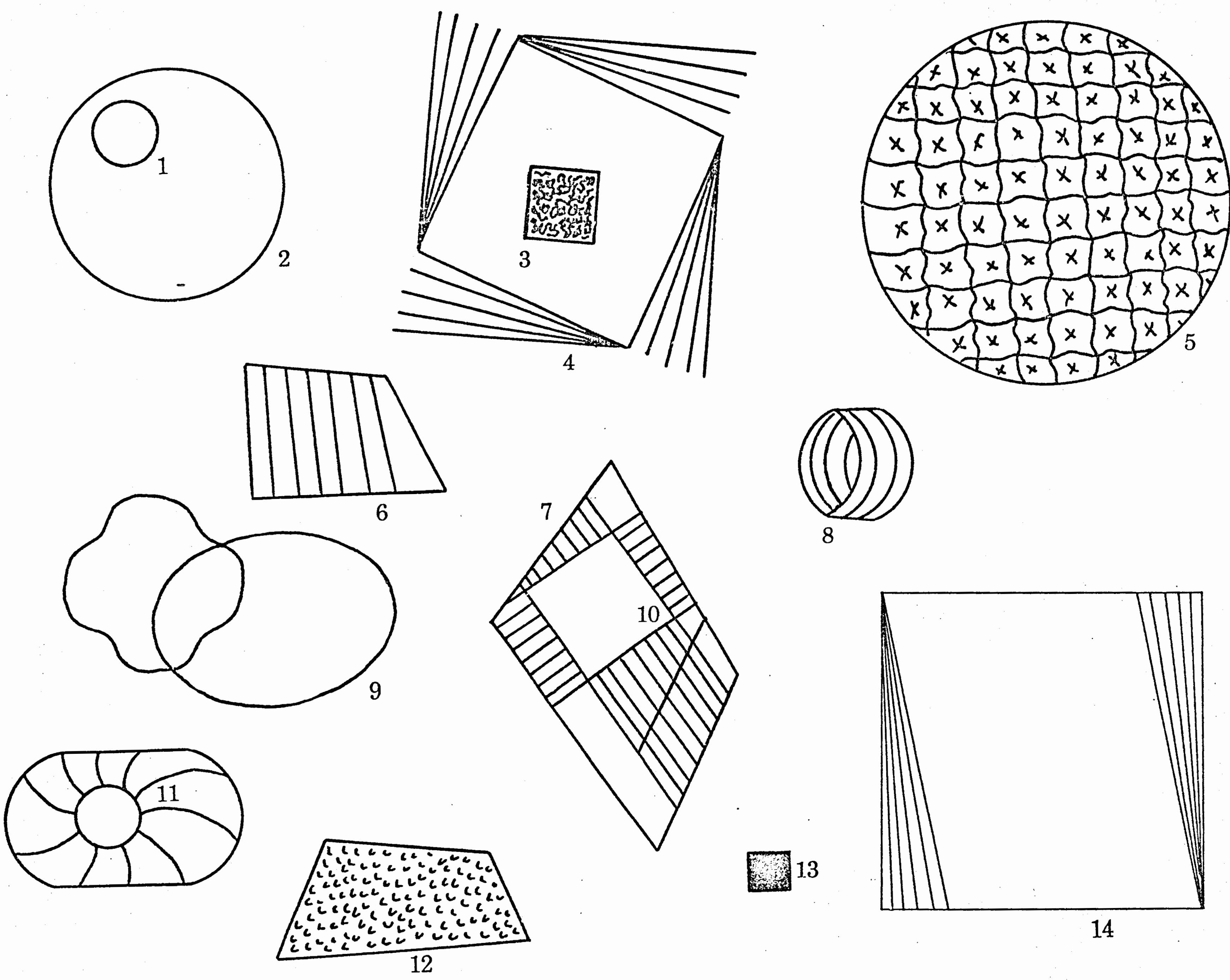
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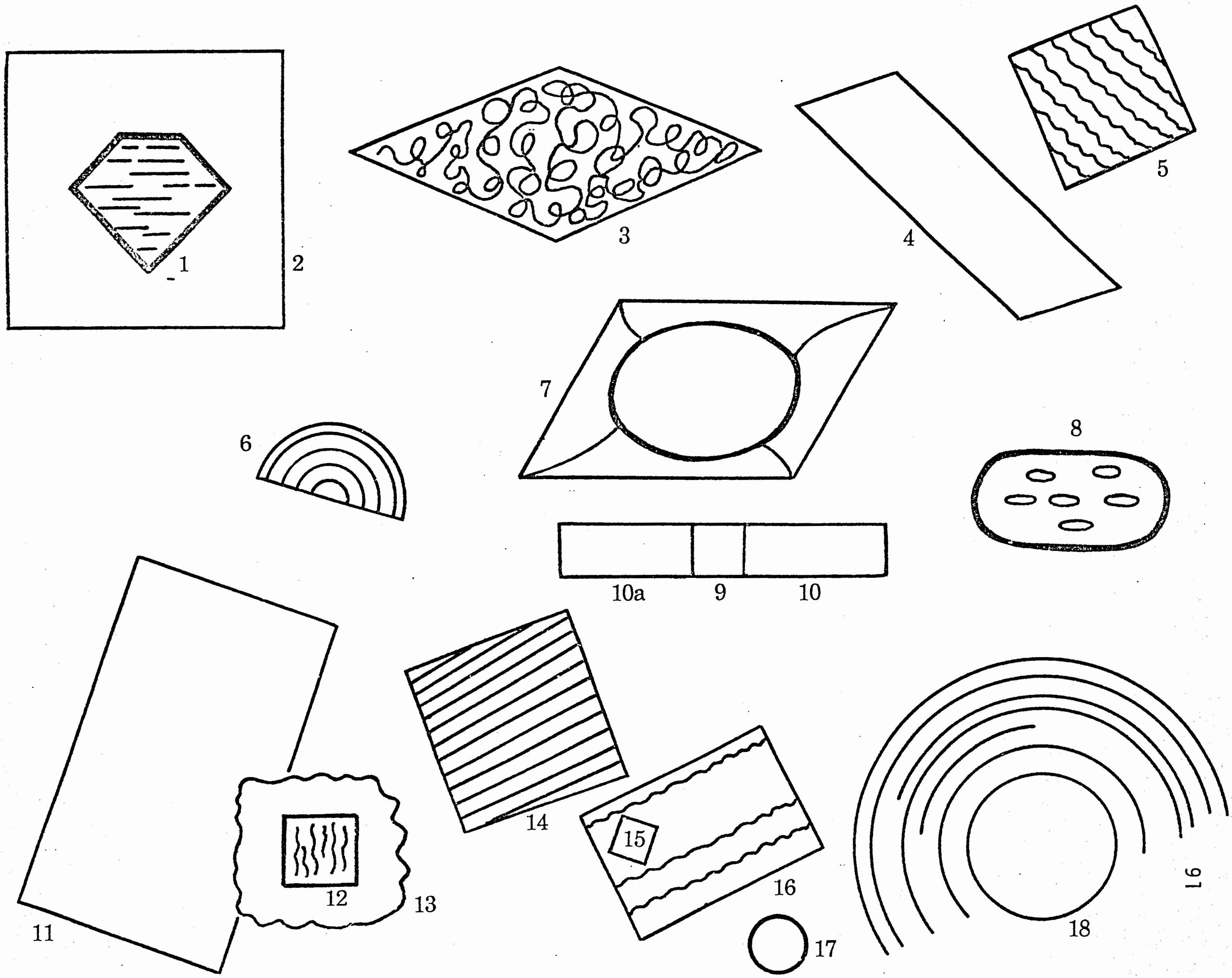
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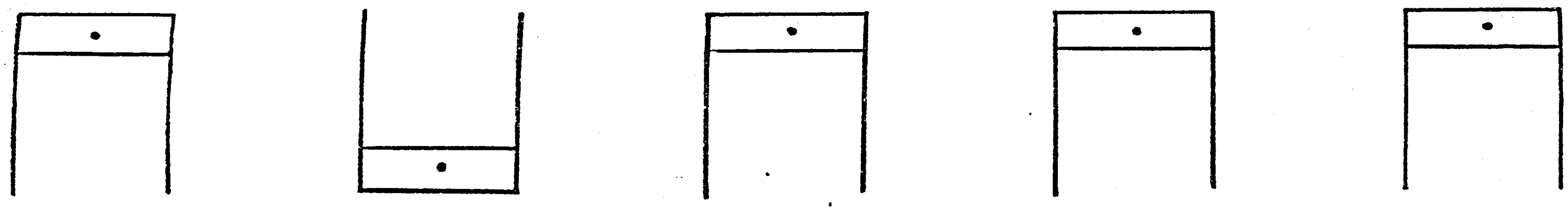

