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THE IMPROVEMENT IN READING ABILITY THROUGH THE DEVELOPMENT OF SPECIFIC UNDERLYING OR ASSOCIATED MENTAL ABILITIES

by

Rachel Brent Burkholder

A Dissertation Submitted to the Faculty of the

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GRADUATE COLLEGE

I hereby recommend that this dissertation prepared under my direction by Rachel Brent Burkholder

entitled The Improvement in Reading Ability Through the Development of Specific Underlying or Associated Mental Abilities

be accepted as fulfilling the dissertation requirement of the degree of Ph.D.

Ralph J. Wetzel — Dissertation Director — Date 4-4-68

Ruth Strang — Dissertation Co-director — Date April 4, 1968

After inspection of the final copy of the dissertation, the following members of the Final Examination Committee concur in its approval and recommend its acceptance:*

Ruth Strang	April 4, 1968
Lyman C. McCreary	April 5, 1968
Jack Cowhard	April 16, 1968
[illegible]	April 16, 1968

*This approval and acceptance is contingent on the candidate's adequate performance and defense of this dissertation at the final oral examination. The inclusion of this sheet bound into the library copy of the dissertation is evidence of satisfactory performance at the final examination.

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SIGNED: Rachel Burkholder

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ABSTRACT

There has been an increasing awareness in the literature that significant relationships may exist among some of the underlying psycholinguistic, cognitive, and other mental abilities and retardation in reading. It has been hypothesized that the development of instructional procedures aimed at improving these underlying abilities might contribute to the acquisition of reading skills.

The general design of this study was (1) to identify deficiencies in certain underlying mental abilities of selected retarded readers, (2) to devise methods and materials for improving underlying abilities in which these subjects were deficient, (3) to provide training in these areas, and (4) to measure the effectiveness of the specialized training on underlying abilities and on reading at the end of the training period and six months later.

An experimental group of ten second and third grade students identified as deficient in reading development and in one or more of the underlying abilities was selected. These children were matched with control subjects approximately equal in age, grade level, IQ, socio-economic background, reading level, and underlying abilities.

Reading tests (The Gray Oral and reading portions of the Stanford Achievement Test) and tests measuring underlying abilities (subtests on the Wechsler Intelligence Scale for Children and the Illinois Test of Psycholinguistic Abilities) were administered to all

of the children. Practice exercises, primarily in the areas of perception, memory, closure, and classification, were developed along a continuum of complexity, from familiar to less familiar, from pictures and forms to letters and words, from concrete to abstract, from percept to concept. These were taught to the ten experimental subjects on a regular schedule over a period of three months. The ten matched control subjects were given the tests but did not receive the special practice. After the training period, experimental and control subjects were retested in reading and underlying skills, and again six months later. Analysis of variance was computed to ascertain mean differences in reading and underlying skills, before and after training, between experimental and control subjects.

After the three month training period, children in the experimental group showed significantly greater gains than did the control group in the following skills: (1) oral reading, (2) study skills, (3) word meaning, (4) auditory and visual memory skills, (5) psycholinguistic skills of closure and automatic language, and (6) classification skills. In silent reading comprehension, the experimental group did not make significantly greater gains than the control group.

A Kruskal-Wallis one-way analysis of variance by ranks revealed that for the combined experimental and control groups a rise in some of the underlying abilities which were taught was accompanied by a rise in reading ability.

For the five matched pairs still available six months after completion of the training, comparative gains made by children in the experimental group were maintained in the following areas: (1) oral reading, (2) study skills, (3) auditory and visual memory skills, (4) closure, and (5) classifying.

The results indicate that the training methods and materials developed to improve certain abilities thought to underlie the reading process were effective. After three months of the special training, the experimental group improved significantly in both underlying skills and reading, even though there was no specific training in reading.

The study of factors underlying the reading process is beginning to provide intriguing clues to possible remedial procedures for baffling reading problems. Research may be moving from an emphasis on complex diagnostic procedures toward the development of methods and materials designed to prevent and correct deficiencies. Continued exploration should lead to increased understanding of the important relationship of underlying abilities to reading development and the prevention of severe reading disabilities.

CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

In our elementary schools there are many retarded readers who have the potentiality to read better. Approximately one out of ten school-aged children is unable to reach the reading level expected of him, based on his performance on measurements of general mental ability (Harris, 1956, Rabinovitch, 1959).

Sources of retardation in reading can conveniently be divided into two major groups, the sociopsychological and the psychophysiological. In the sociopsychological grouping, primary causes of reading retardation include: (1) quantitative and qualitative defects in teaching, (2) deficiencies in cognitive stimulation, and (3) deficiencies in motivation associated with both social pathology and psychopathology. Psychophysiological sources include mental debility, sensory defects, intellectual defects, brain injury, and idiopathic reading difficulties (Eisenberg, 1966).

Through careful diagnostic evaluation it is possible to determine the specific causes and correlates of most reading problems, except in especially complicated cases.

For cases in which an accurate diagnostic evaluation has been obtained, methods of treatment may be developed. The treatment can be aimed at remediation of obvious deficiencies in comprehension

and word recognition skills, including context clues, configuration clues, structural analysis, and phonic analysis, or it can be aimed at improving skills such as memory, perception, closure, and conceptualization which underlie many reading deficiencies.

The aim of this study is to identify certain underlying abilities related to the reading achievement of second and third grade children; to develop and use methods and materials for improving these abilities; and to ascertain the effect of such instruction on the children's reading performance as well as on the underlying abilities.

Approaches to the Study of Reading Problems

The complexity of the reading process is well known to students and educators alike. Holmes and Singer (1961) describe reading as:

> ...an audiovisual verbal processing skill sustained by the interfacilitation of an intricate hierarchy of substrata factors that have been mobilized as a psychological working system and pressed into service in accordance with the purpose of the reader.
>
> Substrata factors are thought of as neurological memory sub-systems of brain assemblies containing various kinds of information, such as auditory, visual and kinaesthetic associations which in a cultural milieux bestow a sense of reality upon symbolically represented thought units. (p. 1).

Recent trends in the field of reading have disclosed several novel approaches to the study and remediation of reading problems at different levels of reading achievement. One approach is through the exploration of "substrata" factors; a second through the psychological correlates of reading; and a third by means of analysis of the cognitive abilities involved. The present review deals with the three approaches.

Substrata Approach

The usual approach to a reading problem is through practice and instruction in the reading abilities in which the reader is deficient. This approach is made in many investigations of reading ability; fewer are concerned with reading-study skills; still fewer with higher levels of interpretation and critical thinking. Holmes (1954) studied the relation of some of these abilities to reading speed and power, as measured by a standardized reading test. But he also included, among his substrata factors, underlying abilities, such as intelligence and perception of word relations.

Holmes college study. At the college level, Holmes (1954) found that four substrata variables accounted for 78% of the variance of the power of reading, namely: (1) vocabulary in context, (2) intelligence, (3) perception of verbal relations, and (4) minimal number of eye fixations.

In addition to all of the measurable factors studied by Holmes, there are others, difficult or impossible to measure precisely, which may account for one-fourth or more of the variance. These "psycho-catalytic" attitudes, goals, and values occupy a central place in a child's reading progress (Strang, 1961).

Singer's elementary school study. At the fourth grade level of reading, at least three substrata factors were evident to Singer (1962) who broadly categorized these as (1) word-meaning, (2) word-recognition, and (3) reasoning-in-context. In word-meaning and word-recognition, visual and auditory discrimination, and memory

are included in the process of "transforming the printed stimulus into mental processes" (p. 226). The reader's experiential background and ability to perceive and conceptualize are both involved. When reasoning-in-context the reader employs "those mental tasks which enable him to relate ideas, infer relations, abstract and generalize, in short, to reason while he is reading" (Holmes and Singer, 1961, p. 13). To do this he utilizes not only his capacity to recall word meanings but also his ability to discriminate meaning by means of contextual clues.

Common findings of Holmes and Singer. Thus, Holmes and Singer (1961) presented clusters of abilities most closely related to reading achievement, namely word recognition, listening comprehension, reasoning in context, visual and oral vocabulary, and suggested that readers develop through a gradient shift in modal dominance from kinaesthetic to the auditory to visual perception.

Holmes and Singer perceived all of the substrata factors as susceptible to education and as undergoing qualitative and quantitative changes with maturity in reading. Ideal teaching would focus on a balanced mastery of substrata fundamentals.

Psychological Correlates

Certain abilities underlie and contribute to the development of the commonly recognized reading skills of vocabulary, word recognition and comprehension. "Learning to read requires more than the ability to understand words and pictures, to associate these with past experience, or to express oneself in vocal or motor terms...

Although these are necessary in learning to read they are not sufficient" (Kirk, 1962, p. 65).

The Illinois Test of Psycholinguistic Abilities. These correlates are described in a clinical model of reading as a communication process. This model accounts for abilities at two levels of language organization, the representational and the automatic-sequential. They are tested by the Illinois Test of Psycholinguistic Abilities (ITPA) (McCarthy and Kirk, 1961).

The six subtests at the representational level of the ITPA are concerned with the processes of decoding, associating, and encoding ideas. Decoding is the act of obtaining meaning from sensory stimuli; association is the ability to associate symbols with meanings; and encoding is the ability to express ideas in word symbols and gestures (Kirk, 1966). Each process is tested according to the channels of communication through which language symbols can be received and through which responses can be made, i.e. auditory and visual input, vocal and motor output. The channels are labeled auditory-vocal and visual-motor. Tests at the representational level assess a child's ability to respond to meaningful aspects of the language.

The integration level is concerned with abilities of a more habitual or automatic nature. At this level the activities which are mediated deal with the learning of important functions such as memory, closure, sequential imitation, and perceptual speed.

On the ITPA the three tests at the integration level are concerned with grammar and sequential rote memory (short and long term tasks). Kass (1962) in her work with children with severe

reading disability extended the integration level of the ITPA model to allow for assessment of additional automatic-sequential abilities and included tests for closure, sound blending, memory, and perceptual speed.

In examining the psychological correlates of reading Kass found that with one exception (auditory-vocal association) retarded readers of normal intelligence were similar to average readers on the ITPA at the representational or meaning level but were deficient at the automatic-sequential or integration level. According to Kass, learning to read involves more than linguistic and comprehension ability; it also demands competencies at the integration level of language organization, including auditory and visual discrimination ability, auditory and visual memory, auditory and visual perception, sound blending, and auditory and visual closure.

Many of these integration factors are closely associated with reading disability. The twenty children in Kass's study ranked lower than normal in the following areas: (1) Auditory-Vocal Association - "the ability to draw relationships from what is heard"; (2) Auditory-Vocal Automatic - "the ability to use the structure of the language automatically"; (3) Visual-Motor Sequential - "the ability to reproduce a series of symbols presented visually"; (4) Visual-Automatic - "the ability to predict a whole from a part"; (5) Sound Blending - "the ability to blend parts into a whole"; (6) Mazes - "the ability to execute a visual prediction"; (7) Memory-for-Designs - "the ability to manually represent a visual image from memory"; and (8) Perceptual Speed - "the ability to visually compare

detailed figures rapidly" (Kass, 1962, pp. 51-52). Strengthening these specific underlying mental abilities seems to be essential to the development of competencies in beginning reading.

These retarded readers were better than normal in Visual Decoding - "the ability to understand what is seen" and similar to normal in: (1) Auditory Decoding - "the ability to understand what is heard"; (2) Visual-Motor Association - "the ability to draw relationships from what is seen"; (3) Vocal Encoding - "the ability to express ideas verbally"; (4) Motor Encoding - "the ability to express ideas manually"; and (5) Auditory-Vocal Sequential - "the ability to reproduce a series of symbols presented auditorily" (Kass, 1962, pp. 51-52).

The Wechsler Intelligence Scale for Children. It has also been found that reading deficiencies are frequently associated with specific mental abilities as measured by subtests of the Wechsler Intelligence Scale for Children (1949). There seems to be considerable agreement among investigators (Graham, 1952, Burks and Bruce, 1955, Altus, 1956, Dockrell, 1960) that children retarded in reading rank significantly lower in those subtests related to school learning, namely Information, Arithmetic, and Coding. Low performance in these areas may reflect deficiencies in long and short term memory functions as well as slow associative ability. More specifically, the Information subtest is thought to measure the subject's background of general information as well as memory development and functioning. The Arithmetic subtest reflects reasoning ability, concentration, and long term memory of computational processes. In the Coding subtest,

the ability to associate a digit with a meaningless symbol is measured along with visual perception, visual-motor coordination, response to visual stimuli, and ability to concentrate as reflected in moods and attention fluctuations. It will be noted that the abilities measured in the Coding subtest include some of the same abilities recognized by Kirk and Kass as essential in beginning reading.

In contrast, on the Picture Arrangement, Picture Completion, and Block Design subtests, retarded readers of average intelligence usually reach the average or above average range. In Picture Completion alertness to the environment and ability to distinguish essential from non-essential detail is appraised. Picture Arrangement deals with cause and effect relations, chronological sequence, and significant details, whereas Block Design involves analyzing, synthesizing, and copying of visual stimuli. Each of these three subtests has one thing in common: a structured stimulus is always available; none of these three subtests seems to require a long or short term symbolic memory.

A possible explanation of the relation of this subtest patterning to reading proficiency is that deficient readers may approach a learning situation in a concrete manner as a result of inability to handle abstractions, whereas good readers have the ability to use abstractions. According to Burks and Bruce, "A person reacts in an abstract manner when he mentally leaves the immediate stimulus and, with the use of symbols as a tool, forms concepts and generalizations about the experience" (1955, p. 490).

Cognitive Processes

In the two major approaches just described, cognitive processes play an important part. Perception, visual and auditory discrimination, memory, closure, conceptualization, spacial relations, and attention span often underlie errors in vocabulary, word recognition, and other comprehension reading skills.

Visual and auditory perception. Various aspects of visual perception appear to be significantly related to success in reading. In her analysis of visual perception, for example, Goins (1958) found that two types of perceptual abilities underlie success in reading: (1) speed of perception or the ability to hold a gestalt in mind during rapid perception, and (2) the strength of closure or the ability to keep in mind a figure against distraction.

Visual perception appears to be significant in predicting success not only in first grade but also in later grades (Bryan, 1964). In a study of fifth grade children, all of whom had been tested in kindergarten, Ames and Walker (1964) learned that children who had shown greater detailing and accuracy in perception in kindergarten were the better readers in fifth grade.

On the basis of a study of 500 second graders, Harrington and Durrell (1955) went so far as to say that mental age has little influence on success in reading at this level but that the relationship between reading success and visual and auditory discrimination and phonics is significant. Robinson (1946) disagreed with this hypothesis, claiming

that defective intelligence is a close correlate of reading disability and sets the limit of achievement in reading.

Abilities required at different reading levels. Other studies suggest that different mental abilities are involved at different reading levels. Braun (1963) suggested that success with first grade readers may be related to spacial factors with certain configurations that always represent specific sounds and words. Backward readers of average intelligence in the third grade were found by Lovell, Shapton, and Warren (1964) to be more deficient in tests involving spacial relations than in language structure. They made many errors in copying words. Here reading difficulty seemed to be linked with difficulty in building up a frame of reference for spacial relations.

There is considerable agreement that perception does seem to have progressively less weight, however, as a student approaches the fourth grade level where intelligence takes on a more dominant role. Reed (1958) claimed that intellectual abilities necessary for mastery of fundamentals of reading differ from those needed for achieving proficiency in handling complex reading material. Perceptual and spacial subtests on the Primary Mental Abilities Tests (Thurstone, 1944) correlate highly with reading in the first grade, but by the fourth grade level verbal meaning, reasoning, and numbers are the best predictors of reading success. By the seventh grade, verbal meaning correlates the most highly with reading scores.

Perception-concept continuum. This progression from sensory impressions to thought patterns might be thought of along the line of

the perception-abstraction-generalization paradigm for concept formation is proposed by Vinacke (1951). At an early stage, the need for abstracting and generalizing is less important than it is at higher levels of concept formation where readers must call upon concepts not explicit in the perceptual content in order to draw meaningful inferences. Most writers agree that conceptualization rests upon percept formation.

Basic to learning to read is the ability to associate patterns of sounds (phonemes) with graphic presentations (graphemes) (Fowler, 1964). According to Kirk (1966), reading is the process of decoding graphic structures in order to discover meanings inherent in language statements. Thus, the student's task is to learn graphic coding systems and to transfer these into meaning patterns. In other words, when percepts are grouped into larger categories or patterns, then conceptualization occurs. This process of conceptualization seems closely related to Kirk's representational or meaningful level of psycholinguistic functioning.

In perceptual categorization, Bruner (1957) suggested that relevant attributes are immediately present and can be examined first hand. This is reminiscent of the integration level on the ITPA. The fitness of an object to be judged as a member of a class is determined by the attribute immediately at hand.

In conceptualizing, however, categorizing relevant attributes is not available to sensory examination. Thus, percepts are concrete and concepts are abstract, but the basic processes of

categorizing are similar. Developing a mode of functionally analyzing the world permits the reader to be free of the myriad and changing appearance of things (Bruner and Olver, 1963). This allows for the emergence of true concepts and permits the reader to be simple with respect to information.

The evidence in the literature would thus seem to suggest the possibility of a percept-concept continuum as an important aspect in learning to read, moving from the concrete perception of printed symbols at the beginning level to the more abstract concepts at higher levels. This ability is somehow acquired by most children of average intelligence even though it is not specifically taught to them.

Conditions Conducive to Failure

However, some children with reading difficulty apparently have failed to acquire the underlying competencies. This failure may be due, as Kirk and Bateman (1962) suggested, to psychological withdrawal from activities requiring use of the function in which they are deficient. For others, the onset of reading training may have been relatively sudden with aversive consequences.

> Many children, especially slow learners, probably encounter only weak sources of reinforcement and these available reinforcers are often not made immediately contingent upon the many reading responses demanded. If adequate reinforcement is not available in the reading process, behaviors that are prerequisite for the acquisition of reading skills may extinguish and progress slacken or cease (Staats and Staats, 1963, p. 140).

Many who fail in reading, therefore, for one reason or another, may not have had the necessary opportunities to develop appropriate

perceptual-cognitive-abstract concept formation behaviors (Bijou, 1963).

Training Cognitive Functions

Until recently only a few investigators have been concerned with the evolution of cognitive processes over time, and even fewer have attempted to influence cognitive development over time through systematic intervention. However, the need to train children in those cognitive functions which contribute to reading difficulties is gaining recognition among some educators and psychologists. "Certain underlying mental abilities may facilitate or inhibit a child's reading development. If the functioning of these abilities can be improved, it may be possible to raise the child's level of reading achievement. The first step is to ascertain the relationship between specific mental abilities and...aspects of reading proficiency" (Strang, 1967, p. 37).

There is some evidence that reading deficiencies can be decreased by the use of special methods and materials designed to develop basic underlying abilities. Several training procedures for overcoming underlying deficiencies have been suggested by Kephart (1960). Frostig (1964) offered specific materials for use with children who are deficient in visual perception. Recently, Hagin, Silver, and Hersh (1965) used the method of stimulating deficient perceptual areas through the teaching of children individually, with emphasis on training of areas of maximal perceptual deficit. Increased accuracy of perception was reflected in increased reading achievement as

measured by the Wide Range Achievement Test and the Metropolitan Reading Test. Levi (1965) successfully taught skills of generalization and conceptualization to an individual case of school failure. Practice in these areas resulted in general improvement in intellectual functioning on the part of an eleven year old student.

Inhelder, in a memorandum prepared for the Conference of the National Academy of Sciences in 1959, made this proposal: "One wonders...whether it might not be interesting to devote the first few years of school to a series of exercises in manipulation, classifying, and ordering objects in ways that highlight basic operations of logical addition, multiplication, serial ordering, and the like."

Recently Bateman (1964) advocated a broadening of the curriculum to include direct training in basic cognitive processes as well as instruction in the content areas with curriculum plans including the education of underlying abilities. Although for many years cognitive structures have been deemed innate and unchangeable, now "learning to learn" is becoming a respectable area of investigation.

Nonetheless, in spite of the interest in curricular inclusion of specific training in underlying abilities, methodology necessary for the growth of training programs of this sort remains in an elementary stage of development.

Summary of Research Findings

Underlying the commonly recognized reading skills are many kinds of "substrata" factors. Of special significance in the acquisition of reading skills is a perceptual-conceptual continuum.

Perceptual and conceptual abilities have been found to be associated with success in reading. Less clearly related to reading achievement are certain abilities such as those measured by the WISC and the ITPA. There is a positive correlation between deficiencies in some of these underlying abilities and retardation in reading. If these deficits are diagnosed and instructional methods and materials devised and applied for developing strengths and weaknesses, may improvement in reading performance as well as in specific abilities be expected? Some evidence of the efficacy of training has already been reported.

Two basic questions need to be asked and answered. If underlying abilities are not acquired through normal experiences, can they be taught systematically? Will practice in the underlying skills in which readers are deficient result in the improvement of these abilities and of reading as well?

In an attempt to attack these issues, three main problems need to be explored: (1) the development of methods to improve mental abilities in which retarded readers are generally deficient; (2) the application of these methods to retarded readers who show underlying deficiencies; and (3) the measurement of change, if any, in (a) mental functioning and (b) reading performance.

Statement of the Problem

The preceding review of the literature indicates that a significant relationship exists between some underlying cognitive and other mental abilities and retardation in reading. A few investigators are

beginning to recognize the possibility of developing procedures for improving these underlying skills as an aid to the acquisition of reading skills. The question remains, however, whether or not such methods can be devised and if systematic instruction of retarded readers in these areas will result not only in the improvement of underlying abilities but also of reading performance.

In beginning reading, retardation is indicated by the deficiencies associated with the basic skills of word recognition, vocabulary, concept formation, auding, and comprehension of meaning. Underlying these obvious deficiencies in reading performance are more specific factors such as long and short term memory, capacity to concentrate, association ability, closure skills, response to visual and auditory stimuli, and visual and auditory perception. If the reading process from percept to concept is to be taught effectively, it is important to devise a system of instruction in these underlying areas which can be programmed along a continuum of complexity.

The purpose of this study was to devise and apply methods and materials for improving these underlying skills with the expectation that improvement in reading should result.

More specifically, the objectives of this study were:

1. To develop instructional materials for the development of the following underlying abilities;

   a. Perceptual speed

   b. Visual memory

   c. Auditory memory

d. Sound blending

e. Visual closure

f. Auditory closure

g. Concept formation and classification

2. To provide instruction and practice in underlying abilities for retarded second and third grade readers which might eventually contribute to improvement in reading.

3. To measure the effect of training on the abilities practiced and on reading performance.

With these objectives in mind, the following experimental hypotheses were generated:

Hypothesis 1. After three months of training using materials specially devised for training underlying skills, a sample group of deficient readers will show significantly greater improvement in oral reading than an untrained matched group, as measured by the Gray Oral Reading Test.

Hypothesis 2. After three months of training in underlying skills, the experimental group will show significantly greater progress in silent reading skills than the control group as measured by the reading portions of the Stanford Achievement Test.

Hypothesis 3. After three months of training, there will be a significantly greater gain by the experimental group than the control group in underlying abilities as measured by the WISC.

Hypothesis 4. After three months of training, there will be significantly greater gains by the experimental group over the control group in underlying abilities as measured by the ITPA.

Hypothesis 5. Significant gains made in reading and underlying abilities by the experimental group will be retained six months later.

Hypothesis 6. Gains in underlying abilities will be accompanied by a gain in reading.

The value of this study is clear. If deficits in psycholinguistic and cognitive mental abilities underlying success in beginning reading can be diagnosed and corrected, many reading failures might be prevented. By preventing failure in reading, this training in basic abilities may alleviate many academic problems in the lives of children and the ensuing emotional consequences of failure.

CHAPTER II

PROCEDURES

The general design of this study has included the identification of deficiencies in underlying abilities of retarded readers in the second and third grades; the construction of practice exercises for the development of these underlying abilities found to be deficient; specific training in these abilities; and measurement of the effect of training on the underlying abilities and on reading at the end of the training period and six months later. More specifically, this aim was accomplished through:

1. Administration of the Gray Oral Reading Test and reading sections of the Stanford Achievement Test to retarded readers in the second and third grades.
2. Administration of tests of underlying ability, the Wechsler Intelligence Scale for Children and the Illinois Test of Psycholinguistic Abilities.
3. Interpretation of tests to identify underlying abilities in which these children were deficient.
4. Selection and development of teaching methods and materials designed to develop general underlying abilities.