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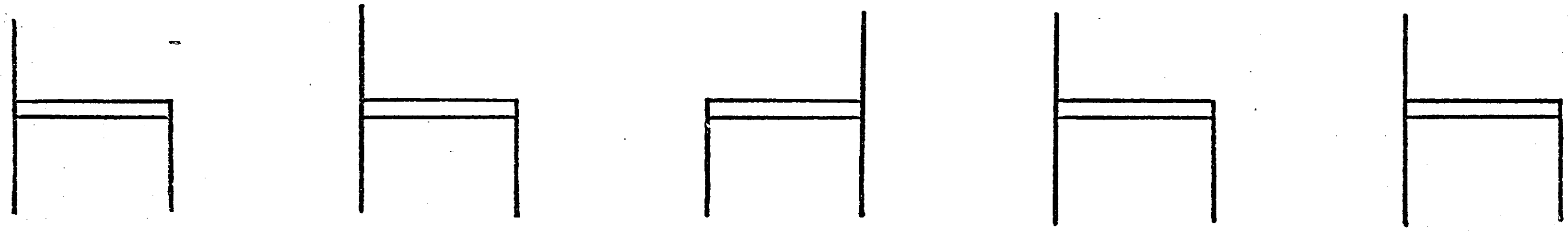

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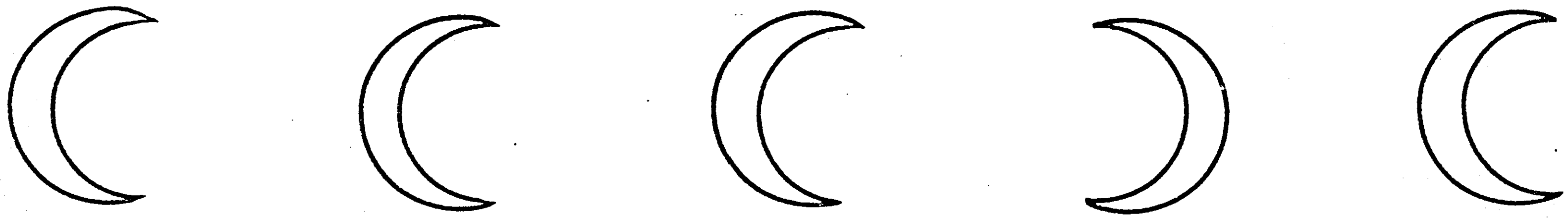

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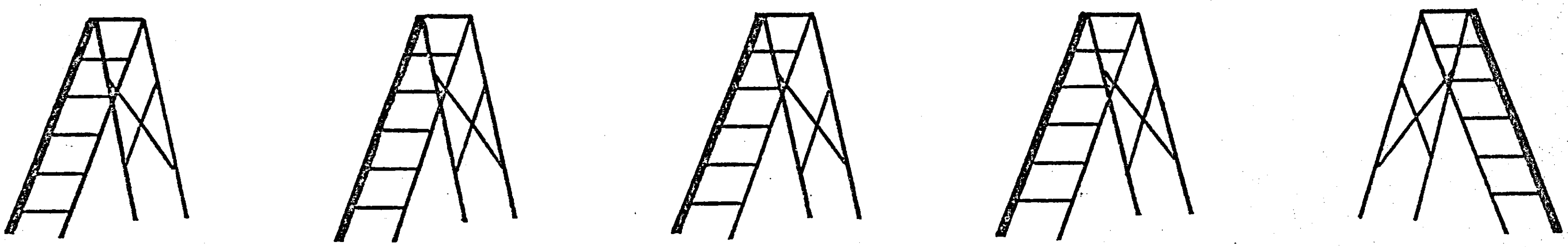

IVb

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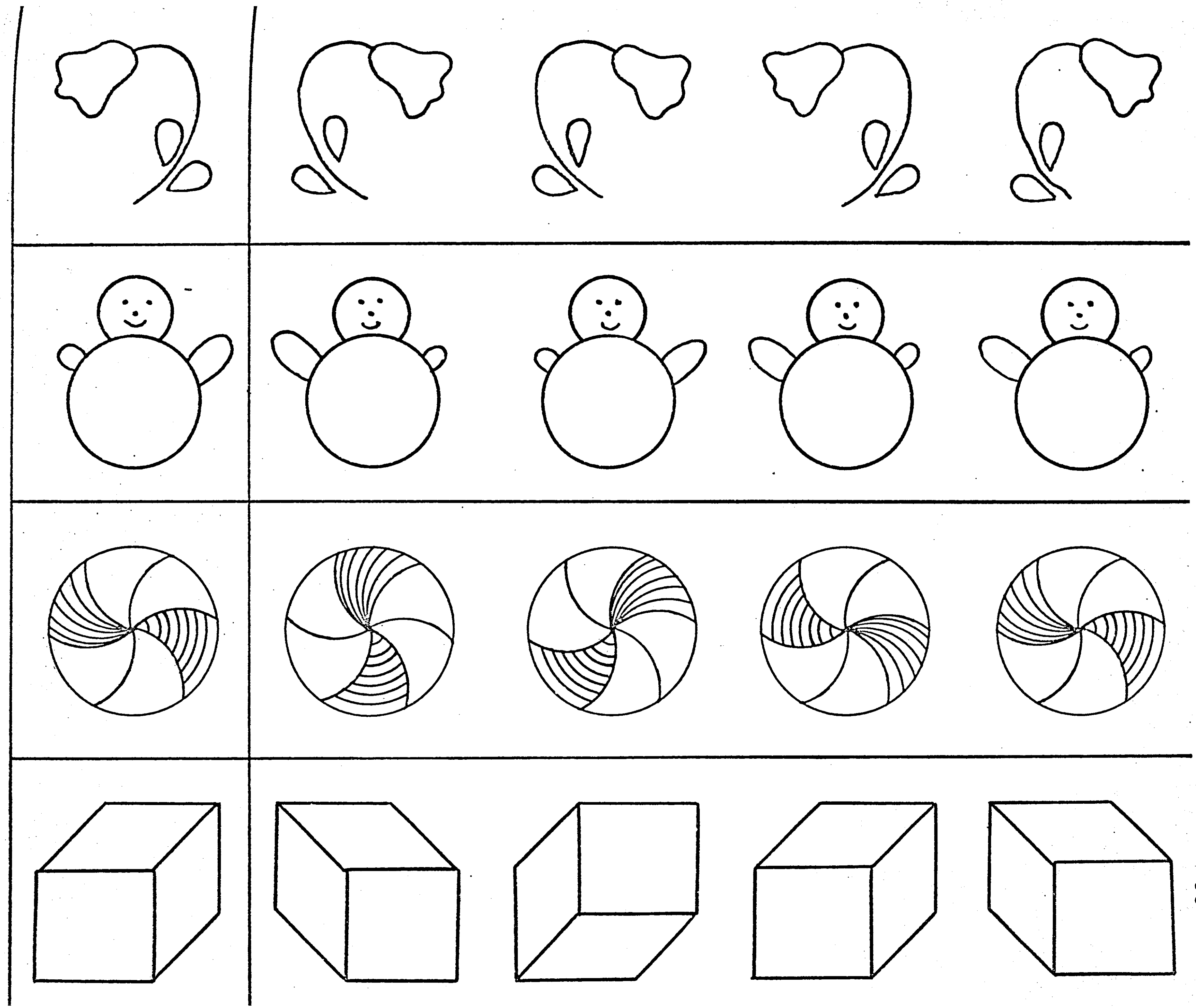

Va

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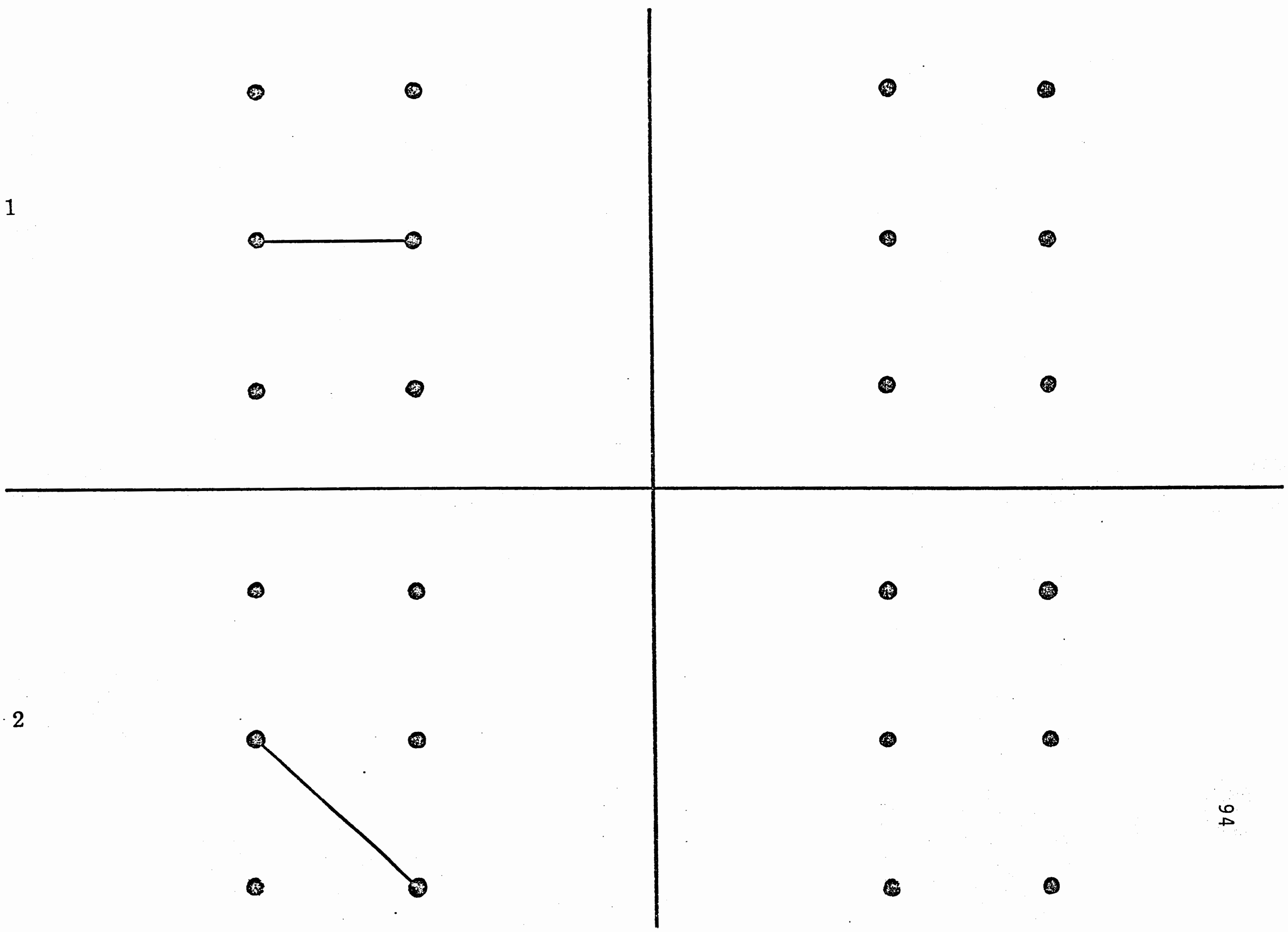