5. Use of these methods and materials over a period of three months with second and third graders found to be deficient in reading and underlying skills.

6. Repetition of tests of reading and underlying abilities at the end of training and six months later to measure improvement.

7. Study of changes in reading and underlying abilities and the relationship of the change in reading to the change in underlying abilities.

Population and Sample

A sample of ten students was drawn from the second and third grade classes at the Los Ranchitos School, Sunnyside School District, Tucson, Arizona. Sunnyside District contains primarily lower-middle-class families, a large percentage of whom are transient. (The school has a population turnover of approximately 33% per annum.) Although a developmental reading program has been incorporated into the curriculum, a sizeable proportion of students in this school, nonetheless, have severe reading problems. Therefore, this appeared to be an ideal population from which to draw students needed for this investigation.

The subjects were selected from referrals made by the school principal, the reading consultant, and the classroom teachers. Children who were in second or third grade, who had an IQ above 80

on a group IQ test, and who had been diagnosed deficient in reading development were referred. In all, approximately 42 referrals were received.

Of these, only children diagnosed as deficient in one or more of the underlying abilities as measured by the Wechsler Intelligence Scale for Children (WISC) or the Illinois Test of Psycholinguistic Abilities (ITPA) were selected. Other characteristics of the subjects were:

1. Between 7-0 and 9-11 in chronological age.
2. A Full Scale IQ of 80 or above on the WISC.
3. At least one year deficient in reading skills as measured by the Gray Oral Reading Test.
4. English speaking.
5. In the second or third grade and in the second, third, or fourth year of school (including repetitions but not kindergarten).

Students were selected from the second and third grades for the following reasons:

1. By the end of the second and certainly by the end of third grade the more severe reading deficiencies which have not responded to ordinary instruction are becoming evident and will seriously affect a student's subsequent achievement.

2. By the end of the second grade most of the basic word recognition, vocabulary, and comprehension skills have been introduced and by the end of third grade should have been thoroughly taught. If

these have not been learned by the pupils by this time, special diagnosis and instruction are indicated.

3. Deficiencies in underlying abilities which seem essential in primary learning can be measured by the Wechsler Intelligence Scale for Children and the Illinois Test of Psycholinguistic Abilities at these ages. As these tests are the most valid now available to determine deficiencies in these underlying abilities, it is important to choose children whose ages fall within validity limits set by these tests.

Control subjects were also selected. These were matched as closely as possible to experimental subjects with respect to initial IQ, oral reading level, school grade, and socio-economic background. In all instances ages of the matched pairs were within one year and IQ's within ten points. In addition, the differences in oral reading level were no greater than .6 of a year. Group means for chronological age were identical and group IQ means only 1.1 points in variation. Grade level means for oral reading showed only .03 of a year difference between the groups and the ITPA means were within six points. The examiner, therefore, feels that the groups can be considered equal for experimental purposes. All subjects were deficient in one or more underlying abilities as measured by the ITPA or the WISC subtests. Similarly, all subjects were at least one year deficient in reading as measured by the Gray Oral Reading Test. A psychological description of the experimental and control groups is listed in Table I.

TABLE 1

DESCRIPTION OF SAMPLE SUBJECTS
IN EXPERIMENTAL AND CONTROL GROUPS

Experimental Subjects	CA	IQ	ITPA Age Score	Gray Oral Score	Grade Level	Years in School
1	7-8	86	6-1	1.0	2	2
2	8-1	86	6-5	1.0	2	3
3	8-2	91	6-5	1.0	2	3
4	8-3	105	7-0	1.3	3	3
5	8-4	103	7-7	1.1	3	3
6	8-9	92	6-11	1.4	3	3
7	8-10	91	7-8	1.8	3	4
8	8-11	86	6-8	1.0	3	4
9	9-0	91	7-7	1.5	3	4
10	9-9	90	6-7	1.0	3	4
Mean:	8-6	92.1	6-9	1.2	2.7	3.3

Control Subjects	CA	IQ	ITPA Age Score	Gray Oral Score	Grade Level	Years in School
1	7-11	96	7-8	1.0	2	2
2	8-4	83	6-0	1.0	2	3
3	8-1	83	6-9	1.0	2	3
4	8-7	99	7-1	1.9	3	3
5	8-4	108	7-8	1.2	3	3
6	8-8	101	8-1	1.0	3	3
7	9-6	82	7-3	1.3	3	4
8	8-9	83	6-9	1.0	3	3
9	9-1	85	7-2	1.0	3	4
10	8-9	90	7-2	1.3	3	3
Mean:	8-6	91	7-2	1.17	2.7	3.1

Both the experimental subject and his control subject were selected from the same classroom so that they were being exposed to the same materials and methods of instruction as well as the same teaching personality during the experimental period. For those experimental subjects enrolled in a special reading class offered by the school system, the control subject was also a participant in the special class.

To each experimental and control subject there were three administrations of the following tests:

1. The Illinois Test of Psycholinguistic Abilities.
2. The Wechsler Intelligence Scale for Children.
3. The Gray Oral Reading Test.
4. Reading sections of the Stanford Achievement Test.

These tests were administered during the latter part of the fall semester, 1966, again in the late spring, 1967, and six months later in the fall of 1967.

Testing Instruments

Measurement instruments for this study were selected with two basic criteria in mind: (1) their capacities as selection devices for identifying experimental and control subjects who fell within the limitations set by the experimental design, and (2) competency in measuring changes in underlying skills and reading skills in students before and subsequent to presentation of specialized training. Oral reading level, silent reading level, intelligence, psycholinguistic development, and underlying skills were measured by the four testing

instruments chosen for this study. These instruments were the Gray Oral Reading Paragraphs, Form A; The Stanford Achievement Tests, Primary II Battery, Forms W, X, and Y (subtests 1, 2, and 5); the Wechsler Intelligence Scale for Children; and the Illinois Test of Psycholinguistic Abilities.

1. The Gray Oral Reading Paragraphs (1963 edition, The Bobbs Merrill Co., New York). This test consists of thirteen paragraphs, carefully graded in difficulty, from pre-primer to college level. For each selection, a passage score can be determined, based on the time required for reading orally and the number of errors made. Eight types of errors can be recorded as the selection is read by the student. These errors include aid given by the examiner, gross mispronunciation of a word, partial mispronunciation of a word, omission of a word or a group of words, substitution of meaningful words, repetition, and inverting or changing word order. After the total passage score is obtained, it can be converted to a grade equivalent score.

The Gray Oral Paragraphs were selected as pre- and post-measurement devices because of their carefully graded construction, their high reliability, and the ease of administration and scoring (Buros, 1965, p. 842).

2. The Stanford Achievement Tests (1964 edition, Harcourt, Brace and World, Inc., New York), Primary II Battery, for the middle of Grade 2 to the end of Grade 3, Forms W, X, and Y. This test is composed of a series of comprehensive achievement tests,

three of which (Word Meaning, Paragraph Meaning, and Word Study Skills) are directly concerned with reading. Frequent revisions of this test have been made in an attempt to insure that the content remains closely attuned to curricular demands. The tests were particularly applicable to this investigation because all children in the two groups were of correct grade level for testing with the Primary II battery. Four forms are available and are matched for content difficulty, yielding directly comparable results. Time limits are generous and calculated to give practically all students time to handle all questions. Odd-even, split-half reliability coefficients corrected by the Spearman-Brown prophecy formula range from .85 on the Word Meaning test to .92 on Word Study Skills and .93 on Paragraph Meaning.

A primary reason for the selection of the Stanford Achievement Test was its high rating among standardized achievement test batteries designed for use in the elementary schools (Buros, 1965, p. 110). Its capacity to measure reading skills considered important in the development of reading proficiency was another major factor considered in its choice. Of additional influence was the fact that this series is a regular part of the Los Ranchitos School's annual testing program and is administered to all of the school children each January. Duplication of testing was thereby avoided by using results provided by the school.

3. The Wechsler Intelligence Scale for Children (1949 edition, The Psychological Corporation, New York). This individual

intelligence test was chosen because of its high reliability and its extensive national usage throughout the past eighteen years. Because no reading tasks are required as a part of this test, it provides a means of matching experimental and control subjects without penalizing them for reading deficiencies.

As the WISC is composed of ten subtests which tap various factors underlying cognitive strengths, changes in proficiency in underlying skills may be reflected by changes in subtest scores. The WISC, therefore, follows the two criteria outlined as necessary requisites for the measuring instruments selected for this study, namely: (1) it is a reliable instrument for screening and matching candidates on an intellectual basis, and (2) it can provide a reflection of changes in the underlying skills as measured by the subtests from pre- to post-training.

Full scale reliability for the WISC, based on split-half correlation coefficient, is .92 at the $7\frac{1}{2}$ age level. In arriving at a final score on the WISC, raw scores on each subtest are transmitted into normalized standard scores with a mean of 10 and a standard deviation of 3. Subtest scores are then added and converted into a deviation IQ with a mean of 100 and a standard deviation of 15.

4. The Illinois Test of Psycholinguistic Abilities (1961 edition, The University of Illinois, Urbana, Illinois). Based upon a clinical model which was developed from a theory of communication proposed by Osgood (1957), the ITPA is a diagnostic instrument designed to detect special abilities and disabilities underlying the linguistic

development of a child. It consists of a battery of nine subtests which encompass a multiple dimensional scheme, including measuring of decoding, association, and encoding abilities, as well as basic automatic-sequential, integrative, and memory abilities thought necessary for the development of effective reading habits. A child's ability to handle information from intake to output is appraised by this instrument.

The test was standardized on 700 children, ages $2\frac{1}{2}$ through 9, in Decatur, Illinois. Reliability coefficients based on split-half correlation coefficients range from .45 to .93 and internal consistency coefficients range from .50 to .83 for the 7-0 to 9-0 age groups. In general, therefore, internal consistency, stability, and reliability appear to be adequate (McCarthy and Kirk, 1961).

Validity has yet to be determined and has to be sought in the effectiveness of the instrument in diagnosing psycholinguistic problems.

The test is yet in the experimental stage of development but was selected because it is an instrument which attempts to measure the psycholinguistic abilities which underly the reading process. It has already displayed potentiality as a screening device for discovering children with underlying deficits. It likewise is adequate as an instrument for measuring gains in deficient areas after specific training in underlying skills.

Methods and Materials

A major objective of this study has been the development of systematically designed instructional materials for training students in the cognitive areas underlying the skills demanded for successful reading. In the selection and creation of these materials, several goals were considered:

1. Materials were designed for the correction of specific underlying deficits discovered through the administration of the ITPA and the WISC to the retarded readers in this study.

2. Other materials were required for the correction of more generalized deficits, such as memory.

3. Additional materials were necessary for remediation of underlying deficits discovered in other research studies on cognitive strengths and weaknesses and their relationships to reading.

As each of the experimental and control subjects selected for this study was deficient in one or more of the underlying skills as measured by the ITPA and the WISC, the first of these three aforementioned goals came under primary consideration. The deficits thus discovered closely resemble those revealed in other studies (Kallos, Grabow, and Guarino, 1960, Kass, 1966). The greatest number of cognitive deficits was found on the Arithmetic and Information subtests on the WISC and on the Auditory-Vocal Association, Auditory-Vocal Automatic, Visual-Motor Sequencing, and the Auditory-Vocal Sequencing subtests in the ITPA. Only the Coding category on the WISC did not fall into the "below normal"

designation generally found in studies on the relation of WISC subtest scores to reading deficiencies. A recent study by Ekwall (1966) was in agreement with this latter finding, however.

Of primary importance, therefore, in the preparation of effective practice exercises was the development of materials which might specifically reach and correct those areas of cognition measured as deficient among the experimental subjects from this study. The second goal of developing more general materials arose after close scrutiny of the primary cognitive strengths demanded in many of the testing tasks. Memory has been thought to be an important factor for adequate performance on the Information and Arithmetic subtests on the WISC and the Auditory-Vocal Sequencing and the Visual-Motor Sequencing subtests on the ITPA. Satisfactory performance on these subtests demands not only the ability to recall information immediately, but also the capacity to store information for a longer time and to retrieve what is relevant for the future. A reader's ability to do this depends on how past information has been coded and organized (Bruner et al, 1966). Sharpening of memory skills was considered to be of sufficient importance to warrant the development of exercises in the classifying and coding of information.

Of third consideration was the development of underlying skills in the areas of perception, closure, and sound blending, found to be strongly related to reading though not specifically tested for among our sample subjects.

With the above-mentioned considerations in mind, practice exercises along the percept-concept continuum were designed in the following areas: (1) perceptual skills, (2) visual memory, (3) auditory memory, (4) automatic language, (5) visual closure, (6) auditory closure, (7) sound blending, and (8) classification. The actual materials developed and the precise reasons for their selection and development have been included in the following section and in Appendix A. Teaching instructions can be found in Appendix B.

Practice sessions were conducted with the experimental subjects over a period of three months. Thirty lessons in all were presented to each child. Each period was about forty minutes in length. No more than four children attended a learning group at one time. In order to provide variety as well as continuity in the instruction, each lesson consisted of at least two types of tasks and frequently more. A typical session might include a perceptual speed task, a visual memory task, and an auditory memory exercise.

There were three instructional groups, one made up of second graders and two with third graders. Originally there were four children in each group, but two children moved away while sessions were being conducted, leaving two groups with only three members. Each group moved at its own pace. All groups completed all of the materials. The experimenter realized the value of teaching each child individually, concentrating entirely on his or her specific deficits. Problems of time prevented this approach; however, the small group plan proved an effective compromise. Flexibility of

teaching was provided within each group and individualized attention given to youngsters with special problems whenever possible.

Perceptual Speed

Though the children selected for this study were not specifically tested for perceptual speed, this ability was selected as the first practice training area for several important reasons:

1. There is ample evidence in the literature that fast, accurate perceptual skills are important factors influencing the early acquisition of successful reading skills (Thurstone and Thurstone, 1941, Goins, 1958, Kass, 1962).

2. A large percentage of poor readers in the early grades are known to be one or more years behind in perceptual development (Coleman, 1953).

3. Perception is modifiable by training and is not necessarily dependent on a subject's intellectual or reading development level.

4. On the percept-concept continuum it is reasonable to begin with perceptual experiences as these are thought to be more elementary and therefore are more likely to provide the student with a successful and rewarding first learning experience.

In the development of perceptual speed exercises the experimenter agreed with many other investigators (Kessler, 1964, Harris, 1960, Walters and Doan, 1962, and Gibson et al, 1962) that a major stress in the teaching of perceptual skills is the development of quick perception of the critical dimensions of the presenting stimulus, critical in the sense that the discriminating cue serves to distinguish

one object or letter or word from another. Small details of shape as well as general form must be noted. Gestalt psychology has long assumed that perception has its own course and sequence of ontogenetic development from the perception of a crude whole to differentiation of details, with a final integration of parts into an integrated whole.

Perceptual reading tasks, therefore, can start with presentation of simple matched forms or pictures, assuring immediate perceptual success. This procedure should be followed by tasks demanding letter and word discrimination, recognizing the fact that evidence is lacking concerning transfer effects to reading of discriminating skills learned through discrimination of pictorial wholes (Gibson et al, 1962).

Because ability to read rapidly and accurately depends on familiarity with letter and word forms as well as on skill in attending to relevant aspects of the recognition task, practice is essential both in the accurate perception of these forms and in the speed with which these discriminations can be made. Vernon (1962) claims that in many instances clear perception of minute details is not essential, but it is important that the reader learn to pick out and attend to those vague outlines or structures of words which provide the salient sufficient clue for perceiving the word. Of course, certain fine discriminations remain difficult, particularly with letters such as c and v, d and b, p and q, etc., and these must necessarily be stressed. A reader needs to know which varying dimensions are significant and which are not. To do this he needs practice in responding to a

significant number of stimulus variables and to discriminate which of these variables is critical for distinguishing one word or letter from another (Gibson et al, 1962).

The thirty pages of practice exercises in perceptual speed developed for this study begin with simple matching tasks of known forms and proceed to more complex exercises. Tasks include matching of familiar things, a man, dog, cat, etc., then the matching of less familiar forms or shapes and proceeds to abstract forms. Numbers are introduced next with the matching of single digits and then multiple numbers. Forms representing letters are then presented, followed by names, familiar words, and finally words which are probably unfamiliar. For the first twenty pages of the exercises, the student is asked to match a sample form with its exact duplicate, selected from four alternatives. The last ten pages require selection from four alternatives of one item which differs from the sample form. Exercises progress in difficulty from the simple known forms to complex words, the latter demanding identification on the basis of more than a single stimulus feature.

The general procedures followed with this group of exercises were:

1. Presentation of exercise paper (See Appendix A).
2. Giving simple directions (See Appendix B).
3. Correction of papers immediately after completion by the student.

4. Asking student to re-examine incorrect answers, to tell why they were incorrect, and to select the correct answers.

Memory

That good readers have a longer memory span and better recall than poor readers is well documented in the literature (Vernon, 1957, Raymond, 1955, Bateman, 1964, Sawyer, 1965). Underachievers in reading generally score low on tasks requiring sustained concentration and memory. This is evidenced by the significant correlation between low scores on the WISC subtests known to contain memory elements and reading proficiency (Coleman and Rasof, 1963, Cohen, 1959). Auditory-Vocal Sequencing and Visual-Motor Sequencing on the ITPA are primarily memory tasks requiring short term memory and recall.

Precise techniques for improving memory are not so well drawn. Russell (1956), recognizing that a child's learning depends on his capacity to remember, suggests training in organization of material as one means of making even rote memory more efficient. Bruner (1960) claims that after almost a century of intensive research on the human memory perhaps the most basic information gleaned is that "unless details to be retained are placed into a structural pattern they are rapidly forgotten. Detailed material is conserved in memory by the use of simplified ways of representing it" (p. 24). The most important part of memory according to Bruner et al (1966) is not

storage but retrieval of what is relevant. This depends on how the past is coded and processed through imagery, action, and language.

Retarded readers are less able to maintain attention (Sawyer, 1965). Memory demands sustained attentional focusing (Flavell, 1966), rehearsal of stimulus names, systematic plans for coping effectively with task requirements, including verbalizing of items to be remembered and recalled. In other words, to improve auditory and visual motor skills, the student needs to attend closely to a given task, to repeat ideas a sufficient number of times to fix memory associations with greater permanency, and to practice recalling memory items immediately after exposure to material.

Practice in memory skills were provided the experimental subjects through a systematic presentation of the following tasks:

1. Visual memory of concrete objects.
2. Visual memory of pictures.
3. Memory for single designs.
4. Memory of designs in sequence.
5. Auditory memory of word pairings.
6. Auditory memory of action tasks.
7. Auditory memory sentences.

A more precise description of each of these tasks follows.

Visual memory of concrete items. Groupings of four or more objects belonging to a specific class of items were placed on a tray. Typical grouping included toy animals, writing items, imitation fruits, and the like. (See Appendix A) These were shown to the

students. After a five second period the tray was removed and the students were asked to recall as many of the objects as they could, including size, color, and other descriptive details. Approximately eighteen groupings were presented.

After presentation of objects on a tray, the items were placed in a row in front of the students. The children were asked to close their eyes while the experimenter changed the order of the objects. One student was selected to tell which objects had been changed and, if possible, to replace the items in their original order.

Using the same objects, students were then asked to tell in their own words how the objects were alike. When concrete answers were given ("all have wheels", "all use gas"), the experimenter guided the children into a discussion of superordinate classification of items (from "they all go" to "modes of transportation").

Occasionally a fourth procedure was added. Two or more groupings of items were presented simultaneously and students were asked to regroup these into their respective classifications. Also, at times, an unsimilar item was added to a grouping. Students were asked to point out which item did not fit and to tell why.

Visual memory of pictures. The next series of tasks involved the presentation of eighteen different colorful comprehensive pictures. Students were permitted a limited amount of viewing time per picture (approximately 30 seconds) and were then requested to recall (1) the main idea or overall theme presented in the picture; (2) designated

specific details such as the number of animals, the color of the clothes, etc.; and (3) classification of objects, animals, fruits, etc.

Special instructions were given and suggestions presented on ways of visually organizing the picture, observational methods to use for noting similarities and differences, and the like. (See Appendix B for greater detail.)

Memory for design. In this exercise, three practice exercises and forty test designs were included. Each design was printed on a 4" by 4" card. The card was presented for a five second viewing, then removed and the student asked to recall the design and to reproduce it on paper. After the presentation of five designs, the reproductions were scored. For incorrect drawings the experimenter presented the original stimulus card again and asked the student to look sharply, noting any differences between the original and his reproduction. Time was given for correction of errors and for redrawing of the design. No more than fifteen stimulus cards were presented at one sitting.

Visual-motor designs in sequence. This exercise was based on the task required on the Visual-Motor Sequencing subtest of the ITPA. Each child was given twelve small cards on each of which was drawn a design. The instructor had a similar selection of design cards. These he placed in a predetermined sequence. The student was then asked to select similar cards from his own pile and to place them in a sequencing similar to that of the instructor's.

At first, the instructor placed only three design cards in a sequential arrangement (a square, a circle, and a triangle). This was shown to the students for a limited period of time (this decreased from approximately thirty seconds to five as proficiency increased). The instructor then covered his cards and asked the student to reproduce the design sequence with his own chips. After students became familiar with the materials and the procedure, they were guided toward careful observation of each design card with suggestions they name each one according to the design printed on it. As the exercise proceeded, special instruction in memory techniques were added, including: (1) practice in forming a visual image - "Try to see the sequence in your mind"; (2) silent naming of the designs in sequence; (3) oral repetition of the designs in sequence; and (4) special attention to easy-to-remember cues, such as two squares together, diamonds at either end of the sequence, etc.

The length of the series was increased slowly from three to six chips. Observation times were decreased until only five second exposures were allowed.

Auditory memory of word pairings. This task consisted of sixteen word pairings presented to the students one at a time. The children were taught a specific meaningful word response to a stimulus word. For example, to the stimulus word bus, the student was taught to reply school. After establishing the first pair, a second pair was introduced, then a third, etc. In all, sixteen sets of words were introduced. The stimulus words were then called out in mixed

order and the children responded with the paired words. This task was conducted over several sessions, requiring long term memory of the word pairings.

Auditory memory action tasks. A series of sentences requesting performance of activities in sequence were read to the students. One child at a time was called upon to listen to a sentence and then perform the activities listed. Other children in the group were to listen and watch, with permission to make comments, additions, and corrections after the performance was completed. Exercises increased in number and difficulty as the series progressed. Twenty sets of directions were listened to and performed over a period of several lessons.

Auditory memory sentences. Meaningful sentences were read to the students and they were asked individually to recite the sentences verbatim. When one or more words were forgotten or mispronounced, the instructor quoted the sentence again for the next child, repeating this procedure until each child was able to recite each sentence verbatim. Each new sentence was longer and more difficult than the preceding one. In all, sixteen sentences were presented.

Sound Blending

Faulty aural perception of sound contributes heavily to backwardness in reading. Poor readers are often handicapped by an inability to analyze word sounds and to synthesize word sounds and shapes (Vernon, 1957). In the Kass study, children with severe reading disability were significantly low in sound blending skills. The ability to synthesize

sounds correlates highly with the development of reading skills, according to Olson (1966).

Consequently, a few simple sound blending exercises were included in several of the training periods. A familiar word was selected, each sound pronounced separately, and the student asked to blend the separate sounds into a whole word.

Auditory-Vocal-Automatic

The Auditory-Vocal-Automatic subtest on the ITPA measures the ability to use the structure of the language automatically.

> A low score on the auditory vocal automatic test suggests that the child has difficulty using and predicting those common sequences of words and sounds that most children acquire automatically...He may fail to use verb tenses or plural in an acceptable manner...At the lower automatic level of functioning, the child learns what is habitual or customary, as well as what is logical (Kirk, 1966, p. 61).

This task may demand some of the same closure skills needed for sound blending ease, including a sense of blending and fusing to make a sensible word or sentence. A student must be able to discriminate alternatives in sounds (man or men) if he is to use words accurately in a sentence.