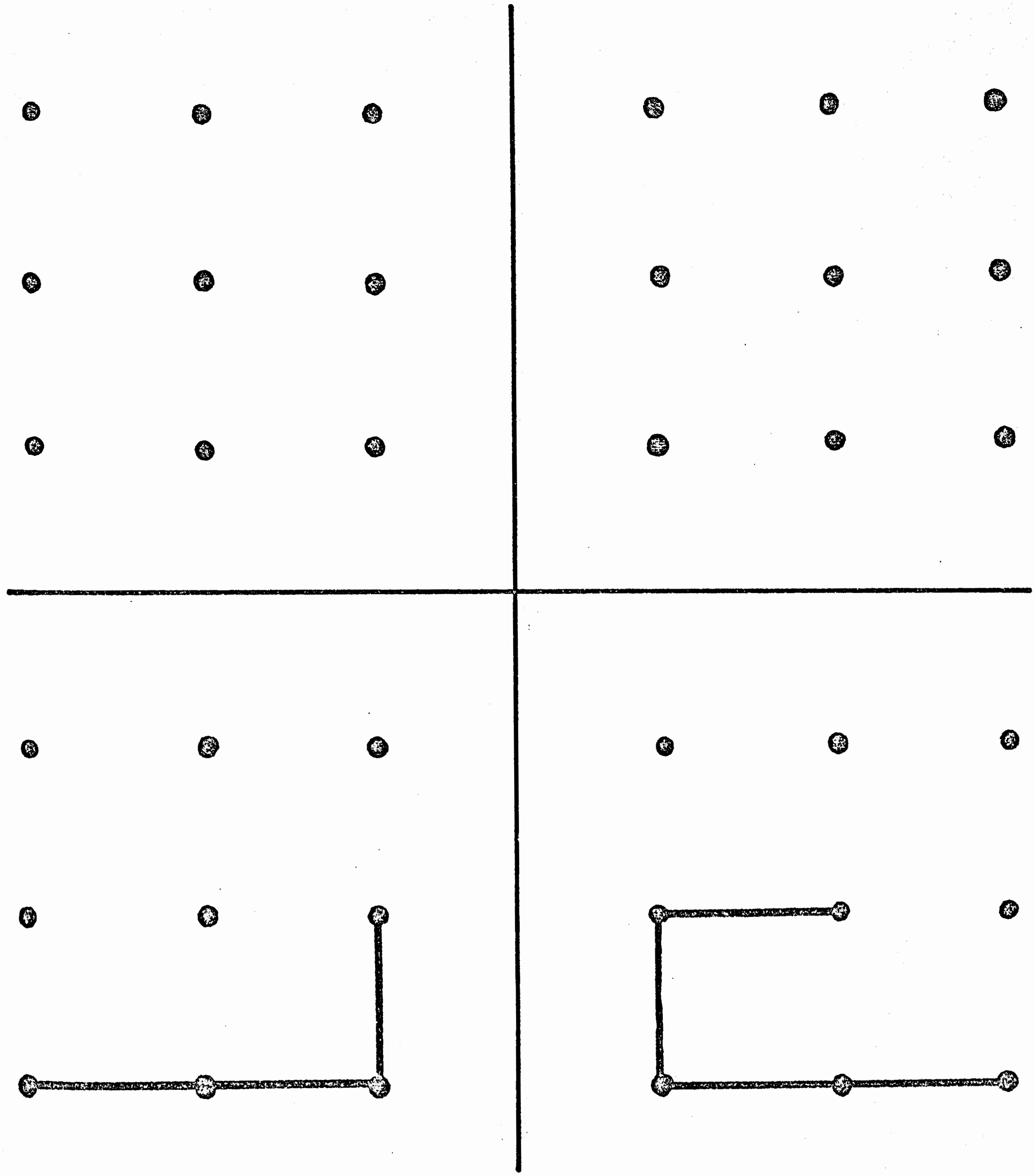

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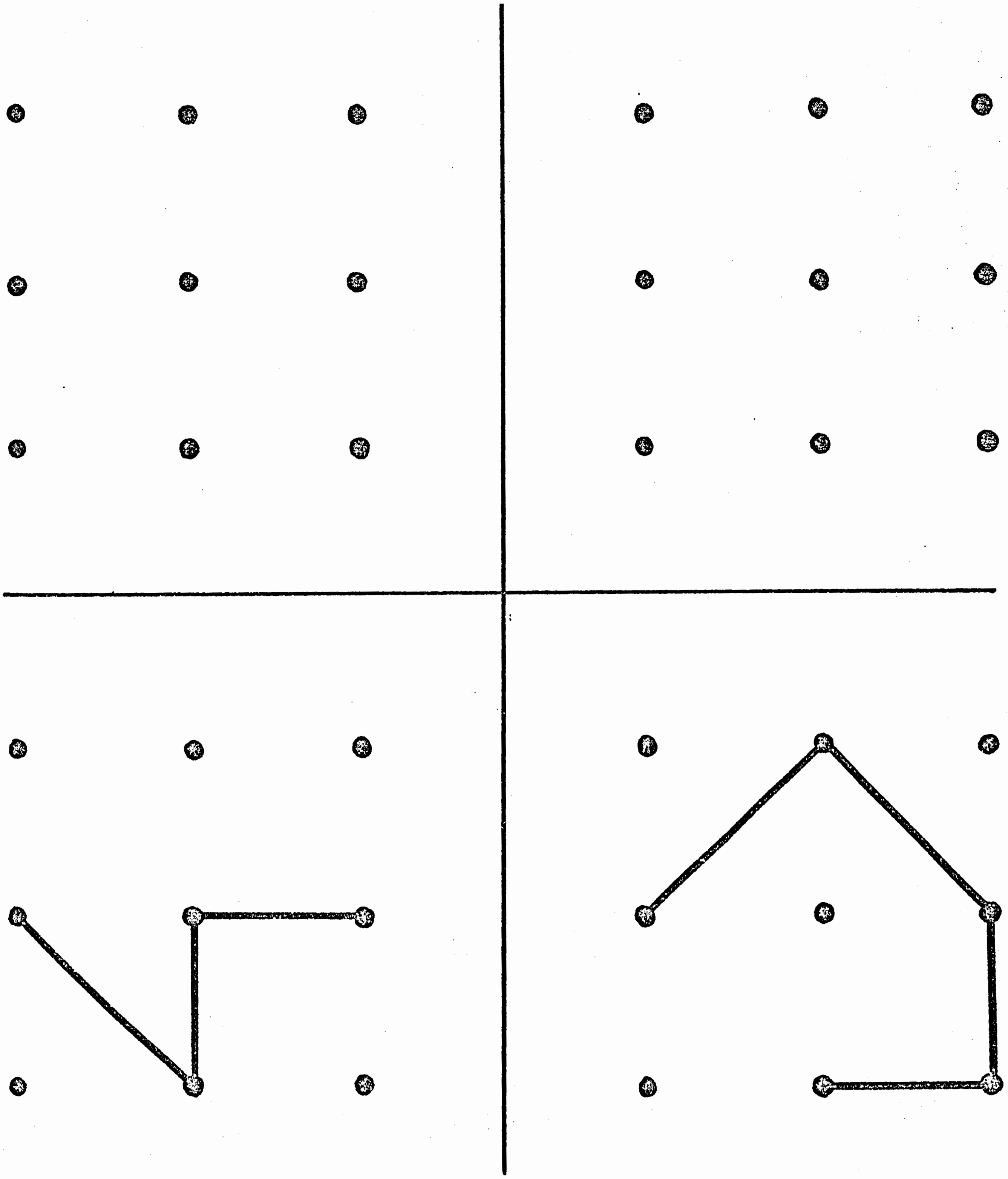
Vc