Brief work was undertaken, therefore, with a few of the language patterns found to be deficient in the sample youngsters. Twenty groupings (such as long, longer, longest) were presented and used in sentences.

Closure

The literature indicates that perceptual and auditory closure competency may be more closely related to beginning reading

achievement than is perceptual speed. Closure has substantial common variance with reading achievement at the first grade level. Two psycholinguistic areas in which children with severe reading problems are deficient (Auditory-Vocal Automatic and Auditory-Vocal Association) are thought to include closure type tasks.

The term close is derived from the Gestalt concept of closure which is the tendency to complete a structured whole by filling in a missing gap. Closure, as described by Goins (1958), is the ability to keep in mind a figure or a configuration against distraction, to compare, for example, reversed versus non-reversed forms.

Strength of closure, found by Goins to be closely related to success in reading, is ascertained by an individual's ability to recognize objects, words, and word phrases in an unorganized or mutilated field. Tests designed to measure strength of closure include verbal passages which have certain words deleted in some recognized manner with the requirement that individuals being tested supply the word or words which will meaningfully complete the phrase or sentence. Exercises devised to improve closure ability can include completion of indefinite forms, incomplete pictures, dotted outlines of familiar objects and letters, as well as completion of incomplete words, phrases, and sentences (Beard, 1965).

With these suggestions as guides, four types of closure exercises were developed for this study:

1. Observation of indefinite forms, using ink blots.
2. Visual closure of incomplete pictures, using minimal cues.

3. Completion of pictures, letters, and words.

4. Auditory closure of sentences read orally.

A description of the exercise follows. Examples can be found in Appendix A.

Observation of indefinite forms. The ten Rorschach inkblots were introduced, one at a time. The children were asked to use their imaginations and to name and describe what the inkblots looked like to them.

Visual closure of incomplete pictures using minimal cues. In a series of four successive frames, a progressive series of incomplete pictures was presented to the students. In the first frame of the series, only one basic but minimal cue was offered (i.e. a smoke stack on a ship). In each successive frame, an additional cue was added until in the fourth frame the total picture appeared. When the first frame was presented to a student, he was asked to mentally complete the rest of the picture and to report his "guess" to the examiner. Upon failure to "close in" on the total correct solution, a second frame offering an additional cue was presented. If he was still unable to arrive at a correct solution, the third and finally the fourth frames were offered. In all, thirty series were presented.

Completion of pictures, letters, and words. For the completion tasks a two frame series was offered, the first frame introducing a complete design, with the second frame offering an almost identical picture, with a small detail or part missing. The requirement was the drawing in of missing details. Six pages of exercises began with

simple designs and obvious omissions and progressed in difficulty from simple objects to letters and words.

The final two pages of the completion tasks offered single frame exercises, each including one word with a single letter missing. The student's responsibility was the filling in of the missing letters, using the balance of the word as a stimulus cue for the closure task.

Auditory closure. The first round of exercises consisted of forty sentences in each of which one word was missing. The sentences were read by the instructor to the students who were asked to supply the missing word orally.

Thirty additional sentences were then presented. Students were asked to read these silently as the instructor read them out loud. Again, one word was missing in each sentence, but this time the student was presented two words from which to select the correct one for insertion into the incomplete sentence. These two words, though similar in structure, differed slightly in form and considerably in meaning (chair-chain, batter-better). The student was asked to read these two words and underline the correct one.

The final exercise consisted of fifteen sentences, each with a word missing, but with no cues other than context clues provided. The student was asked to supply orally or write in, if possible, the most meaningful word.

Classification

In many reading programs, once the perceptual skills have been mastered the lessons shift toward the comprehension and organization

of the materials read. Even in learning to discriminate letters and sounds a student finds the task simpler when he can order these stimuli into some patterns of similarity and difference. When the expanse of knowledge of the reader is not sufficiently broad or relevant so that new stimuli or images or ideas can be assimilated into an existing framework, then the student needs to develop an underlying framework. Stauffer (1965) suggests that a promising technique for helping readers gain a better grasp of the material is to teach organizer-type techniques, providing not only an overview of the material but also a method for noting how concepts already learned are similar to or different from new concepts being developed. Likewise, Ausubel (1960) recommends the introduction of appropriate concepts or organizers prior to learning unfamiliar material. Stephens (1964) claims that learning to categorize perceptions and concepts is the basic form of cognition through which man adjusts to his environment. The process of categorization is possible because of accumulated similar experiences or ideas which are placed into meaningful aggregates. Meaningfulness of new material depends on the extent to which a reader is able to relate this content to previously established categories. An individual whose repertoire of categories is limited is likely to be confused when confronted by areas of experience for which he can provide no framework for interpretation.

It is claimed by Oster and Weiss (1962) that subjects between the ages of six and ten benefit more from explicit instruction in concept attainment tasks than from problem solving activities. But

rarely is this type of instruction given (Ausubel, 1960). Rather, students are usually required to learn details before they have acquired an adequate body of subsumers at the appropriate level of inclusiveness. Consequently, rote memory exercises are frequently resorted to when an attempt is made to retain new information.

In training students in methods for handling and retaining information, approximations to the final conceptual goal should be made (Levi, 1965). A notion of categorization should first be presented by describing an underlying organizer class to which members of groups of things can be assigned. Easy categories can be presented first - color, shape, pairs - and practice given in placing items into appropriate classes. Shifts can then be made from pictorial to verbal abstractions. Classification according to Bijou (1965) is the behavior in which the subject learns to respond to one aspect of the stimulus property while ignoring the others. Hunt (1962) suggests that both positive and negative aspects of a concept should be precluded, interspersed, or followed by another experience that contrasts or presents a negative instance of this class.

Taking into consideration many of the suggestions found in the literature, tasks in this portion of the training were geared to the elementary task of conceptually classifying items and objects both visually and verbally. Ideally, the children should have been taught ways of developing advanced organizers for materials presented in the actual classroom but this proved unfeasible.

Visual classification. Six pages of visual classification exercises were offered, each exercise consisting of three pictures of objects belonging to some category. Students were asked to verbally place the items into a single classification, to tell why they selected the category, and to add any pertinent details.

Verbal classification. After the initial presentation of visual exercises, the tasks shifted to the categorization of ideas, objects, and groups presented orally. The first exercises required placement of items into acceptable classifications, with an explanation of the similarity of the items. Questions were directed to one child but other members of the group were encouraged to supply additional ideas. In later tasks, the students were required to select from a list of similar items the one item which did not belong in the group and to explain why. Group participation was again encouraged.

A final exercise contained both a closure and classification assignment, requiring the oral and written completion of a category (knife, for, _____). Recognition of the underlying classification plus an ability to close the category gap were required for successful completion of this exercise.

Exercises described in this section were developed as precise training tools for the development of certain underlying cognitive skills thought to be lacking by many retarded readers. Progression from familiar to concrete to less familiar and more abstract forms was provided as were exercises which moved from simpler to more complicated tasks, from pictures and forms to letters and words,

from perceptions to concepts. In some items the child's response was supplemented by a retrospective explanation of the process. Motivational appeal and ease of administration as well as applicability to the deficiencies were considered in the selection and creation of the tasks and lesson plans. In most instances the exercises provided specific extended practice in underlying skills known to be defective through tests given to measure underlying strengths and weaknesses.

CHAPTER III

RESULTS

There is considerable evidence in the literature that many disabled readers of normal IQ in the second and third grades are also deficient in one or more of the skill areas thought to underlie the reading process. These deficiencies seem to reside primarily at the integrative level of cognitive functioning and include conceptual, perceptual, and memory type abilities as well as automatic and sequential functioning. It is postulated that if a relationship between deficiency in underlying skills and reading is a stable one and if a learning lag in reading can be viewed within a framework of functional analysis, then the development of a new repertory of these underlying skills through a systematic training program may be accompanied by an improvement in reading.

A primary goal of this study, therefore, has been the development of practice exercises in these underlying areas and presentation of these to a selected group of retarded readers over a three month period of time. To measure any changes in reading level and underlying skills which might have occurred during the three month training period, tests of oral and silent reading and tests of underlying skills were presented to ten experimental and ten control subjects before and after the three month training period.

Alternate forms of the same tests were re-presented six months later to determine if any improvements found immediately after training held up over time. At this final testing, the total was reduced to ten (five experimental and five control) due to the loss of five matched pairs from the school locale.

Statistical Methods

Of the six experimental hypotheses generated for this study, the first five were tested by statistical treatment of the test scores for the sample subjects using an analysis of variance to determine at what level of probability the difference in the means, pre- and post-training and six months later, would occur by chance in the normal population. The treatment was first applied to scores in reading and underlying skills, produced by the total experimental and total control populations, over two trial periods, before and immediately following training.

Analysis of variance was again applied to scores in reading and underlying skills over three trial periods (pre-test, post-test, and six months later) for those five matched pairs who were still available for testing six months after the training was completed.

Inspection of the data indicated that the homogeneity of variance assumption seemed tenable. A normal distribution of scores was assumed.

The analysis of the experiment was also concerned with the trend of a series of means over two and three successive trials under two different experimental treatments, one trained and one untrained.

Observations for each trial were obtained under standard conditions and significant differences between trends of means for the two groups were attributed to the effectiveness of practice over time.

Hypothesis six was concerned with the relationship between changes in reading and changes in underlying skills. For analytical purposes, the name of each experimental and control subject was placed into one of three subgroupings, depending on whether his score on underlying ability tests indicated (1) no improvement between trials 1 and 2, (2) slight improvement, or (3) considerable improvement. Into each of these subgroupings, a subject's score was replaced by the rank order of his improvement in reading between trials 1 and 2 as compared to the rest of the subjects. The Kruskal-Wallis analysis of variance by ranks (Siegal, 1956) was then applied to the summed data from each of these subgroupings to determine if an improvement in underlying skills was accompanied by an improvement in reading ability.

Confirmation of the experimental hypotheses was based on a probability of .05 or less. Trends in skills over time were analyzed as was the interaction between groups and trials.

The Results Relative to Experimental Hypotheses

Hypothesis One

The hypothesis that disabled readers would show significantly greater improvement in oral reading, after three months of specialized training in underlying skills, than an untrained matched group, as measured by the Gray Oral Reading Test, was confirmed. An

analysis of variance, the results of which are shown in Table 2, reveals a significant difference between passage scores of these two major groupings beyond the .001 level. Examination of mean scores, as shown in Table 3, discloses that the difference was in the right direction.

Testing for interaction, Groups vs Trials, an F-ratio of 9.193 indicates that a difference between characteristics of the trends of means for the two groups is significant beyond the .01 level. (See Figure 1.) This means that no difference was found between the group means on the first trial, but the two groups differed significantly on trial two.

Hypothesis Two

The hypothesis that after three months of training in underlying skills the disabled readers would show significantly greater progress in silent reading than an untrained matched group, as measured by the combined reading portions of the Stanford Achievement Test, Primary II Battery, was confirmed. An F-ratio of 6.166 (df, 1, 18) means that a difference in trial means would occur by chance only 3 out of 100 times. (See Table 4.)

That there was a difference between characteristics of the trends of the means for the two groups was indicated by an F-ratio for interaction (Groups vs Trials) of 9.353 which is significant beyond the .01 level.

An analysis of the separate reading tests (Word Meaning, Paragraph Meaning, and Study Skills) on the Stanford Achievement

TABLE 2

SUMMARY OF ANALYSIS OF VARIANCE OF GRAY ORAL READING TEST PASSAGE SCORES FOR TWO GROUPS (EXPERIMENTAL AND CONTROL) OVER TWO TRIALS

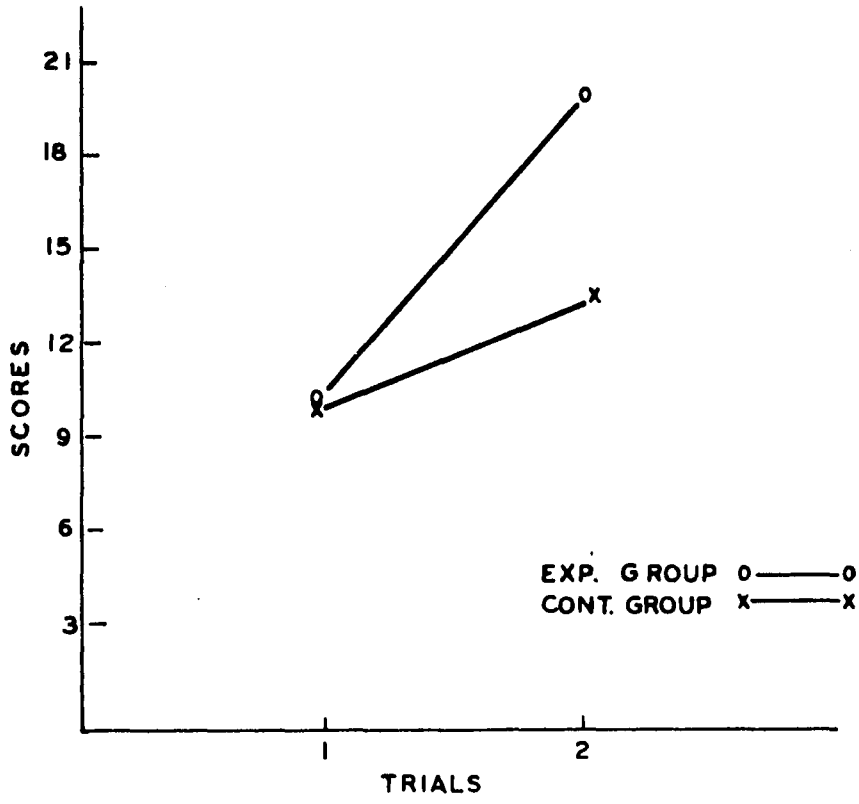
Source of Variation	Mean Square	df	F-ratio
Total	57.0256	39	
Between	86.5263	19	
Groups	122.5000	1	1.499
Error (G)	84.5278	18	
Within	29.0000	20	
Trials	348.1000	1	40.820 ***
G x T	78.4000	1	9.193 **
Error (T)	8.5278	18	

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

TABLE 3

MEAN SCORES FOR EXPERIMENTAL AND CONTROL GROUPS ON READING TESTS OVER TWO TRIALS

Tests	Group 1		Group 2	
	Trial 1	Trial 2	Trial 1	Trial 2
Gray Oral Reading Test:				
Passage Scores	10.9	19.6	10.2	13.3
Grade Level Scores	1.0	1.9	1.0	1.2
Stanford Achievement Test: (Grade Level Scores)				
Reading Totals	2.42	2.78	2.48	2.44
Word Meaning Subtest	2.41	2.80	2.41	2.42
Para. Meaning Subtest	2.65	2.85	2.59	2.33
Study Skills Subtest	2.23	2.68	2.43	2.57



SCORES ON GRAY ORAL READING TEST AS A FUNCTION OF TRIALS BY GROUPS, OVER TWO TRIALS

FIGURE 1

TABLE 4

ANALYSIS OF VARIANCE, F-RATIOS ON SILENT AND ORAL READING TESTS FOR EXPERIMENTAL AND CONTROL GROUPS OVER TWO TRIALS

Reading Tests	F-ratio Trials	F-ratio Groups vs Trials
Gray Oral	40.820 ***	9.193 **
Stanford Total	6.166 *	9.353 **
Word Meaning	5.418 *	4.889 *
Paragraph Meaning	.008	5.168 *
Study Skills	4.628 *	1.278

* $p < .05$
** $p < .01$
*** $p < .001$

(all F-ratios have 1, 18 df)

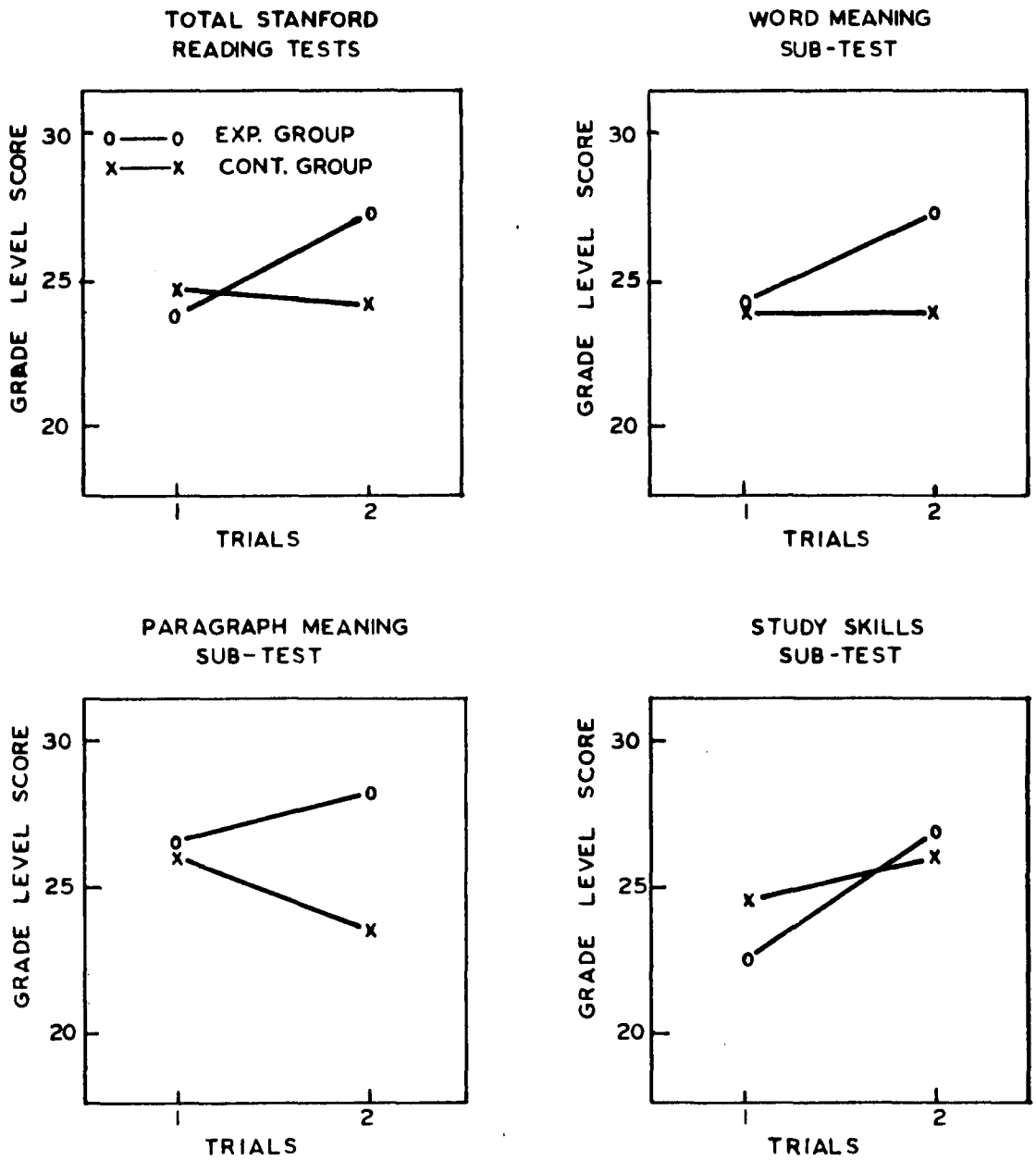
Test revealed that after training, disabled readers made significantly greater gains on the Word Meaning and Study Skills subtests beyond the .05 level of significance than an untrained matched group, but Paragraph Meaning scores were not significantly altered.

A difference between characteristics of the trends of means for the two groups over trials was significant for the Word Meaning and Paragraph Meaning subtests beyond the .05 level of significance. (See Figure 2.)

Hypothesis Three

The hypothesis that after three months of training in underlying skills the disabled readers would show significantly greater gains than an untrained matched group in underlying skills as measured by the WISC subtests was confirmed for the Information and Similarities subtests beyond the .001 and the .01 levels respectively. Gains made on the WISC total and the Verbal and Performance sections were also highly significant.

Gains for the trained and untrained groups over two trials (pre- and post-training) were not the same for the following portions of the WISC: (1) The WISC total scores beyond the .001 level of significance; (2) The Information and Similarities subtests and the Verbal section beyond the .01 level; and (3) Vocabulary, Coding, and Performance sections beyond the .05 level of significance. (See Table 5 for mean scores on the WISC and Table 6 for F-ratio and probability levels for all WISC scores.)



SCORES ON STANFORD ACHIEVEMENT READING TESTS AS A FUNCTION OF TRIALS VERSUS GROUPS OVER TWO TRIALS

FIGURE 2

TABLE 5

MEANS OF WISC SCALED SCORES FOR EXPERIMENTAL AND CONTROL GROUPS OVER TWO TRIALS

Tests	Group 1		Group 2	
	Trial 1	Trial 2	Trial 1	Trial 2
Total IQ	92.10	104.30	91.00	92.50
Verbal IQ	90.30	102.90	87.10	88.90
Performance IQ	95.90	104.30	97.00	98.00
Information	7.30	11.30	7.10	8.20
Comprehension	8.00	8.40	7.80	8.60
Arithmetic	7.90	9.20	7.40	7.30
Similarities	10.10	13.50	9.00	9.00
Vocabulary	9.10	9.90	8.60	8.10
Pict. Arr.	8.60	9.80	8.90	8.60
Pict. Comp.	10.20	11.70	10.20	9.90
Block Design	8.20	9.50	9.20	9.30
Object Assem.	9.70	11.40	8.60	10.60
Coding	10.00	10.90	10.90	10.00

TABLE 6

ANALYSIS OF VARIANCE, F-RATIOS ON WISC TEST SCORES FOR EXPERIMENTAL AND CONTROL GROUPS OVER TWO TRIALS

Tests	F-ratio Trials	F-ratio Groups vs Trials
Information	37.216 ***	12.033 **
Comprehension	2.025	.255
Arithmetic	2.445	3.328
Similarities	10.573 **	10.573 **
Vocabulary	.336	6.311 *
Pict. Completion	.562	1.561
Pict. Arrangement	1.400	3.149
Block Design	2.028	1.490
Obj. Assembly	2.650	.096
Coding	.000	1.748
WISC Total	31.451	18.780 ***
WISC Verbal	7.991 *	5.062
WISC Performance	17.540 ***	9.866 **

* $p < .05$
** $p < .01$
*** $p < .001$

(all F-ratios have 1, 18 df)

Hypothesis Four

The hypothesis that after three months of training in underlying skills the trained group would show significantly greater gains than the untrained matched group in underlying skills, as measured by the ITPA, was confirmed beyond the .001 level of significance for the following subtests:

The Auditory-Vocal Association subtest

The Auditory-Vocal Automatic subtest

The Visual-Motor Sequential subtest.

This hypothesis was also confirmed at the .001 level of significance for the Total ITPA score.

Relative gains were made beyond the .01 level of significance for the Motor Encoding subtest and beyond the .05 level for the Auditory Vocal Association, Visual Decoding, Visual Motor Association, and the Vocal Encoding subtests.

Gains for the matched groups over two trials differed beyond the .001 level of significance in the following testing areas:

Auditory Vocal Automatic

Visual-Motor Sequential

Motor Encoding

Total ITPA.

A difference in the characteristics of the trends of the means was significant beyond the .01 level for the Visual Decoding and Vocal Encoding subtests and beyond the .05 level for the Auditory-Vocal Association subtest.

Refer to Table 7 for mean scores and Table 8 for F-ratios and probability levels for the ITPA tests.

Hypothesis Five-a

The hypothesis that relative gains made by the trained group of disabled readers over the matched untrained group in oral and silent reading would be retained six months after the training had ceased was confirmed in the following instances:

1. Oral reading as measured by the Gray Oral Reading Test, beyond the .001 level of significance.

2. Study Skills as measured by the Stanford Achievement Test, beyond the .05 level of significance.

This hypothesis was not confirmed for the following tests:

1. Word Meaning as measured by the Stanford Achievement Test.

2. Paragraph Meaning as measured by the Stanford Achievement Test.

Refer to Table 9 for F-ratios and probability levels for the matched pairs over three trials.