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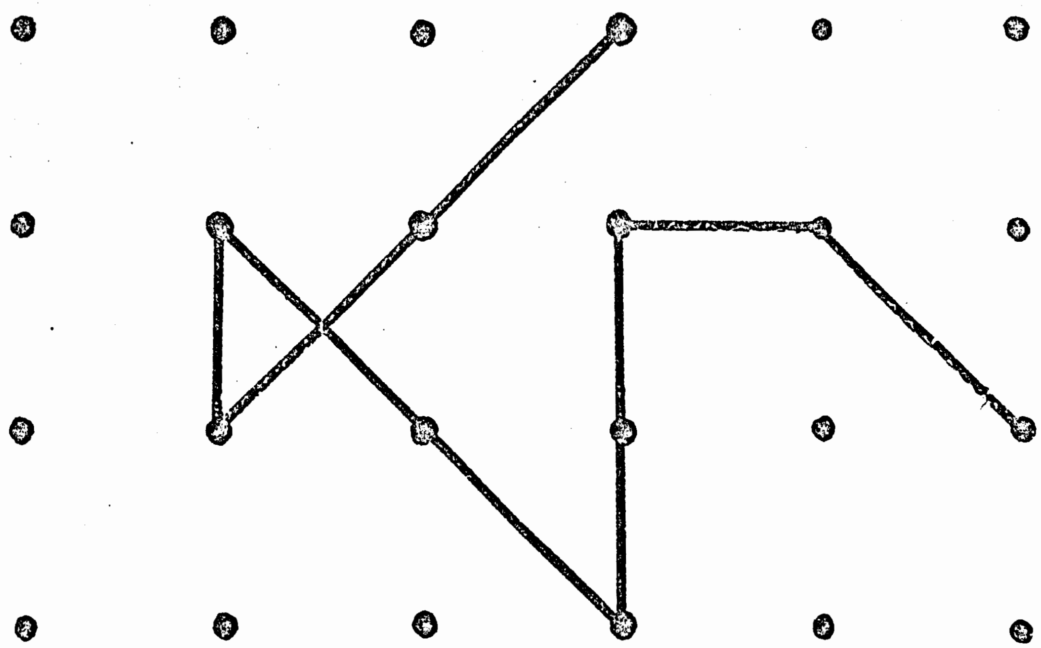
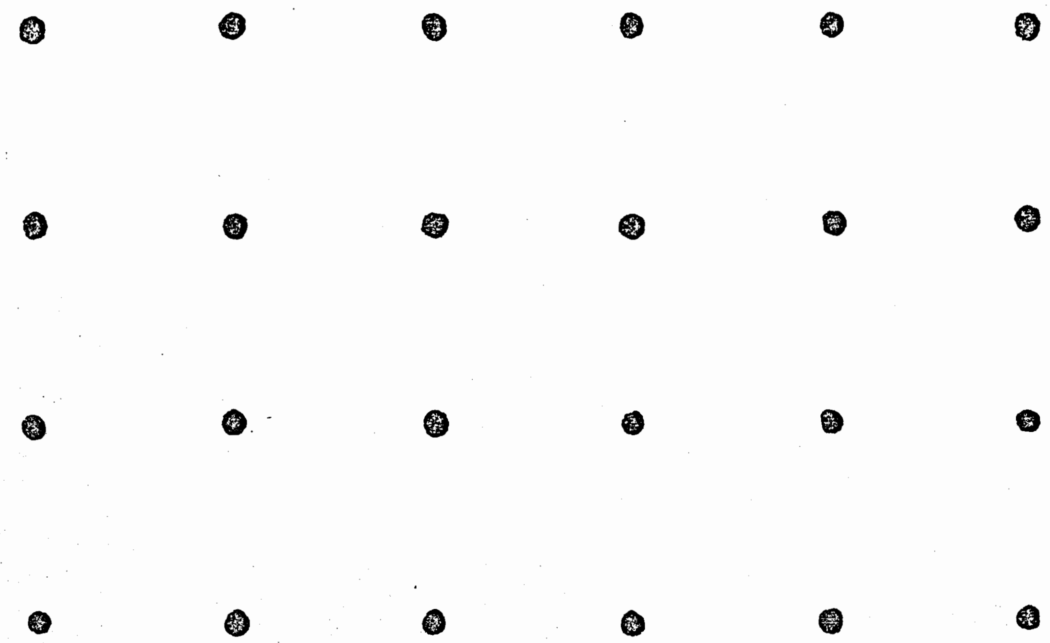
6