Hypothesis Five-b

The hypothesis that relative gains in underlying abilities made by the trained group of deficient readers over the matched untrained group would be retained six months after termination of training was confirmed beyond the .001 level of significance as measured by the following tests:

TABLE 7

MEANS OF ITPA RAW SCORES FOR EXPERIMENTAL AND CONTROL GROUPS OVER TWO TRIALS

Tests	Group 1		Group 2	
	Trial 1	Trial 2	Trial 1	Trial 2
Total ITPA	163.90	199.30	169.40	171.40
Aud. Decoding	29.10	30.30	28.90	29.20
Vis. Decoding	14.60	18.40	16.70	15.80
Aud-Voc. Asso.	19.00	21.90	19.30	20.00
Vis-Mot. Asso.	18.40	20.80	20.00	20.50
Voc. Encoding	18.50	24.30	18.10	16.80
Mot. Encoding	15.70	20.20	14.30	15.00
Aud-Voc. Auto.	13.70	18.60	13.80	14.40
Aud-Voc. Seq.	22.00	23.40	22.50	23.40
Vis-Mot. Seq.	13.20	21.30	15.80	15.60

TABLE 8

ANALYSIS OF VARIANCE, F-RATIOS ON ITPA TEST SCORES FOR EXPERIMENTAL AND CONTROL GROUPS OVER TWO TRIALS

Tests	F-ratio Trials	F-ratio Groups vs Trials
Aud. Decoding	4.856 *	1.748
Vis. Decoding	4.439 *	11.660 **
Aud-Voc. Asso.	29.955 ***	4.347 *
Vis-Mot. Asso.	6.650 *	2.983
Voc. Encoding	8.004 *	19.923 ***
Mot. Encoding	37.125 ***	18.093 ***
Aud-Voc. Auto.	37.142 ***	22.703 ***
Aud-Voc. Seq.	2.779	.131
Vis-Mot. Seq.	36.832 ***	40.656 ***
ITPA Total	80.884 ***	64.508 ***

* $p < .05$
** $p < .01$
*** $p < .001$

(all F-ratios have 1, 18 df)

TABLE 9

ANALYSIS OF VARIANCE, F-RATIOS FOR READING, WISC, AND ITPA TEST SCORES FOR EXPERIMENTAL AND CONTROL GROUPS OVER THREE TRIALS

Tests	F-ratio Trials	F-ratio Groups vs Trials
Gray Oral Total	53.464 ***	6.234 **
Stanford Total	3.176	3.871 *
Word Meaning Subtest	1.090	.457
Para. Meaning Subtest	1.184	2.659
Study Skills Subtest	5.489 *	5.879 *
WISC Total	29.533 ***	7.836 **
WISC Performance	18.235 ***	.561
Information	17.046 ***	5.313 *
Comprehension	1.190	1.485
Arithmetic	.049	1.094
Similarities	6.603 **	4.621 *
Vocabulary	1.173	5.236 *
Pict. Completion	1.932	.110
Pict. Arrangement	3.092	.754
Block Design	1.564	1.606
Obj. Assembly	17.796 ***	.685
Coding	1.094	1.393
ITPA Total	69.561 ***	48.359 ***
Aud. Decoding	.211	1.965
Vis. Decoding	14.120 ***	8.856 **
Aud-Voc. Asso.	8.964 *	2.307
Vis-Mot. Asso.	1.639	4.787 *
Voc. Encoding	1.586	3.642 *
Mot. Encoding	10.346 **	5.823 *
Aud-Voc. Auto.	18.091 ***	8.455 **
Aud-Voc. Seq.	8.669 **	1.000
Vis-Mot. Seq.	16.290 ***	13.137 ***

* p .05
** p .01
*** p .001

(all F-ratios have 1, 18 df)

The Information subtest

The Auditory-Vocal Automatic subtest

The Visual-Motor Sequential subtest

ITPA total

WISC total.

Relative gains made by the trained group over the untrained group were significant beyond the .01 level in these areas:

Similarities subtest

Performance section on the WISC.

Relative gains made beyond the .05 level of significance were the following:

Auditory-Vocal Association subtest

Motor Encoding subtest

Verbal section on the WISC.

That the trends of the means for the matched groups were different over the three trials was confirmed in the following areas beyond the .001 level of significance:

Visual-Motor Sequential subtest

ITPA total

Auditory-Vocal Automatic subtest

Visual Decoding subtest

WISC total,

and beyond the .05 level of significance were the following:

Information subtest

Vocabulary subtest

Similarities subtest

WISC Verbal

Motor Encoding

Paragraph Meaning on the Stanford

Total reading scores on the Stanford.

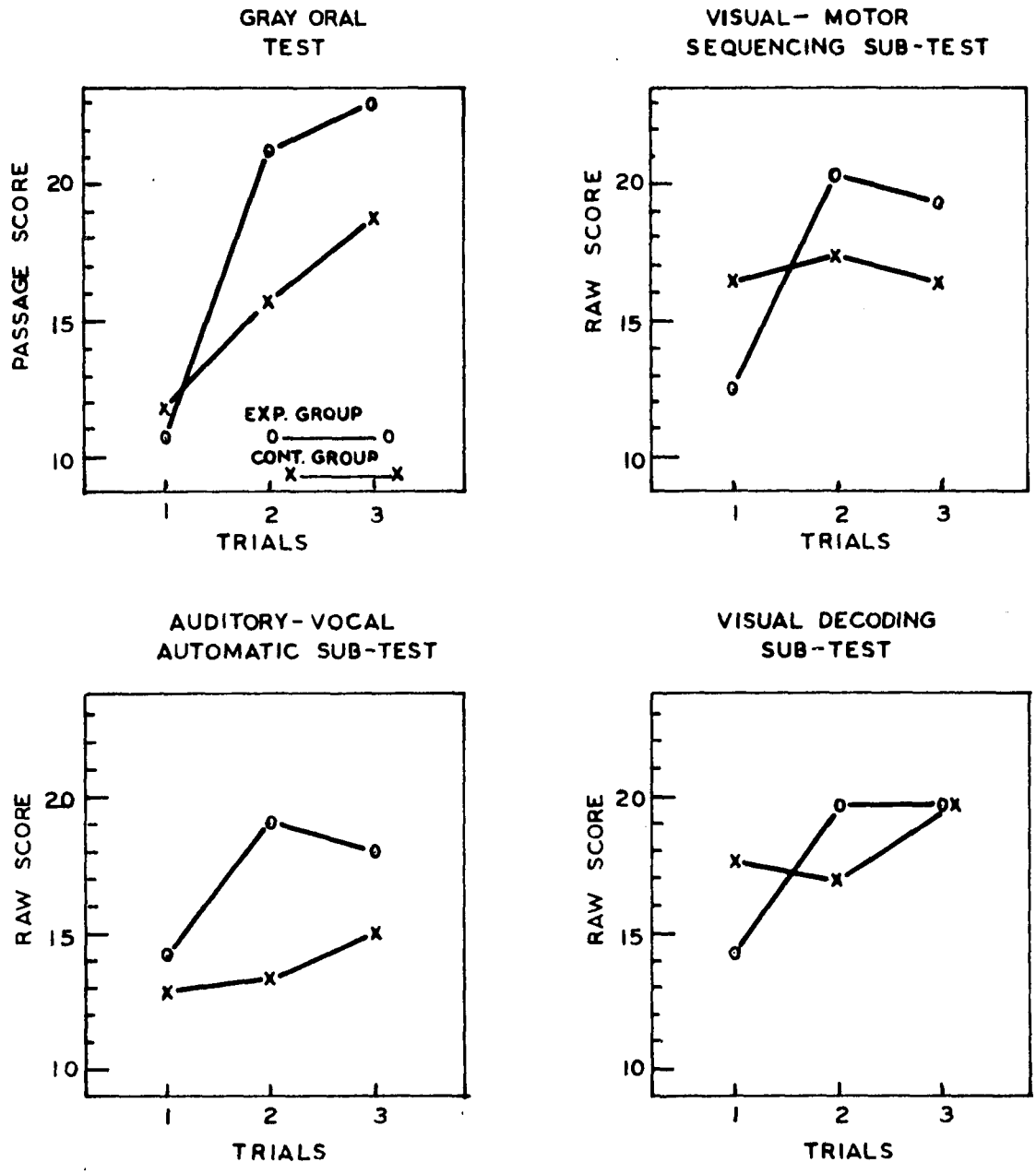
These results are based on the scores made by five instead of ten matched pairs of deficient readers. During the six month interim between test periods, five of the pairs were lost, one from each pair having moved out of the area.

See Table 9 for F-ratios and probabilities for three trials and Figure 3 for interaction of Groups vs Trials for three trials.

Hypothesis Six

Using a Kruskal-Wallis analysis of variance by ranks, the hypothesis that after three months of training significant gains in underlying abilities, as measured by the Information and Visual-Motor Sequential subtests, would be accompanied by significant gains in oral reading was confirmed beyond the .02 level of significance. No significant relationship was found between gains in oral reading and gains in underlying skills, as measured by the Auditory-Vocal Association, Auditory-Vocal Automatic, and Similarities subtests, although the results were in the right direction with significance levels beyond the .20, .10, and .10 respectively.

The hypothesis that significant gains in the underlying skills as measured by the Auditory-Vocal Automatic subtest would be accompanied by gains in silent reading was confirmed beyond the .01 level



MEAN SCORES ON GRAY ORAL TEST AND I.T.P.A SUB-TESTS AS A FUNCTION OF TRIALS BY GROUPS OVER THREE TRIALS

FIGURE 3

of significance. No significant relationship was found between gains in silent reading and gains in Information, Auditory-Vocal Association, Visual-Motor Sequencing, and Similarities.

Summary of Results

After three months of training in skills thought to underlie the reading process, including perceptual, conceptual, and memory functions, a sample group of deficient readers made significantly greater gains than did a matched group of untrained students in the following areas:

1. Oral reading as measured by the Gray Oral Reading Test.
2. Silent reading as measured by the total reading score and by the Word Meaning and Study Skills subtests on the Stanford Achievement Test, Primary II Battery.
3. Underlying skills as measured by the Information and Similarities subtests on the WISC.
4. Underlying skills as measured by the following subtests on the ITPA:
   a. Auditory-Vocal Association
   b. Auditory-Vocal Automatic
   c. Visual-Motor Sequential
   d. Auditory Decoding
   e. Visual Decoding
   f. Visual-Motor Association
   g. Vocal Encoding
   h. Motor Encoding.

Gains made by the trained and untrained groups differed beyond the .05 level of significance in the following areas:

1. Oral reading as measured by the Gray Oral Reading Test.
2. Silent reading as measured by the Paragraph Meaning and Word Meaning subtests on the Stanford Achievement Test, Primary II Battery.
3. Underlying skills as measured by the following WISC subtests:
   a. Information
   b. Similarities
   c. Vocabulary.
4. Underlying skills as measured by the ITPA subtests of:
   a. Visual-Motor Sequencing
   b. Auditory-Vocal Automatic
   c. Motor Encoding
   d. Auditory-Vocal Association
   e. Vocal Encoding
   f. Visual Decoding.

Six months after completion of the training, the relative gains made by the remaining members of the trained group over their matched untrained students were retained in the following areas:

1. Oral reading as measured by the Gray Oral.
2. Study Skills as measured by the Stanford Achievement.
3. Memory and classification skills as measured by the WISC subtests of:
   a. Information
   b. Similarities.

4. Underlying skills as measured by the ITPA subtests of:
    a. Visual-Motor Sequential
    b. Auditory-Vocal Automatic
    c. Visual Decoding
    d. Motor Encoding.

Significant gains made in underlying abilities as measured by the Information and Visual-Motor Sequential subtests were accompanied by significant gains in oral reading. Gains made in silent reading were accompanied by gains in underlying skills as measured by the Auditory-Vocal Automatic subtest.

The above results indicate that a positive relationship does exist between reading and underlying skills in the sample group tested, and that practice in certain areas thought to underlie reading skills may be accompanied by a gain in reading proficiency.

CHAPTER IV

CASE STUDIES

A closer look at the scoring patterns made by some of the individual children reveals the differences rather than the similarities in their reading progress and cognitive growth.

To provide the reader with greater insight into the variety of problems encountered, three case studies will be presented. The first of these illustrates an instance where the child shows gains in both reading and underlying skills after the three months of specialized training. In the second case, underlying skills improve but reading does not, and in the third there is some gain in reading with a lesser gain in underlying skills.

Case One

This is the case of an eight year old boy in his third year of school and in the third grade. Before the specialized training in underlying skills was presented, his grade level for reading was 1.3 as measured by the Gray Oral Reading Test and 2.9 on the reading portions of the Stanford Achievement Test. His total IQ on the WISC was 105 and language age on the ITPA was 7-0.

This child was known as a friendly, cooperative youngster, although he was quite restless and had a speech problem. His teacher reported that his tongue had been clipped when he was an

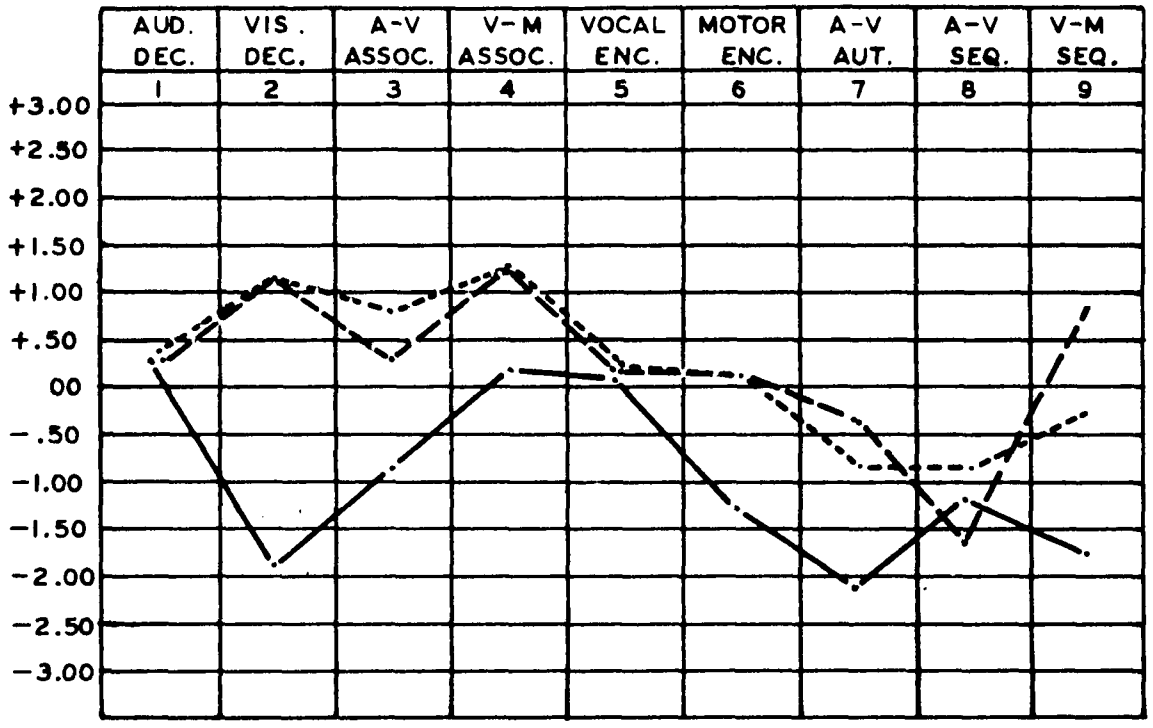
infant. She described him as an interested, active student whose academic work suffered primarily as a result of his reading problem. His grades were mostly 3's with a 4 in reading.

This student responded well to the practice sessions. He participated in every phase. Since the research design permitted variation in individual treatment, particular emphasis was given to the development of memory and closure skills.

After the three month training period, his test results showed marked improvement both in reading and in some of the underlying skills. Oral reading grade level rose from 1.3 to 3.0. Silent reading tests changed from 2.9 to 3.4. Six months later, oral reading continued to rise slightly and silent reading increased to the 4.6 grade level.

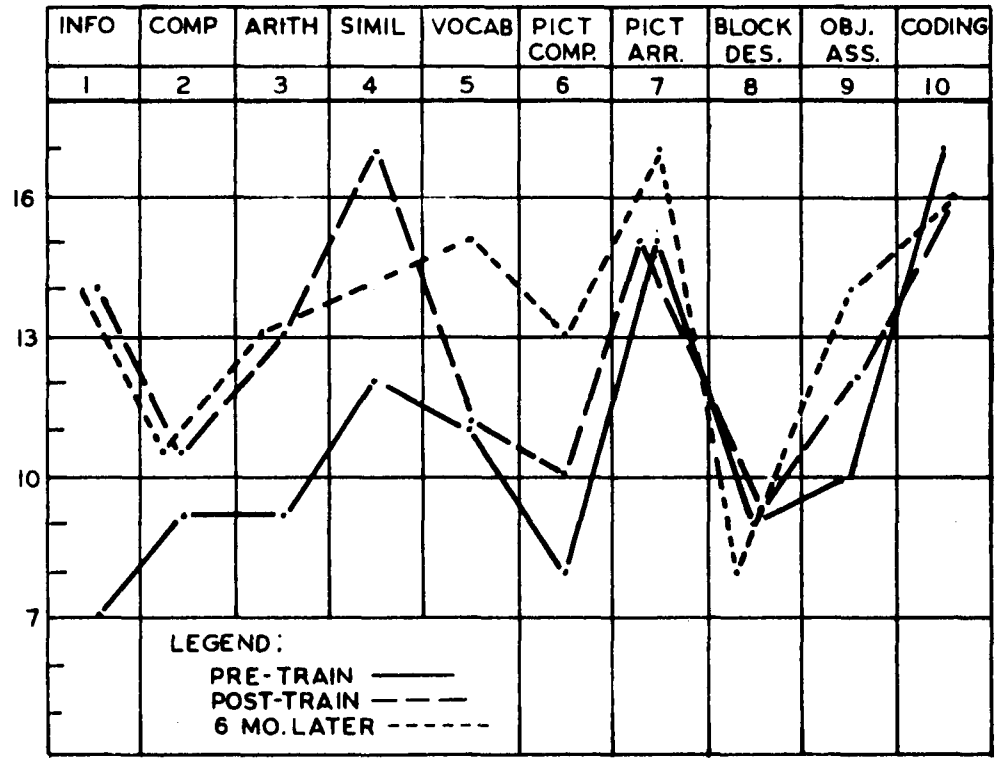
Likewise, growth was evident in underlying skills as measured by the subtests on the WISC and the ITPA. Information and Visual-Motor Sequencing, representing long and short term memory, increased significantly. Notable increases were also found in Auditory-Vocal Association, Auditory-Vocal Automatic, and Similarities subtests.

This student presents a success story for this methodology, showing immediate improvement in both reading and underlying skills after training as well as retention of his growth over a six month period of time. His progress was reflected in his school grades which rose from below a 3 average to above a 2 average. Total IQ as measured by the WISC shifted from 105 to 119 after three months and from there to 125 six months later. See Figures 4 and 5 for a graphic

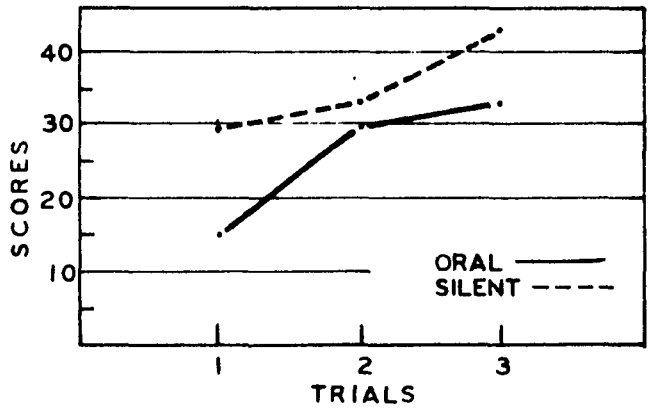


CASE ONE – SCORING PROFILE ON I.T.P.A. SUBTESTS, PRE-TRAINING, POST-TRAINING, AND SIX MONTHS LATER

FIGURE 4



WISC SCALED SCORES



READING TESTS

CASE ONE – SCORING PROFILE ON WISC SUB-TESTS AND READING TESTS, PRE-TRAINING, POST-TRAINING, AND SIX MONTHS LATER

FIGURE 5

accounting of his scores in reading and underlying skills before and after training.

Case Two

This was the case of an eight year old girl in the third grade but in her fourth year of school. Before the specialized training, her reading level, measured by the Gray Oral Reading Test, was 1.0 with a passage score of 3. Reading scores on the Stanford Achievement were averaged at the 2.3 grade level. This may have been chance level scoring for her, as she did not appear to have this much competency in reading. She was unable to read even pre-primer passages orally with accuracy.

Her IQ, as measured by the WISC, was 86 and her psycho-linguistic age level was 6-8.

Her grades in school were mostly 3's and 4's. Her teacher claimed she was strongly lacking in confidence, especially when it came to anything connected with arithmetic and reading. Her attention span was limited, and she was more apt to copy from other children's papers than to attend to her own. This latter trait persisted throughout the specialized training sessions, and many times she had to be placed at a table alone so that she would concentrate on her own work. She was known as a slow learner with suspected perceptual problems.

During the training, this student participated in all of the exercises, but particular emphasis was placed on perceptual tasks, attending carefully to materials, and making fine discriminations.

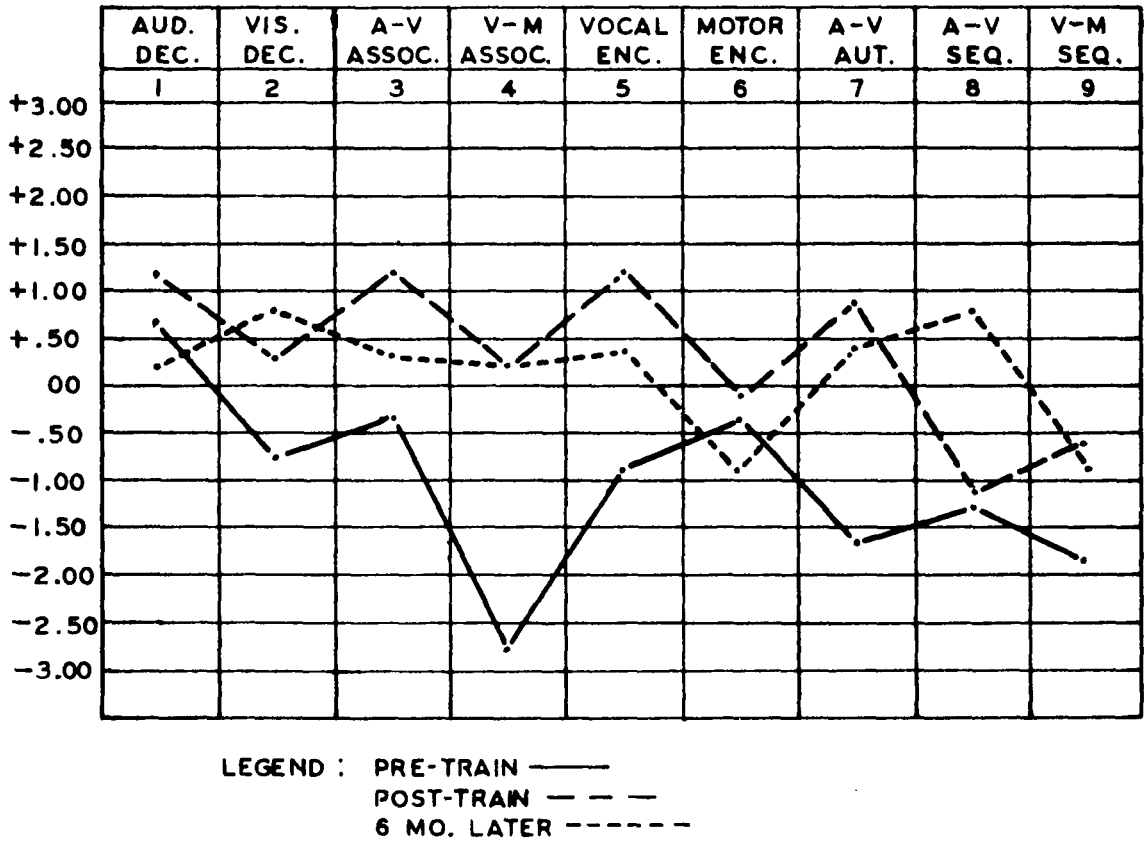
At the end of three months of training, improvement was noted in perceptual discrimination skills required by the Visual-Motor Association subtest and on the memory, comprehension, and closure tasks represented in the Information, Similarities, and Auditory-Vocal Association subtests. Sequential memory remained difficult for her in spite of intensified training in this area. Arithmetic, likewise, did not improve. Total IQ rose from 86 to 100 and the ITPA age score from 6-8 to 9-4.

For this girl, reading progress was only slight. Passage scores on the Gray Oral increased from 3 to 8, but these still fell below the 1.0 grade level in oral reading. After the training sessions, silent reading averages improved from 2.3 grade level to 2.5 but slipped back to 2.2 after six months. Test-taking behavior for silent reading tests did not seem to improve over time. Post-training scores on the Stanford Achievement Test were similar to those obtained previous to training in that they all showed discrepencies with actual reading and seemed to be the result of chance rather than a measure of true reading power.

Remediation in this case was limited to improvement in underlying skills and did not result in measureable improvement in reading. Scoring profiles for Case Two are presented in Figures 6 and 7.

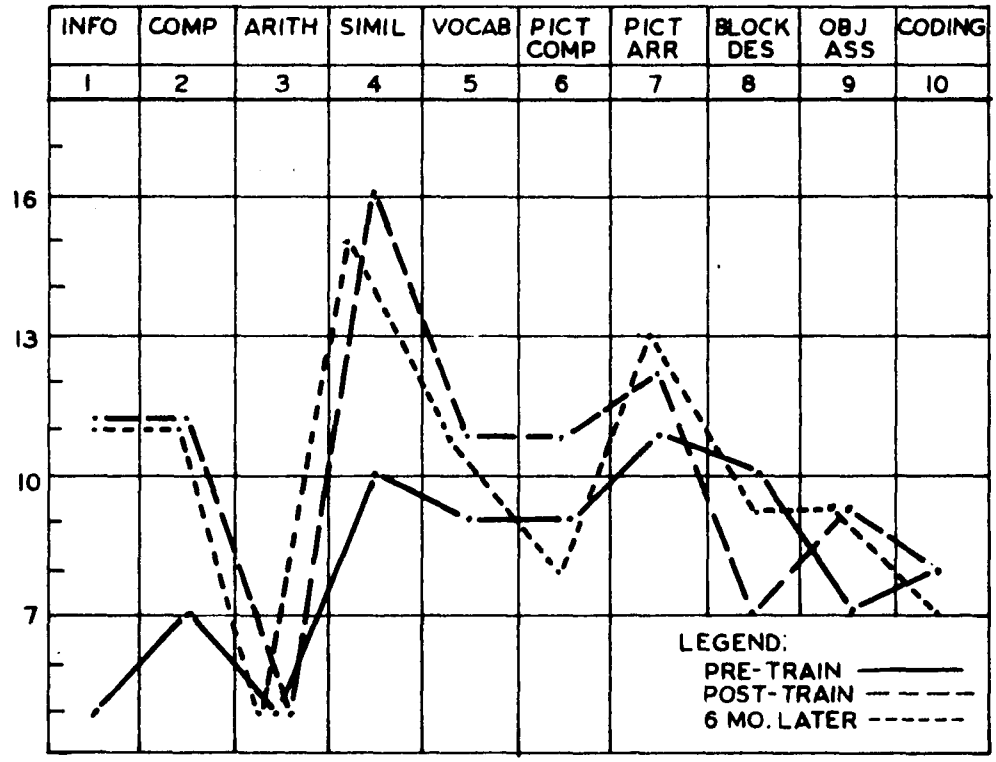
Case Three

This was an eight year old boy known as an underachiever. IQ scores on the WISC at the beginning of training were 91 and language age on the ITPA was 7-8. His oral reading level measured 1.8 and

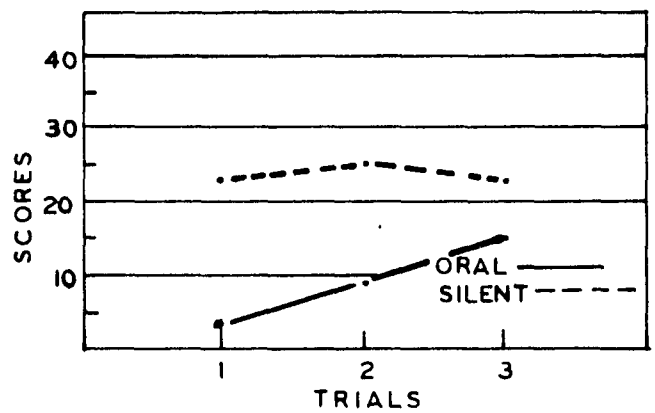


CASE TWO- SCORING PROFILE ON I.T.P.A. SUBTESTS, PRE-TRAINING, POST-TRAINING, AND SIX MONTHS LATER

FIGURE 6



WISC SCALED SCORES



READING TESTS

CASE TWO- SCORING PROFILE ON WISC SUB-TESTS AND READING TESTS, PRE-TRAINING, POST-TRAINING, AND SIX MONTHS LATER

FIGURE 7

silent reading 3.0. He was in his fourth year in school and in the third grade. Grades were 3's and 4's.

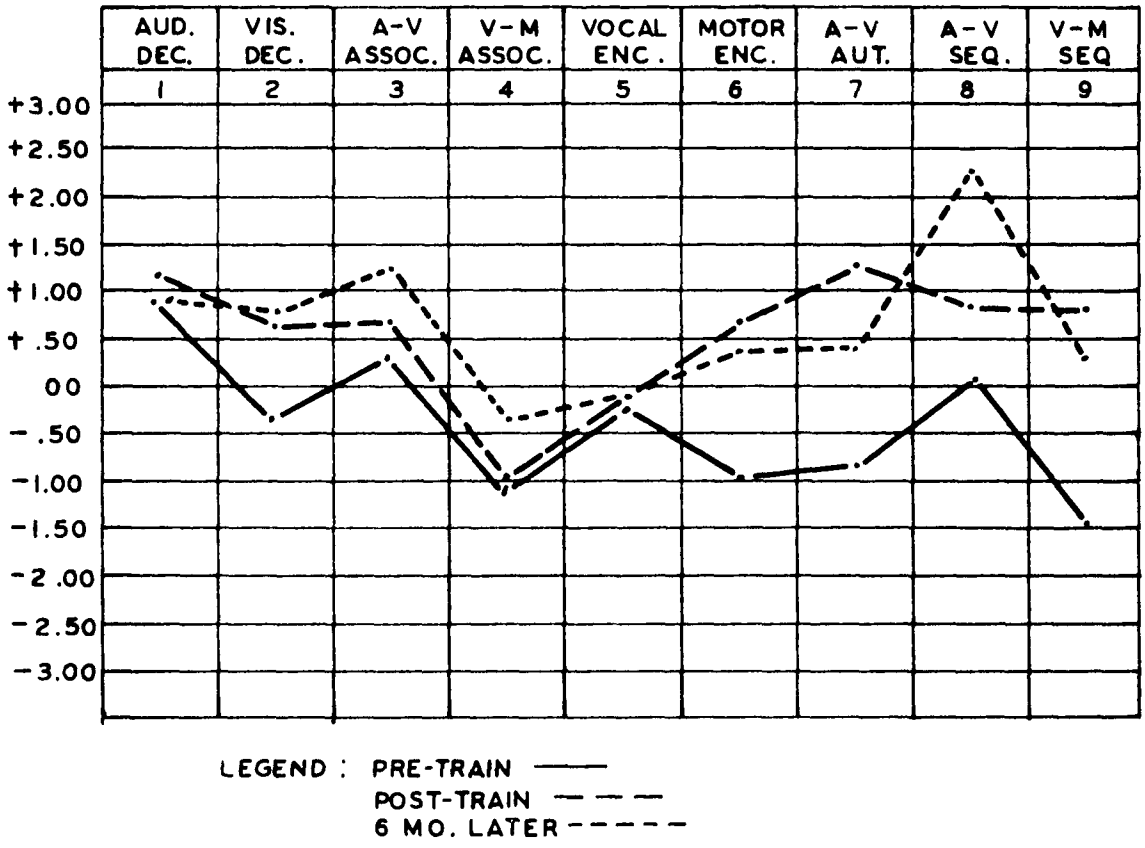
The teacher claimed he was lazy when it came to school work and an acting-out, aggressive child on the playground. These behaviors became evident to the experimenter as the training proceeded. He responded well to new exercises but fatigued on repetitive tasks.

Primary emphasis was placed on memory and perceptual tasks to which he responded actively. Greatest progress was shown in the Automatic Sequential tasks with marked improvement in Auditory-Vocal and Visual-Motor tasks. Oral reading improved over the three month period from 1.8 to 2.7 grade level, but no improvement was evident in silent reading skills. After six months, however, oral reading rose to a grade level of 3.4 and silent reading to 3.5.

His school grades rose to 2's and 3's. In this case, skill improvement showed immediate improvement, with reading gains appearing later.

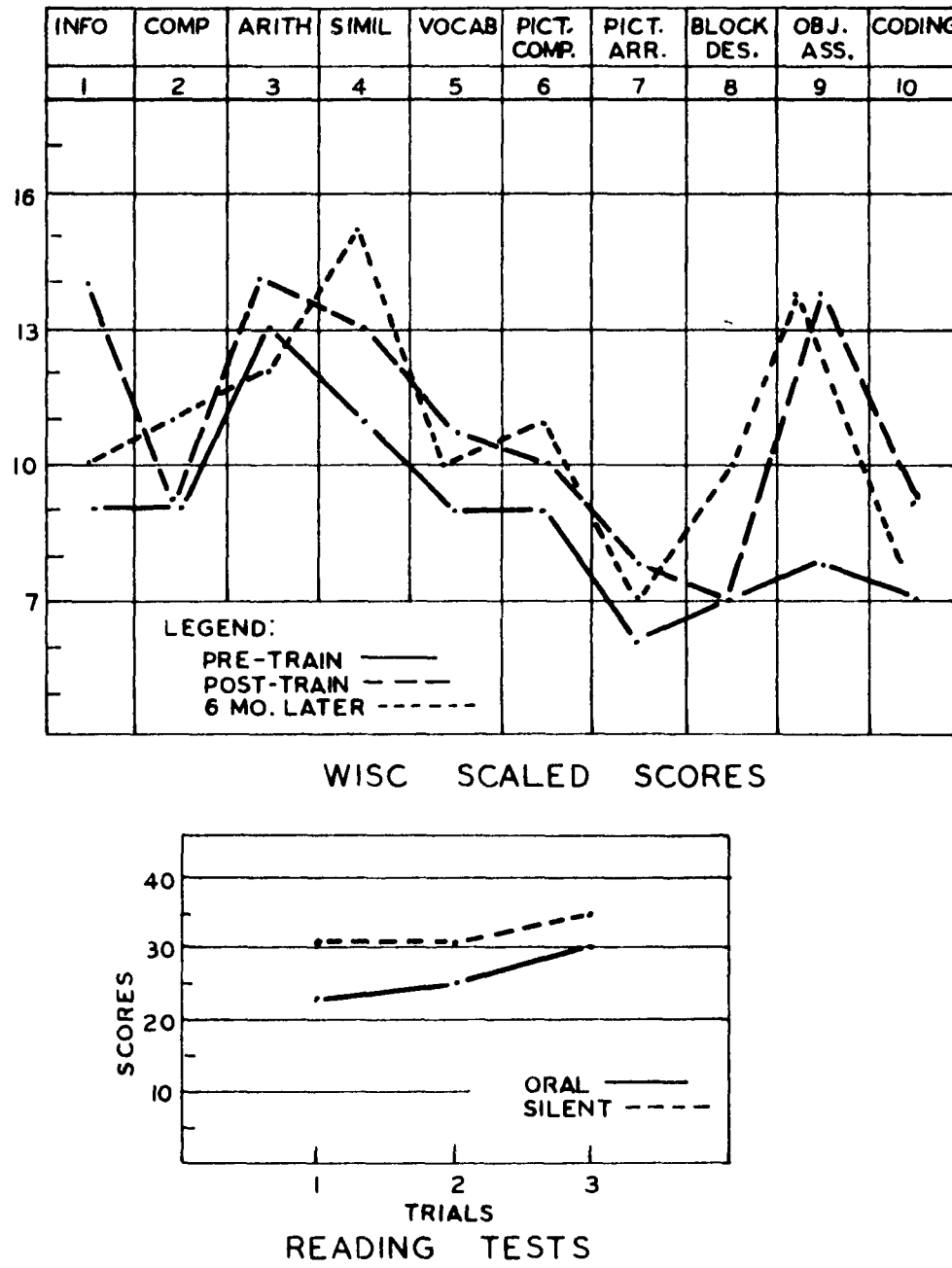
See Figures 8 and 9 for profiles of scores in reading and subtests of the WISC and ITPA.

In each of these cases some improvement occurred. Considerable gains were made by each child in at least one of the underlying skills. In some instances this may have been due to familiarity with the testing materials. Many gains, however, were maintained over time and probably indicate a genuine change in performance. Each child had become accustomed to "tuning in" to the task at hand and was motivated to do well. Case One seemed to progress with far



CASE THREE-SCORING PROFILE ON I.T.P.A. SUBTESTS, PRE-TRAINING, POST-TRAINING, AND SIX MONTHS LATER

FIGURE 8



CASE THREE - SCORING PROFILE ON WISC SUB-TESTS AND READING TESTS, PRE-TRAINING, POST-TRAINING, AND SIX MONTHS LATER

FIGURE 9

greater rapidity than would be anticipated. This might have happened without specialized exercises, but the fact that it was coincidental to the additional training is worthy of consideration. Case Two progressed in skills taught directly, but failed to improve in reading. One might speculate that older, non-productive learning behaviors (such as copying rather than reading) were never extinguished and continued to interfere with the acquisition of new essential reading skills. Reading gains appeared later for Case Three indicating, perhaps, that this youngster "incubated" the instruction a while longer but continued to improve over time. At any rate, scrutiny of these cases provides a glimpse into the individual differences encountered in the group training and points out the importance of adapting instruction to individual needs.

CHAPTER V

DISCUSSION OF RESULTS

Summary

Although reading instruction has usually centered around the training of word recognition, word analysis, and comprehension skills, there has been an increasing awareness that a relationship may exist between a student's inability to acquire these basic skills and a deficiency in cognitive and psycholinguistic strengths which may underlie the act of reading. A few investigators are beginning to recognize the value of developing instructional procedures and materials aimed at improving these underlying skills as a possible aid to the development of reading skills.

Statement of the Problem

The purpose of this study has been to identify differences which may exist in underlying abilities of retarded readers, to construct practice exercises for the development of underlying abilities found to be deficient, to train children in these areas, and to measure the effect of specialized training on underlying abilities and on reading.

Procedure

A sample of twenty second and third grade children (ten matched pairs) with deficits in reading and underlying abilities comprised the

sample. In order to qualify for this study, each subject also met the following criteria:

1. Between 7-0 and 9-11 in chronological age.
2. Full Scale IQ on the WISC above 80.
3. At least one year deficient in reading skills as measured by the Gray Oral Reading Test.
4. English speaking.
5. In the second or third grade and in the second, third, or fourth year of school (including repetitions but not kindergarten).

Two reading tests (The Gray Oral Reading Test and reading portions of the Stanford Achievement Test, Primary II Battery) and two tests measuring underlying abilities (the WISC and the ITPA) were administered. Deficits in underlying abilities were noted, and practice exercises were devised to train in these areas of deficiency. These exercises were taught to the ten experimental subjects over a period of three months. The ten matched control subjects did not receive the special practice and instruction.

Immediately after the training period, the initial tests of reading and underlying skills were repeated and again six months later. An analysis of variance tested the significance of differences in means of scores in reading and underlying skills, before and after training, between experimental and control subjects. A Kruskal-Wallis analysis of variance was computed to determine if a rise in scores for underlying skills was accompanied by a rise in reading scores.

Results

Children who had received special training for three months showed greater improvement, beyond the .05 level of significance, than the untrained matched group in the following areas:

1. Oral reading as measured by the Gray Oral Reading Test.
2. Study Skills and Word Meaning on the Stanford Achievement Text.
3. Memory skills as reflected by the WISC Information subtest.
4. Psycholinguistic skills of closure, automatic language, and visual memory as measured by (1) the Auditory-Vocal Automatic subtest, (2) Visual-Motor Sequential subtest, and (3) the Auditory-Vocal Association subtest.
5. Classification skills as reflected by the WISC Similarities subtest.

Children in the experimental group did not show significantly greater improvement on silent reading comprehension as measured by the Paragraph Meaning subtest on the Stanford Achievement Test.

A rise in underlying skills was accompanied by a rise in reading, as measured by the Kruskal-Wallis analysis of variance by ranks.

Six months after the training, the five remaining matched pairs were re-tested. Significantly greater gains were maintained by members of the trained group over the untrained group in the following areas:

1. Oral reading.
2. Silent reading, Study Skills subtest.
3. Information and Similarities subtests.
4. Auditory-Vocal Association and Visual-Motor Sequential subtests.

Implications

It would appear that training methods for improving cognitive skills thought to underlie the reading act can be developed, and that a rise in underlying skills can be accompanied by a rise in reading ability significantly beyond the chance level.

It would appear that effective training materials for the development of cognitive skills thought to underlie the reading act can be developed for remedial purposes. It would seem advisable to develop similar materials for preventative purposes.

Discussion

From an analysis of the results, it can be stated that the sample of retarded readers trained in this study showed gains both in underlying abilities and gains in reading ability. Not all of the children responded equally to the specialized training, as was illustrated in the case studies; but, in general, the progress made in both reading and underlying abilities was sufficient to warrant continued interest in the study of underlying skills as a prerequisite to improvement in reading. Because of the limited number of cases in this study, however, the reader is warned against indiscriminate generalization

from these results. Nonetheless, there are several practical findings which the writer considers worthy of mention:

1. Additional evidence that a relationship exists between deficiencies in certain skills thought to underlie the reading process and retardation in reading has been brought forth by this study.
2. Special tests, including the WISC and the ITPA, can be used to obtain information about cognitive difficulties thought to underlie reading problems.
3. By closely examining the underlying areas in which retarded readers are deficient, effective practice materials can be devised.
4. If practice materials based on deficiencies in underlying abilities are presented to children over time and in sufficient depth, skill in underlying abilities and in reading can result.
5. Certain gains in underlying abilities and in oral reading may be retained at least six months after the special training has ceased.

These results illustrate the close relationship between diagnosis, instruction, and remediation (Strang, 1964) and follow Kirk's (1962) suggestion that remediation should be based on behavioral symptoms determined through a study of related disabilities. A transition can be made from diagnosis to remediation by ascertaining deficiencies, developing exercises to remedy the problems, teaching the skills needed to the students, and examining the results.

Instructional exercises in this investigation were concentrated mainly at the integrative level of language, as it was in this area that greatest deficiency had been displayed by retarded readers. Practice was devised along a continuum of complexity, starting where the students were in their psycholinguistic development and progressing up to, but not including, the reading process itself.

The underlying areas in which the students displayed the greatest gains and were able to retain this improvement over a six month period were those in which the special training was concentrated. These were the memory skills, as measured by the WISC Information and ITPA Automatic-Sequential subtests; classifying, as tapped by the WISC Similarities subtest; and closure, as tested by the ITPA Auditory-Vocal Automatic subtest.

Several unanticipated gains occurred in other psycholinguistic areas. The reason why significant progress was made in Motor and Vocal Encoding and Visual Decoding can only be inferred. The investigator suspects that improvement in Encoding may have been due to a relaxed, familiar testing environment in which the student was not intimidated by the required tasks. Greater perceptual awareness stimulated by the perceptual speed and closure exercises may have been behind the significant gains shown in the Visual Decoding portion of the ITPA.

Of equal importance to the gains made by the trained subjects in underlying skills were the significant gains made in reading. In all of the reading tests, with the exception of the Paragraph Meaning

subtest on the Stanford, the experimental children made significantly larger gains than the control group. The greatest gains were found in oral reading. It is interesting to speculate as to the reasons for this finding. Oral reading tasks in which no comprehension exercises are required probably demand more perceptual than conceptual skills. It is possible, for example, for a student to read out loud fluently without understanding the passage. Silent reading, on the other hand, is usually measured by some sort of comprehension task. On the Stanford Achievement Tests of Word Meaning and Paragraph Meaning, for example, the scoring is based on understanding of words and passages read silently. Both perceptual and conceptual skills are needed for successful completion of the exercises.

In this particular experiment, a greater portion of the practice time was devoted to perceptual and discrimination tasks. Conceptual or classifying exercises were included only during the latter portions of the training. Therefore, it may be that the higher gains made in oral reading are primarily a reflection of the relative proportion of time devoted to training in abilities underlying this aspect of reading.

It is also interesting to note the results of direct training of underlying skills in relation to indirect training. All skills trained directly, for instance, showed gains at a high level of significance. Short-term memory, automatic grammar, and closure (which were skills taught directly) all showed significant gains as measured by the Visual-Motor Sequential, Auditory-Vocal Automatic, and Auditory-Vocal Association subtests on the ITPA. Methods for classifying

information were also presented quite directly, and these were accompanied by a highly significant gain in the Similarities subtest on the WISC, a subtest which demands categorization.

Less specifically trained were skills demanded in the Arithmetic and Information subtests on the WISC. Long-term memory exercises were presented, but no specific training in the processes of information-gathering and arithmetic computation was given. Results were varied; a significantly greater gain in Information but not a recognizable one in Arithmetic was obtained. Apparently, the training did not affect the skills demanded in the latter subtest. It might be surmised, therefore, that specific training was reflected more directly in the results, as measured by the subtests on the WISC and the ITPA, than was the less direct training.

Of added interest in this study was the fact that many of the effects of the training were retained over time. Gains in oral reading and in study skills and in many of the underlying variables were maintained six months after completion of the training. Not maintained was progress made in reading skills requiring comprehension. Perhaps comprehension skills need more direct training with sustained practice. Brzeinski (1968), as a result of his work with the Denver Beginning Reading Project, maintains that reading training should be started early and continued through the elementary years if a high progress rate is to be maintained. Had the training in underlying skills been continued over the six month interim between tests, it might be postulated that all of the gains would have been maintained

and possibly increased. According to Brzeinski, progress made during pre-school years will have long term effects only when reinforced in a child's subsequent classwork.

Implications

Several independent variables may have contributed to the significant gains made in reading by the experimental over the control group. The presentation of special materials, designed to progress in small graduated steps from simple discriminations to the actual act of reading, may have given children opportunity to learn skills requisite to the reading act and facilitated transfer from the practice exercises to reading tasks presented by the classroom teacher. In addition, exposure to a different teaching personality, to the novelty of the materials, or to a more positively reinforcing environment provided by small group participation may have added experiences which resulted in measureable improvement in underlying skills and in reading. Also obvious to the experimenter were many other effects which were not measured, including a tendency on the part of many of the children to "tune in" to the material, to attend quickly to the task at hand, to respond with accuracy, and to recognize and correct mistakes without fear of punishment. These latter results may be another set of variables underlying and essential to development of successful reading skills. It may be that a formal training program designed to improve children's ability to attend to details, to concentrate on the presented tasks, and to note and correct errors

immediately should be developed and results measured in terms of reading growth.

Certainly the processes involved in reading are complex and results obtained will also, of necessity, be complex and perplexing. The whole process of reading is made up of many complicated parts. Just as the Gestalt psychologists have so often expounded that the whole is more than the sum of its parts, reading experts recognize that reading is more than the sum of perceptual and conceptual components. To Wepman (1961), reading is an involved process requiring an intense interaction of auditory and visual skills with underlying cognitive facts.

To identify and integrate the variables underlying the development of competent reading ability is difficult but not impossible. Hopefully, we will continue to identify and measure accurately skills underlying successful reading development.