First Grade and up only

7





First Grade and up only

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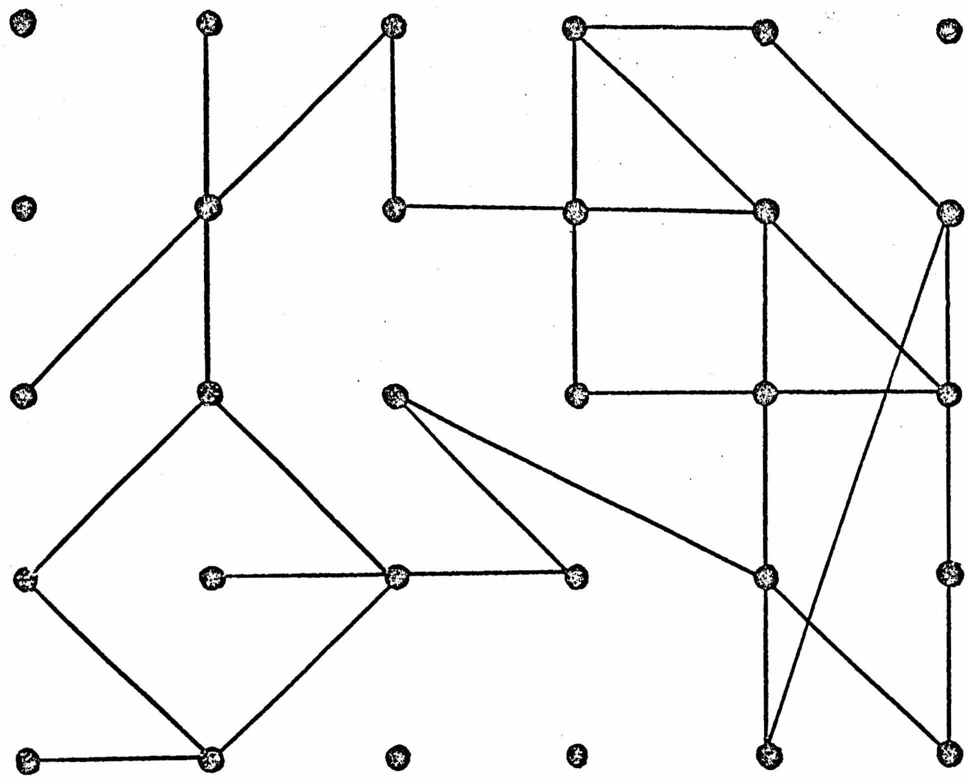
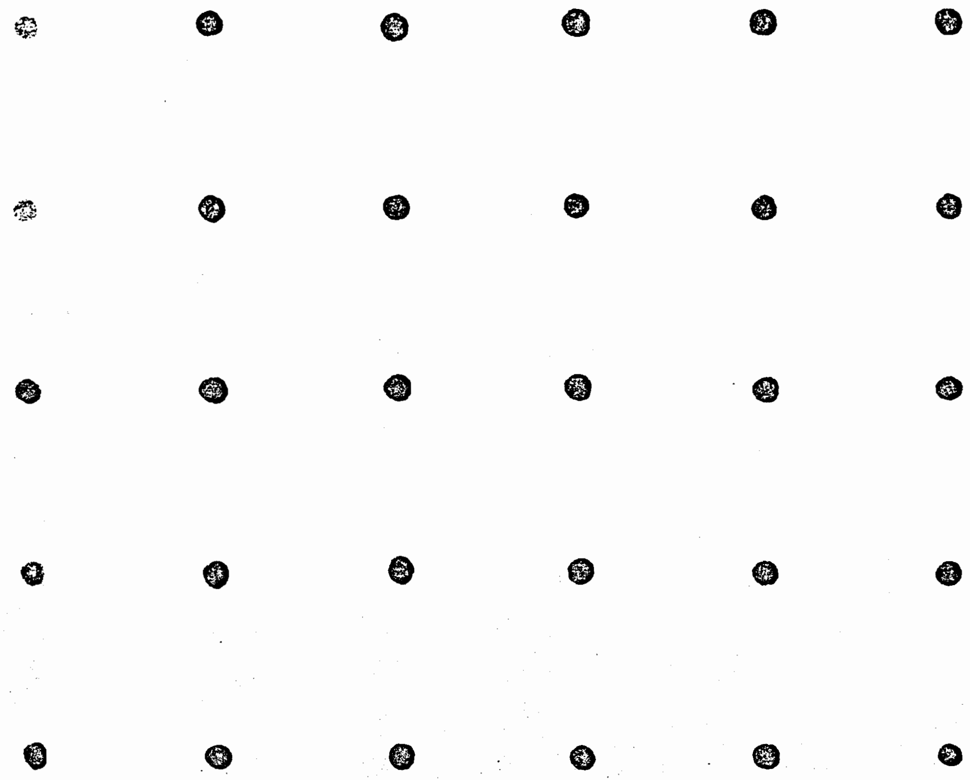