Suggestions

In this experiment a primary purpose was to determine whether or not gains made in underlying skills would be accompanied by gains made in reading. No attempt was made to determine whether the training materials were solely responsible for the progress made or if other interacting variables had a strong influence on the final outcome. It is important, therefore, to explore whether the positive gains obtained were primarily due to teaching materials, the close student-teacher relationship, the teaching methods, the novelty of

the training, the development of new skills, or a complex interweaving of all of these factors.

A second recommendation is in reference to a broader application of the type of training conducted in this study. Much of the work done in the area of underlying deficits has been conducted on an individualized basis. This approach may be ideal, but because it demands so much teacher time and can incur such large financial outlays, it is important to work towards more extensive, less expensive plans. The small group plan is one approach. Here, children whose reading problems are accompanied by deficiencies in underlying skills, many of which are common to numerous children, can obtain both generalized and specific training in their areas of need. General training can emphasize the development of close attention to the task at hand, recognition and correction of errors, and tuning in on minimal cues. Specific training would be geared to deficits in perception, closure, memory, and the like. Tasks could be added, steps shortened, and training lengthened as needed by individual students with deficits in clearly defined areas.

In addition to developing methods for working economically with greater numbers of students, thought should be given to preventing problems from getting a firm foothold. In this study, the concern has been with the detection of deficits which have already contributed to reading problems. For many of the children, much damage had already been done before remediation commenced. To avoid this unnecessary failure in learning to read, it seems advisable to attempt to detect

deficiencies in underlying skills among children who are just beginning their schooling. Retardation in learning, according to Bijou (1963), is not a theoretical construct such as mentality or brain impairment, but it is often generated by environmental events which influence organismic variables. Children with learning lags can be viewed within the framework of functional analysis. This emphasis permits focus to be placed not only on the elimination of deficits but also on the training of new repertoires of useful responses. To do this, Bijou feels that the development of precise materials of great length and small steps should be generated for kindergarten and first grade. Materials helpful to all children in the areas of perceptual and conceptual development should be created and presented to children at different speeds, according to individual needs. More specific materials with extended practice and small steps between levels can be added for youngsters with pronounced areas of deficiencies. These recommended procedures will also provide for individualized instruction in a group setting.

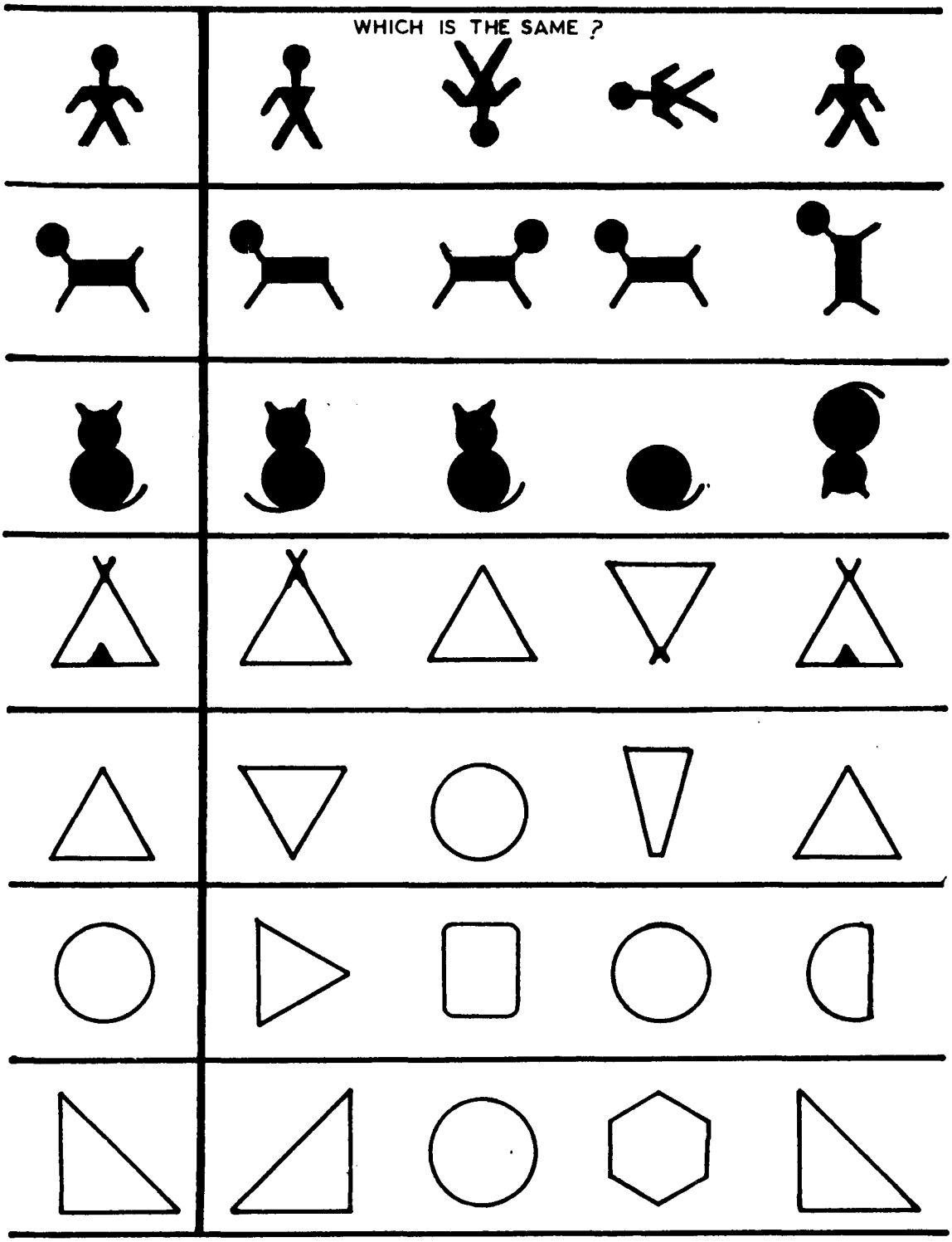
Work in areas underlying the reading process is beginning to supply us with intriguing clues to causes behind reading problems. Strang (1962) claims this type of research is essential to improvement of reading instruction. "It underlies programmed reading instruction...; it is prerequisite to the construction of effective reading tests; it is essential for efficient reading instruction at every grade level" (p. 188).

It may be that the future curriculum for primary youngsters will include broad basic instruction in areas underlying the reading process. Currently, interest is beginning to shift from precise instruction in technical skills to broader training in underlying processes. Intelligence is not static, according to Hunt (1961), but can be developed. Head Start programs are accumulating evidence of the value of presenting exploratory experiences to disadvantaged or educationally deprived children. The "hidden curriculum" provided in many middle class homes is being examined for its vital contribution to the learning strengths of children. Today's technical society is calling for a solid underlying instructional base as a necessity for future technological demands. It is important, therefore, that we continue to search for and measure those underlying variables which will make the most significant contribution to the curriculum of tomorrow.

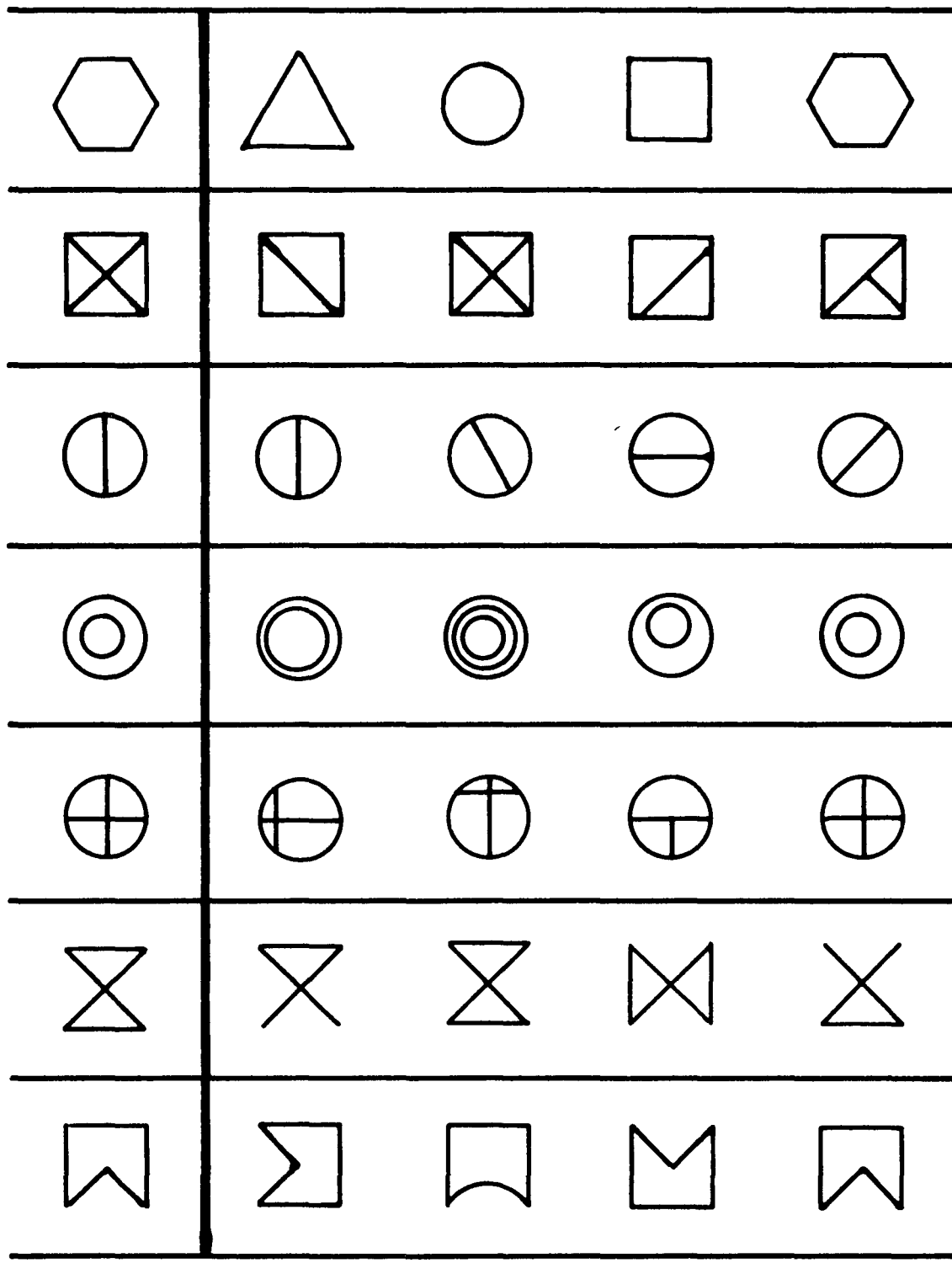
APPENDIX A

PRACTICE EXERCISES FOR DEVELOPING UNDERLYING SKILLS

Practice exercises for the development of the following underlying skills are included in this sector: Perceptual Speed, Visual Memory, Auditory Memory, Sound Blending, Visual Closure, Auditory Closure, Visual Classification, and Verbal Classification. (Teaching instructions for these exercises are included in Appendix B.)



PERCEPTUAL SPEED-EXERCISE 1



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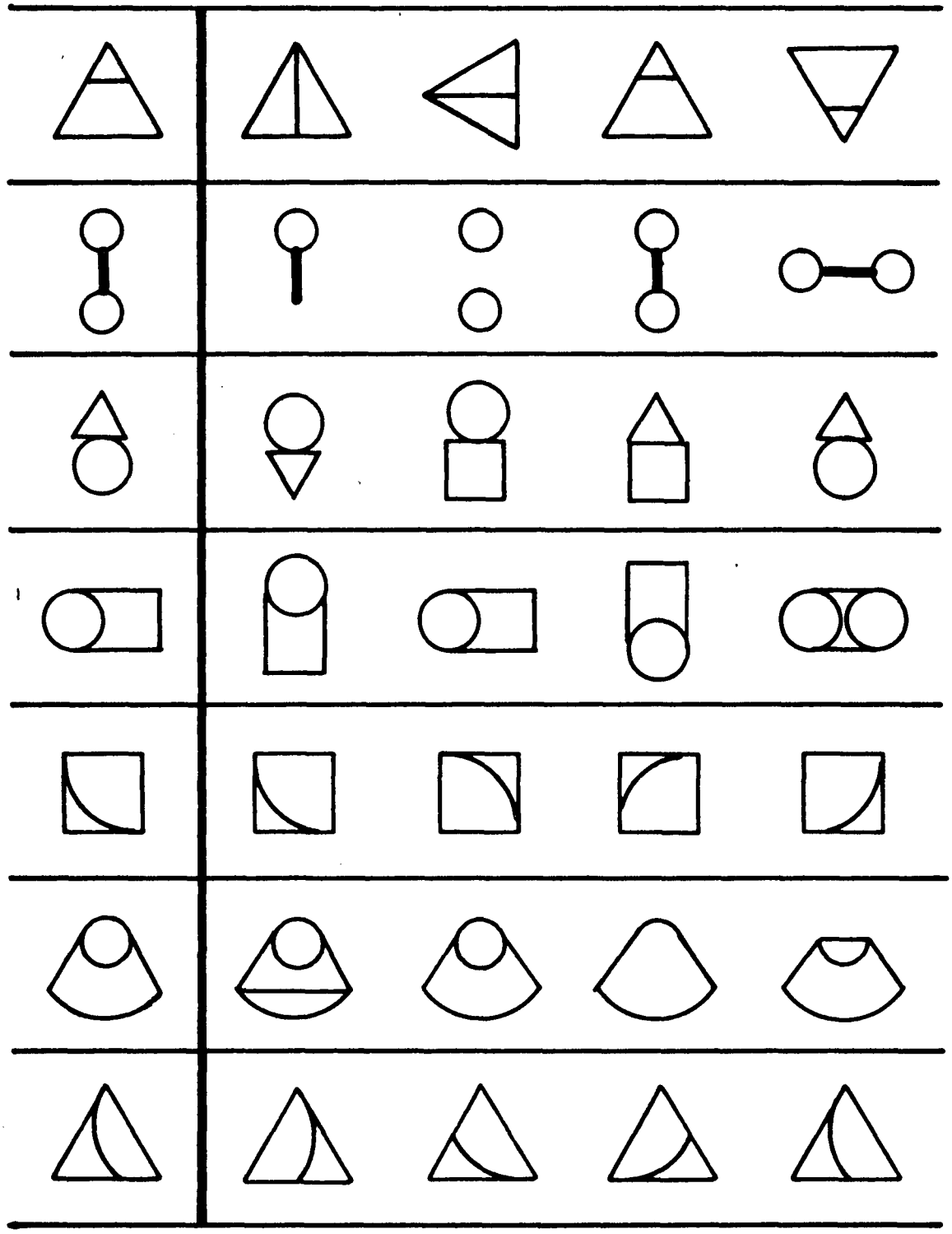
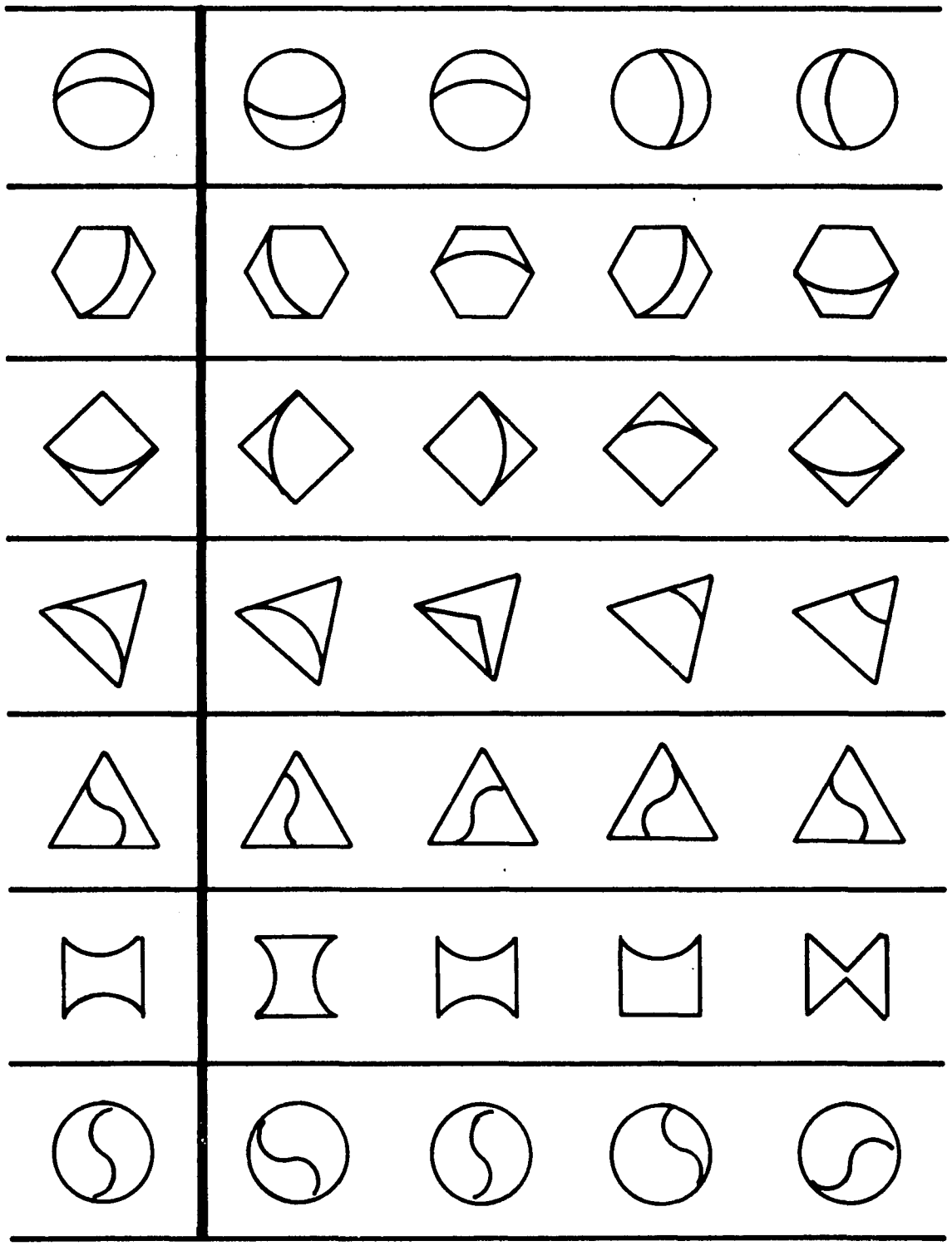
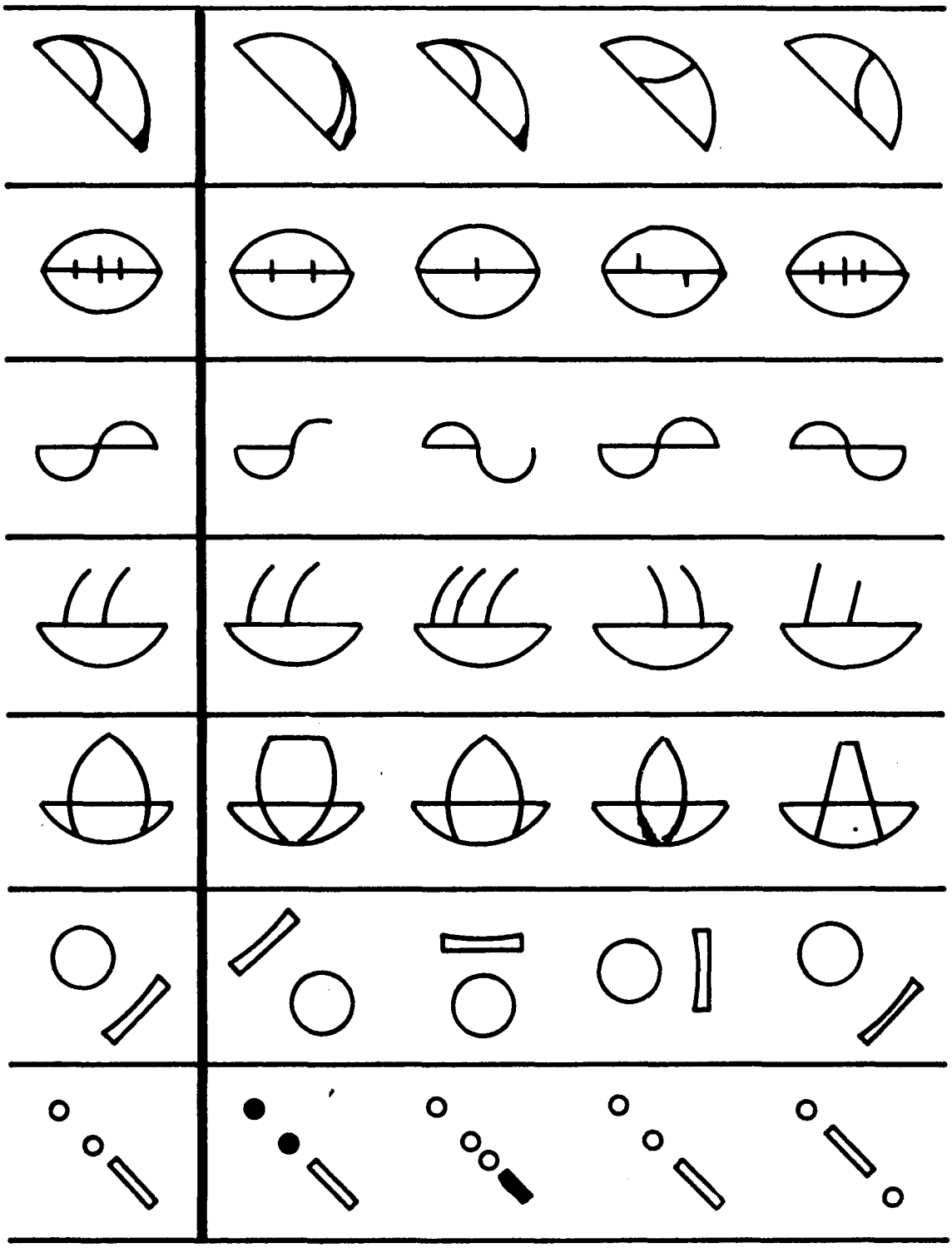


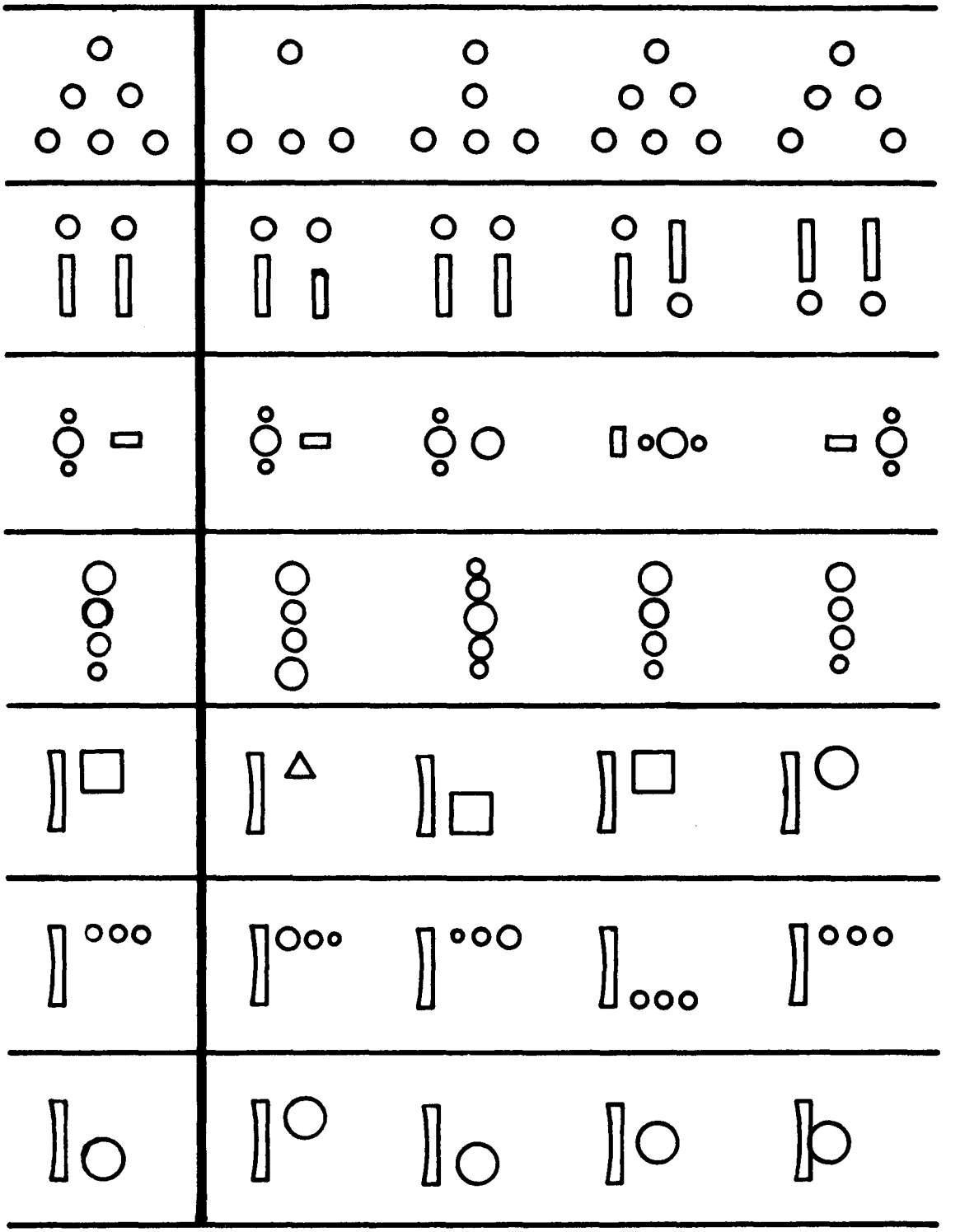
PERCEPTUAL SPEED-EXERCISE 3



PERCEPTUAL SPEED-EXERCISE 4



PERCEPTUAL SPEED-EXERCISE 5



PERCEPTUAL SPEED-EXERCISE 6

34	43	34	44	33
26	26	62	22	66
17	71	77	17	11
69	99	69	96	66
123	123	132	231	321
432	234	324	423	432
567	675	567	765	657

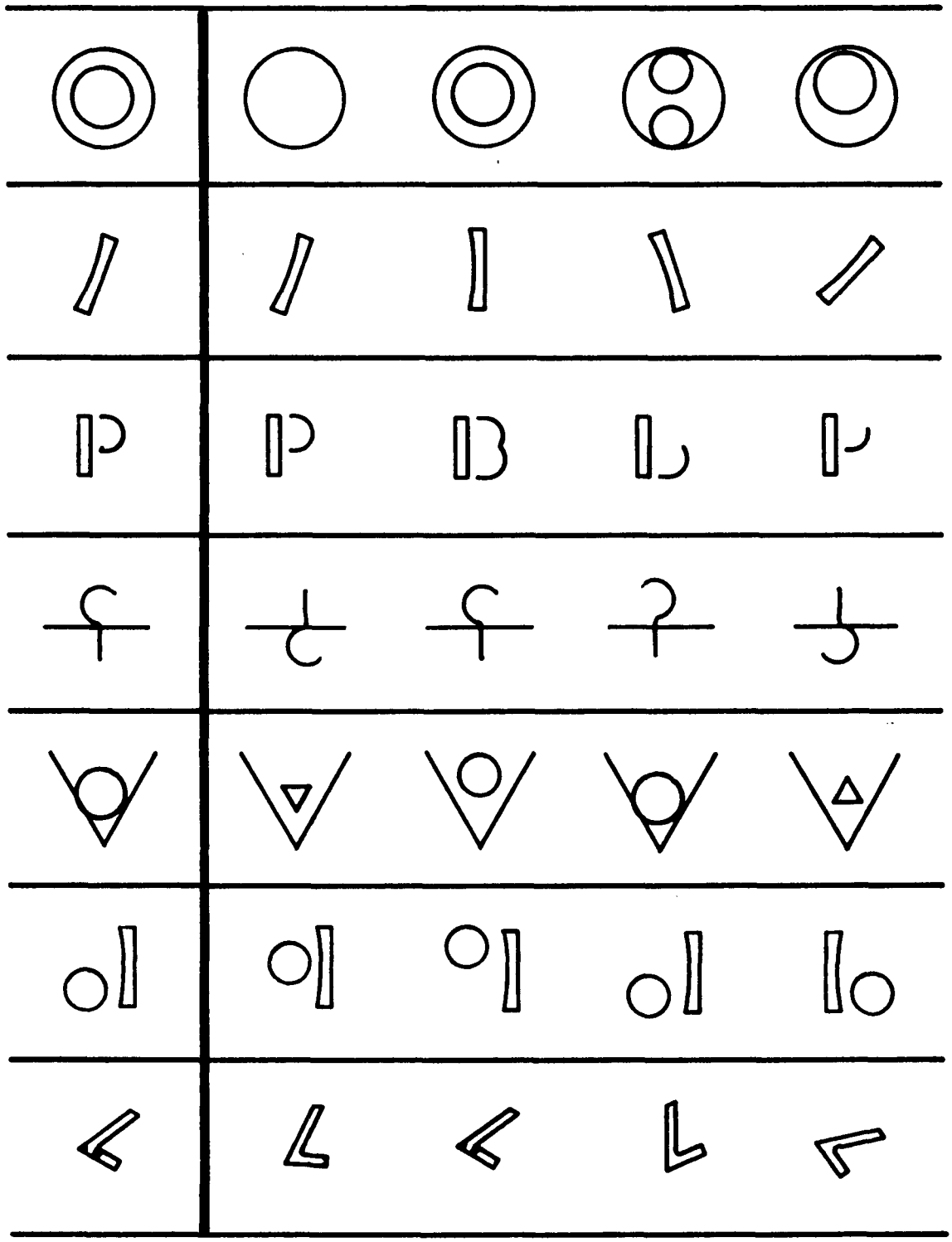
PERCEPTUAL SPEED-EXERCISE 7

672	672	627	726	762
189	198	891	189	981
865	568	865	586	685
789	987	978	897	789
4271	4271	1724	4712	4217
3562	2653	3562	3526	5362
8369	8639	8963	8369	8693

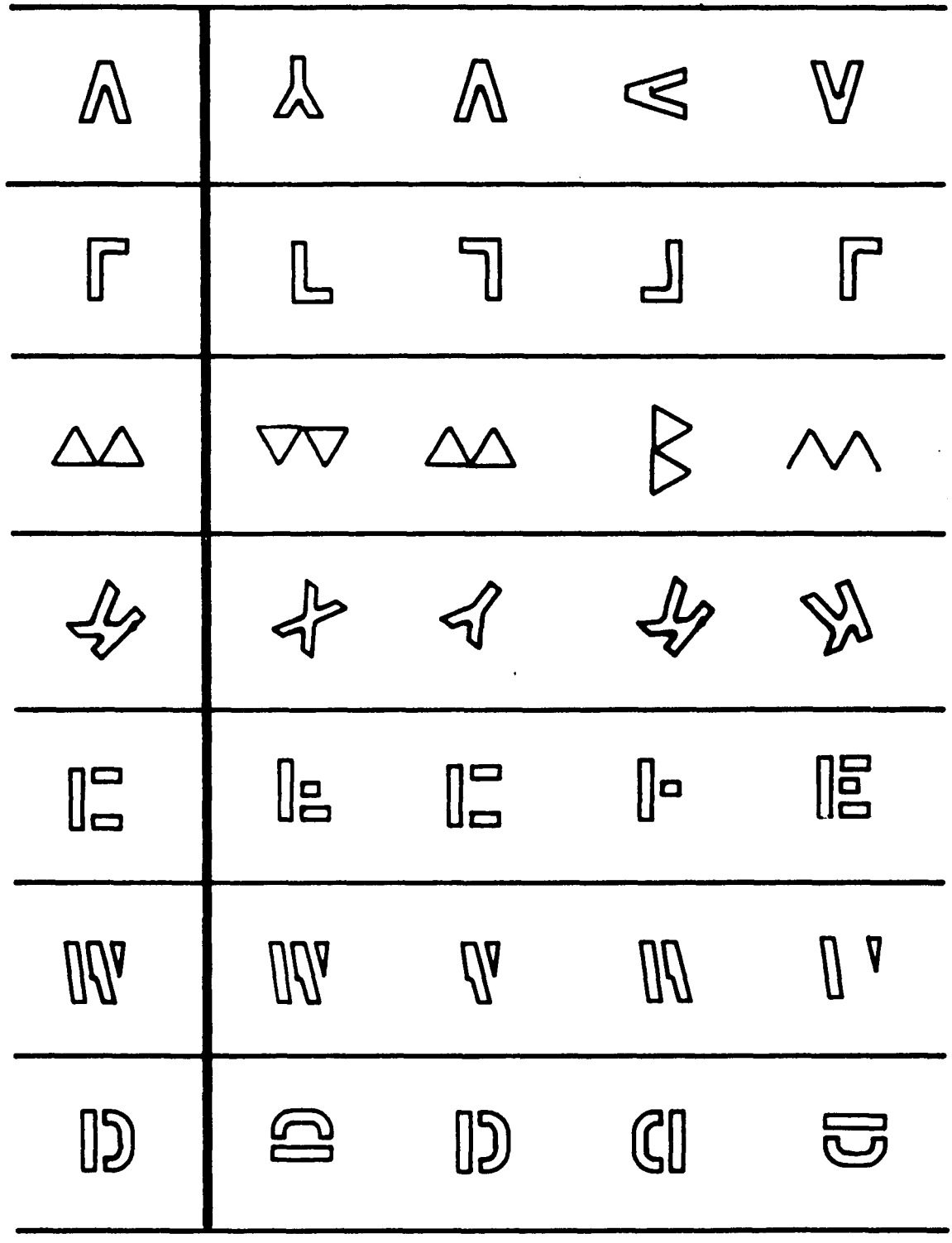
PERCEPTUAL SPEED-EXERCISE 8

7413	7143	7413	7314	7134
6937	6397	6739	6937	6973
1834	1384	1348	1843	1834
34681	34681	34618	36481	34816
71533	75133	71533	71353	75313
69741	67941	61974	69741	67419
42516	45216	42516	42516	42615

PERCEPTUAL SPEED-EXERCISE 9



PERCEPTUAL SPEED - EXERCISE 10



PERCEPTUAL SPEED - EXERCISE 11

h	n	b	H	h
q	h	p	q	d
c	e	d	o	c
f	t	E	f	T
B	D	R	b	B
I	T	I	t	F
y	y	p	x	v

PERCEPTUAL SPEED-EXERCISE 12

k	L b h k
z	m n x z
d	D d b a p
M	W X M N n
R	r P D R B
H	N R h M H
W	M W X V N

PERCEPTUAL SPEED - EXERCISE 13

S	B X Z S E
T	I T J F t
e	a e c E o
K	h Z k K F
v	w u v n y
U	n v U w u
w	x N v m w

PERCEPTUAL SPEED - EXERCISE 14

E	F E e T B
j	J g p i j
g	p g p q y
a	d b c a e
p	q j p d g
n	m w h u n
h	n b H h d

PERCEPTUAL SPEED-EXERCISE 15

JOHN	JONE	TOM	JOHN	JACK
GAIL	GIAL	GAIL	GAYL	GIRL
JAMES	JAMES	JANE	JAYNE	JAMIE
PATSY	PEGGY	PATSY	PATTY	PUTTY
BETTY	BENNY	BETTY	BATTY	BUNNY
CAROL	CHARL	CARYL	CARAL	CAROL
DONALD	DAVID	DONALD	DOUGLAS	DANNY

PERCEPTUAL SPEED - EXERCISE 16

LARRY	LORRY	LENNY LARRY LANNY
TOMMY	TIMMY	TOMMY TAMMY TUMMY
FREDE	FREDE	FRANK FRISCO FRED
BETSY BROWN	BETTY BROWN BETSY BROWN	BETSY BLACK BETSY BLUE
THOMAS N TOM	TOM N THOMAS THOMAS N TOM	THOMPSO N TOM TOM N THOMPSON
JOHN T JONES	JONES T JOHN JOHN T JOHN	JOHN T JONES JOHN I JONES
JERRY L GRAY	JOHN L GRAY GARY L GRAY	JERRY E GREY JERRY L GRAY

PERCEPTUAL SPEED-EXERCISE 17

RUTH ROBERTS	ROBERT RUTH RUTH ROBERT	RUTH ROBERTS ROBERT ROBERT
JANE REID	JEAN REID JANE REID	JOHN REID JANE READ
JOSE ROMERO	JOE ROMAN JOSE ROMANO	JOHN ROMERO JOSE ROMERO
BILL WILLIAMS	WILL WILLIAMS BILL WILLISS	BILL WILLIS BILL WILLIAMS
CARY GRANT	GRANNY CARR RANDY CART	CARY GRANT CAROL GRAND
PAGE BURK	BART PANE PAN BURT	PAT BURNS PAGE BURK
KELLY SCOTT	SCOTT KELLY SVEN SCOTT	KELLY SCOTT KELSO SORO

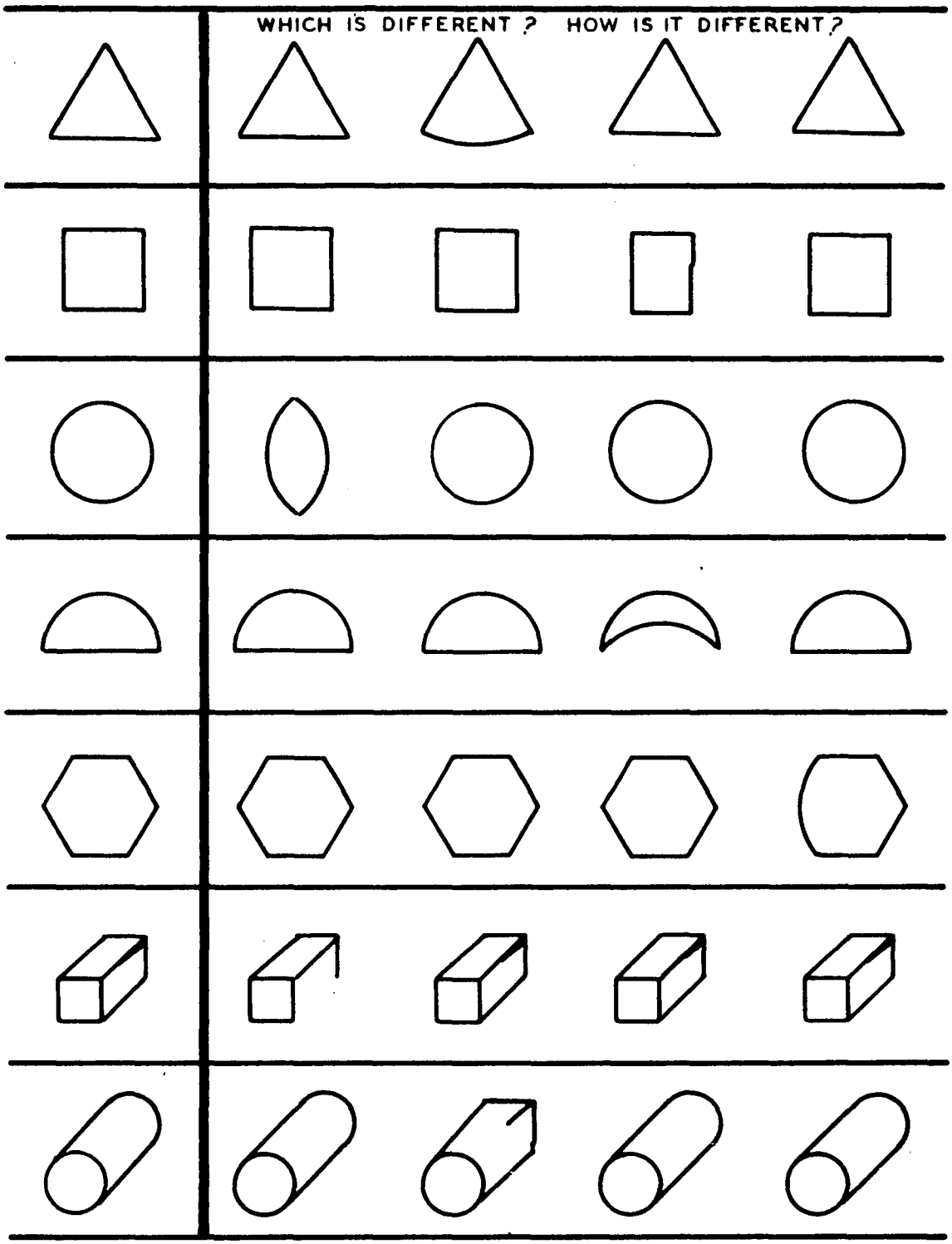
PERCEPTUAL SPEED-EXERCISE 18

nat	mat	bat	nat	fat	hat
pin	fin	tin	din	pin	bin
bat	cat	bat	hat	bet	rat
pan	nap	tan	ban	pen	pan
pail	pain	bail	pial	pail	pain
road	rode	raod	roam	voom	road
read	real	peal	road	read	need

PERCEPTUAL SPEED-EXERCISE 19

last	lost	list	fast	lisp	last
some	soam	zone	some	same	seam
meat	meal	mean	neat	heat	meat
from	form	from	foam	firm	fume
fall	fell	feel	fall	fill	fail
brain	train	plain	grain	brain	brail
train	tramp	trail	train	brain	pain

PERCEPTUAL SPEED-EXERCISE 20



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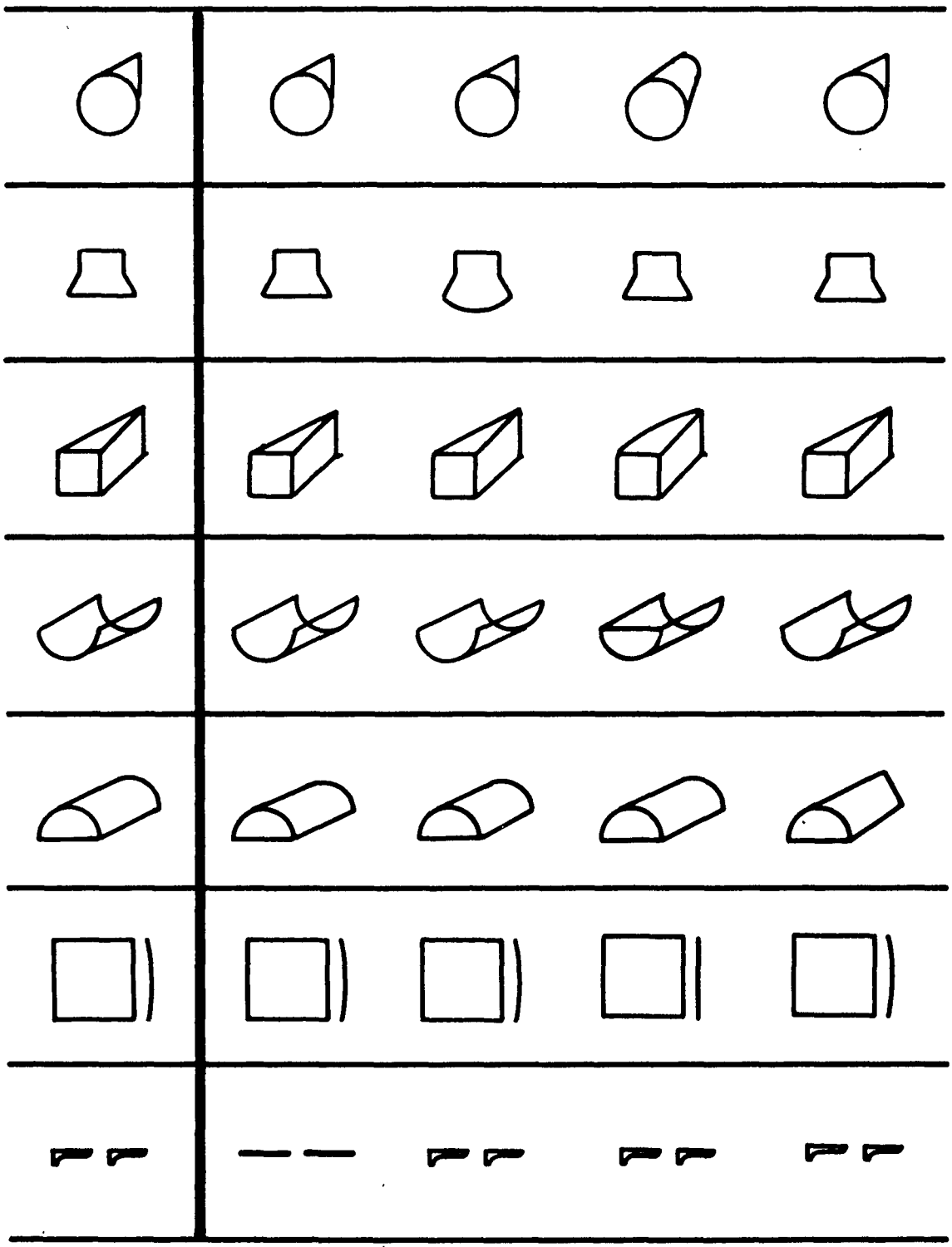
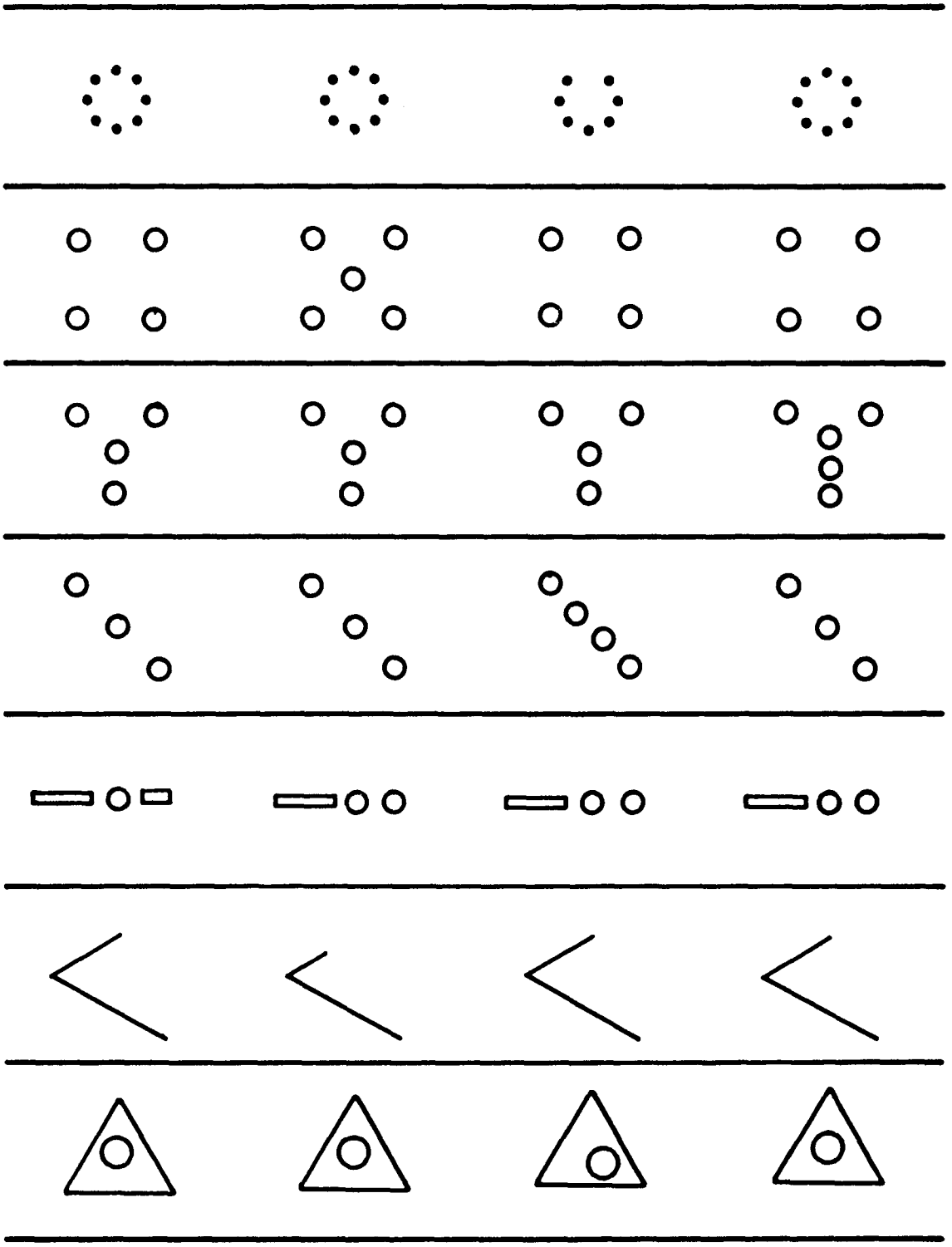
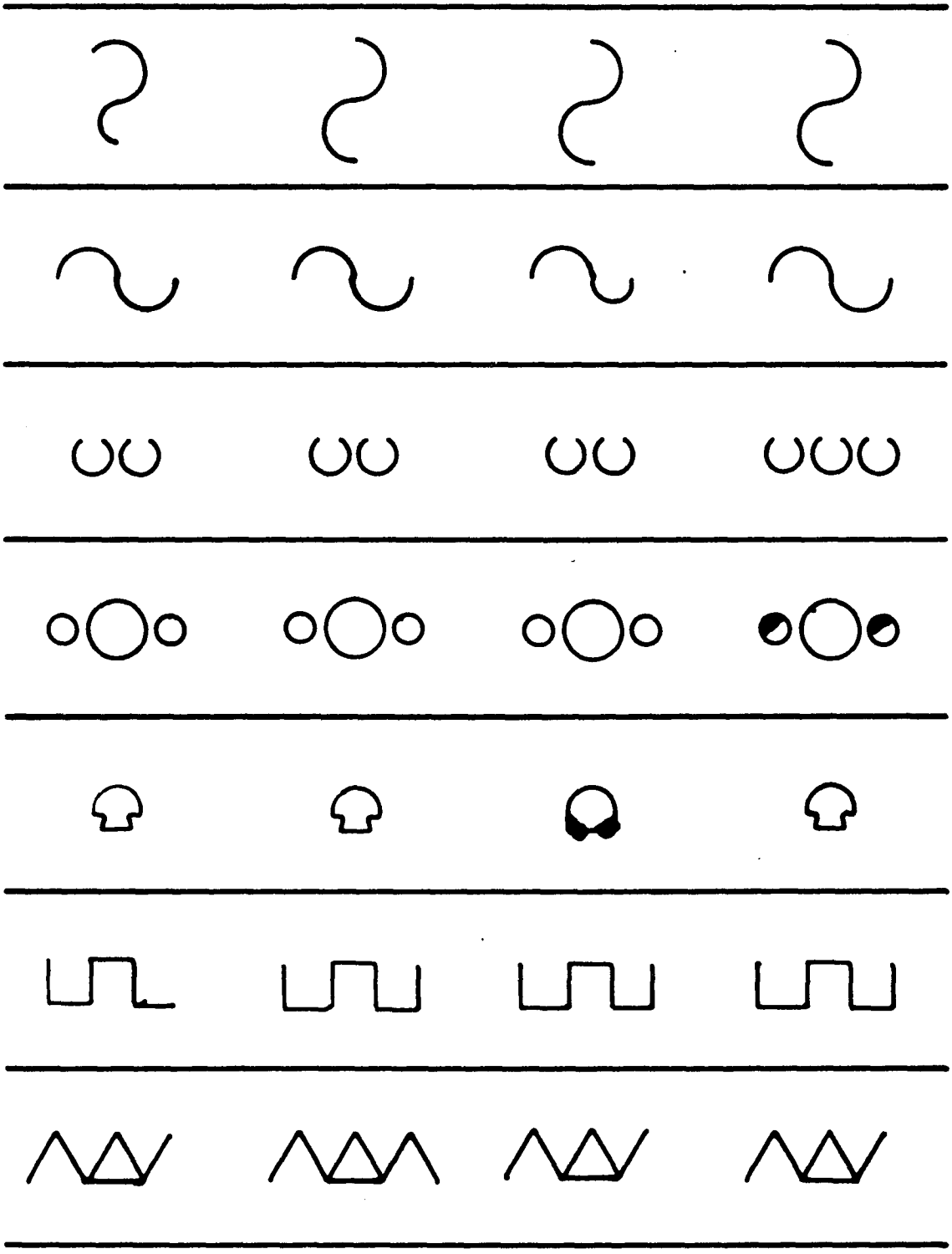