DEVELOPMENTAL TEST OF VISUAL

CHILD'S NAME ....

PARENT'S NAME ....

ADDRESS ....

.... TELEPHONE ....

	YEAR	MONTH	DAY
DATE OF TEST	______	______	______
BIRTH DATE	______	______	______
CHRONOLOGICAL AGE	______	______	______

I.Q. .... HANDEDNESS .... GRADE ....

SOCIAL ADJUSTMENT ....

READING ACHIEVEMENT ....

MEDICAL DIAGNOSIS IF AVAILABLE ....

....

DIAGNOSING PHYSICIAN AND AGENCY ....

.... TELEPHONE ....

EXAMINER ....

SUBTESTS	I	II	III	IV	V	TOTAL
RAW SCORES						
AGE EQUIVALENTS						
SCALED SCORES						
	PERCEPTUAL QUOTIENT					

I	II	a	b		
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9		9	9		
10		10	10		
11		11	11		
12		12	12		
13		13	13		
14		14	14		
15			15		
16			16		
			17		
			18		

I	II	III	IV	V

Total

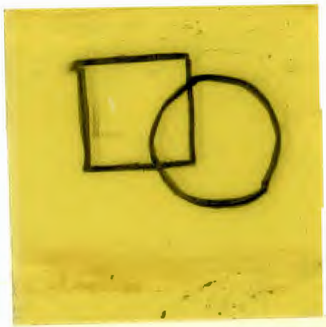
APPENDIX C

<u>V I S U A L</u> <u>P E R C E P T U A L</u>

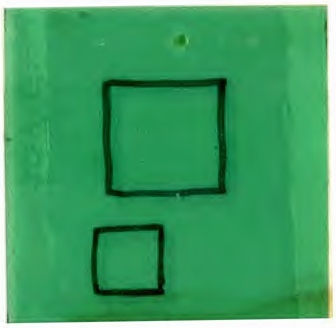
<u>T R A I N I N G</u> <u>S L I D E S</u>

V I S U A L P E R C E P T U A L T R A I N I N G S L I D E S

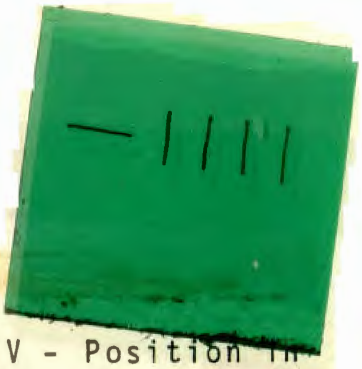
I - Eye-motor Co-ordination



II - Figure-ground



III - Form constancy



IV - Position in space

V - Spatial relationships

APPENDIX D

D A I L Y C A M P A C T I V I T Y

S C H E D U L E

D A I L Y C A M P A C T I V I T Y S C H E D U L E

The following tentative daily schedule will be in use during the summer:

7:00	WAKE UP! (make beds, wash up for breakfast)
8:00	Flag raising and breakfast
9:00	Activity period (see list of activities)
10:00	Activity period or school
11:00	School of activity
12:00	Lunch
1:00	Rest hour
2:00	Team and circle games
2:30	Juice and cookies
3:00	Swim (by age groups) This is an instruction period.
4:00	Music period (appreciation, group singing, instrument)
5:00	Clean up and supper (free play after eating)
6:45	Flag lowering, canteen and infirmary call
7:15	Evening activity (15 minutes for young campers)
7:45	Bedtime for young campers
8:30	Bedtime for older campers

Medications will be given at designated times throughout the day.

Activities include:

Arts and crafts, bicycle riding, physical fitness exercises, story and reading period, hiking, swimming, horseback riding, nature craft, relay races, speech stimulation activities, circle games, team games, ping pong, pool, basketball, softball, volleyball, fishing, science hikes, and the like.