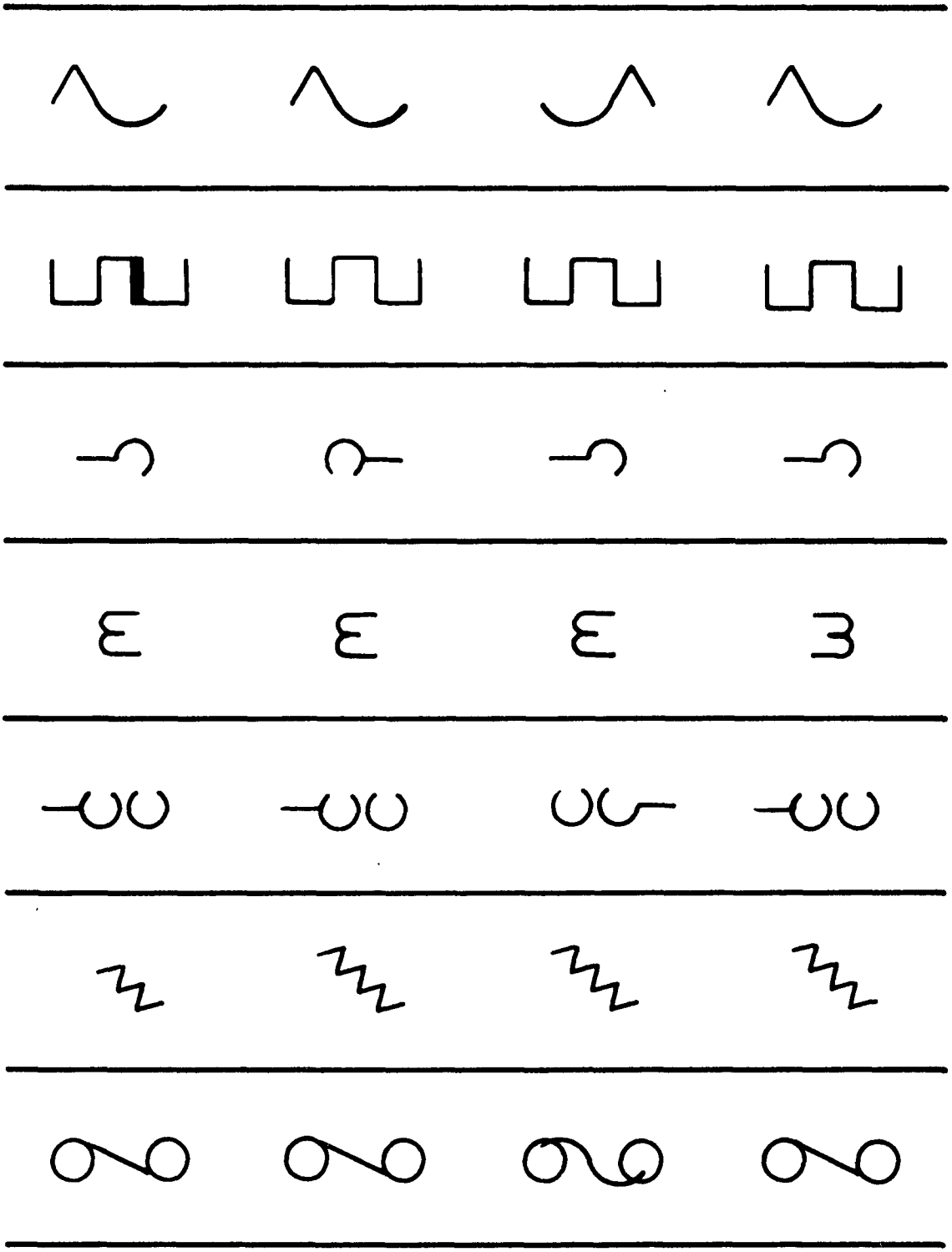
PERCEPTUAL SPEED-EXERCISE 22



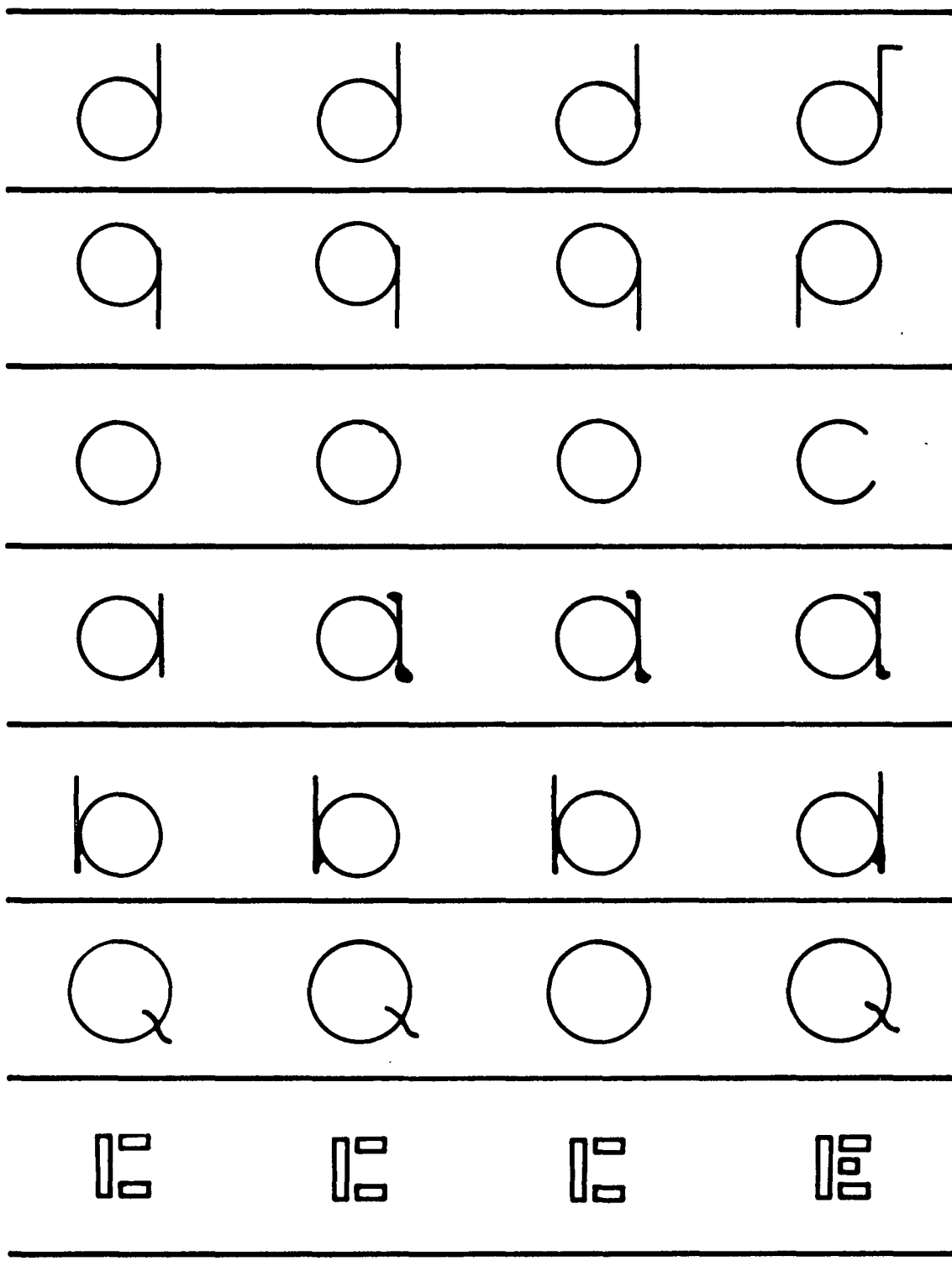
PERCEPTUAL SPEED-EXERCISE 23



PERCEPTUAL SPEED - EXERCISE 24



PERCEPTUAL SPEED-EXERCISE 25



PERCEPTUAL SPEED-EXERCISE 26

a	d	a	a
f	f	f	t
g	g	q	g
h	h	b	h
B	B	B	P
5	5	S	5
C	C	C	O

PERCEPTUAL SPEED-EXERCISE 27

K	K	K	R
T	7	T	T
U	V	V	V
L	J	L	L
R	R	B	R
S	2	S	S
W	W	M	W

PERCEPTUAL SPEED - EXERCISE 28

N	N	N	M
u	*v*	*u*	*u*
p	*p*	*q*	*p*
b	*b*	*b*	*d*
w	*w*	*m*	*w*
e	*i*	*e*	*e*
l	*l*	*l*	*k*

PERCEPTUAL SPEED-EXERCISE 29

d	a	d	d
m	m	w	m
j	j	j	p
no	no	on	no	no
it	it	it	in	it
nat	nat	rat	nat	nat
ban	pan	ban	ban	ban

PERCEPTUAL SPEED-EXERCISE 30

our	our	own	our	our
saw	saw	saw	was	saw
hand	hard	hand	hand	hand
show	show	show	show	snow
hard	hard	hard	herd	hard
trick	trick	trick	truck	trick
among	along	among	among	among

PERCEPTUAL SPEED-EXERCISE 31

began	began	begin	began	began
got	get	got	got	got
band	band	bend	band	band
many	many	many	many	mary
then	thin	then	then	then
when	when	wind	when	when
four	four	for	four	four

PERCEPTUAL SPEED-EXERCISE 32

house	house	horse	house	house
quiet	quick	quiet	quiet	quiet
trail	trail	trail	trail	trial
quick	quick	quick	quirk	quick
brain	brain	brain	brain	drain
plane	plain	plane	plane	plane
farm	farm	farm	firm	farm

PERCEPTUAL SPEED-EXERCISE 33

Memory Exercises

Visual Memory of Concrete Items

A. Items are presented on a tray and are removed after a thirty second viewing time.

1. Items are placed in classification groups.

a. Writing instruments (pen, pencil, crayon, chalk)
b. Dishware (cup, glass, plate, saucer)
c. Fruits (apple, orange, banana, plum)
d. Utensils (can opener, peeler, scraper, knife)
e. Grooming supplies (comb, brush, nail file, mirror)
f. Cutting tools (scissors, knife, razor)
g. Doll furniture (chair, table, lamp, bed)
h. Doll clothes (dress, shoe, sock, hat, pants)
i. Transportation (airplane, boat, truck, car)
j. Light (bulb, candle, match)
k. First aid (band-aid, bandage, adhesive, medicine)
l. Toy instruments (guitar, horn, drum)
m. Containers (jar, can, bag)
n. Toy animals (horse, sheep, dog, cow)
o. Space vehicles (plane, capsule, rocket, missile).

2. Students are asked to look at items carefully.

3. They are then asked to remember as many of the items as possible, to itemize these to the instructor, and to note the overall category into which they might fit.

4. Items from two or more categories can be placed on the tray and students instructed to recall these both individually and in categories.

B. Items are presented to the student on a tray. Students are asked to close their eyes while the instructor removes one of the objects. Students are then asked to name the missing item.

C. Items are again presented to the student. When he closes his eyes, the instructor changes the order of the items. The student is asked to replace items in the original order.

Visual Memory of Pictures

A. Large, colorful, comprehensive pictures are presented for viewing.

1. Students are asked to pick out certain details.

2. They are requested to verbally place items seen in the picture into classified groupings.

3. The overall theme of the picture is noted and discussed.

B. Pictures are presented for viewing and then removed.

1. Special questions are asked about the picture.

2. Students are asked to recall as many details as possible, in categories, if possible.

3. Special instructions are given on ways to visually and verbally organize the picture.

Memory for Design

A. Forty different designs are presented to students for five seconds each.

B. After each presentation, the student is asked to draw the design from memory.

C. If the drawing is incorrect, the student is again shown the original stimulus card and asked to correct his drawing.

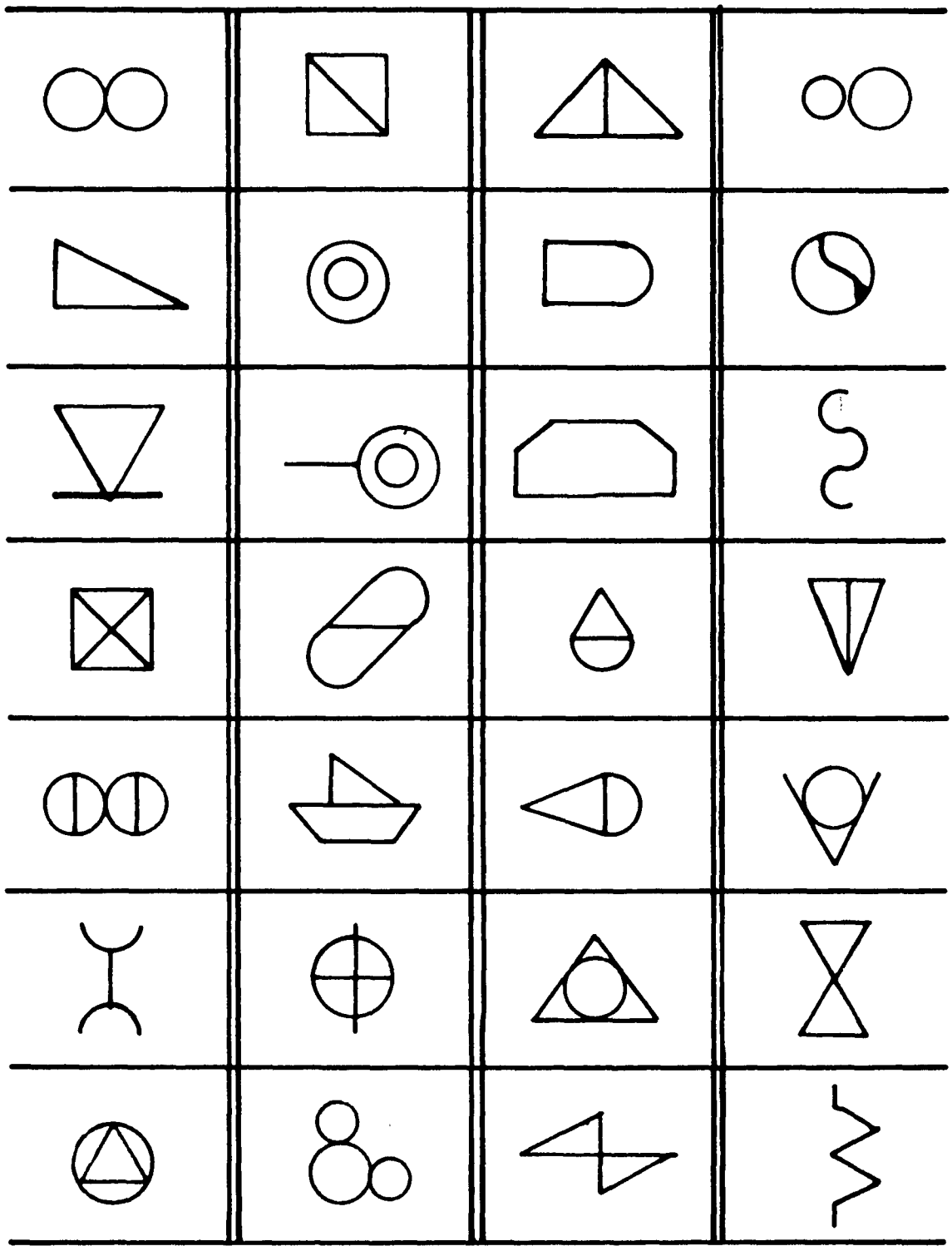
Designs in Sequence

A. Design chips are placed in certain order and shown to student for a specified period of time.

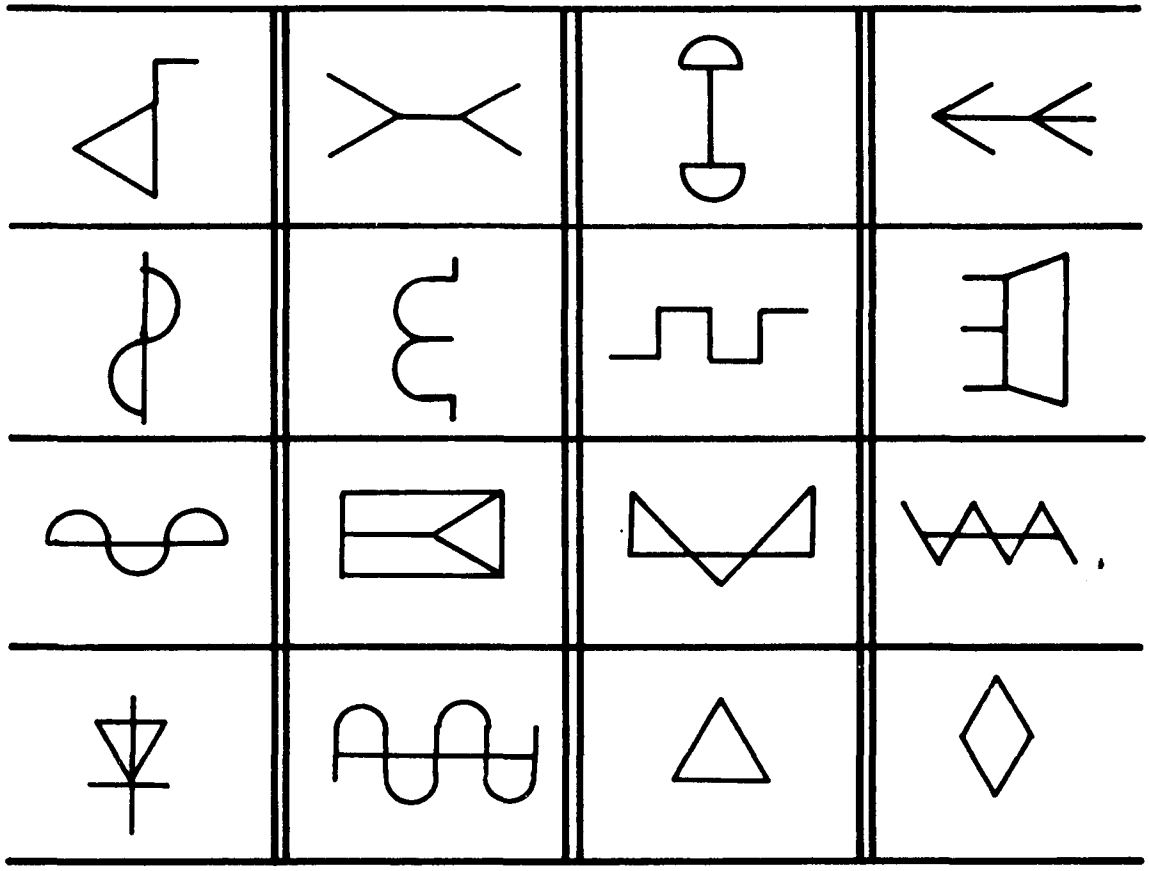
B. Instructor's chips are covered while student tries to duplicate the patterning with his own set of chips.

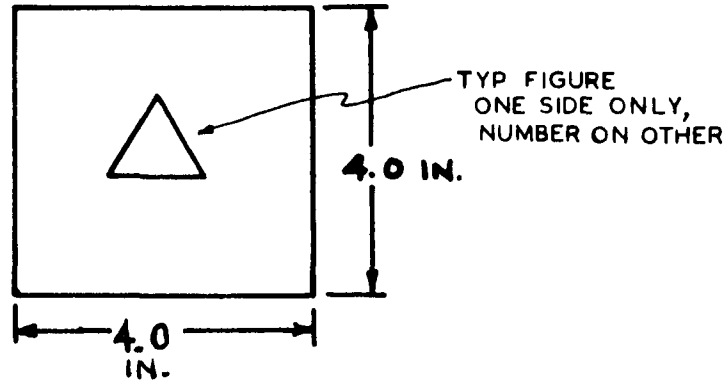
C. Corrections are made by the student when necessary.

D. Viewing time is reduced and sequences lengthened as the exercise proceeds.



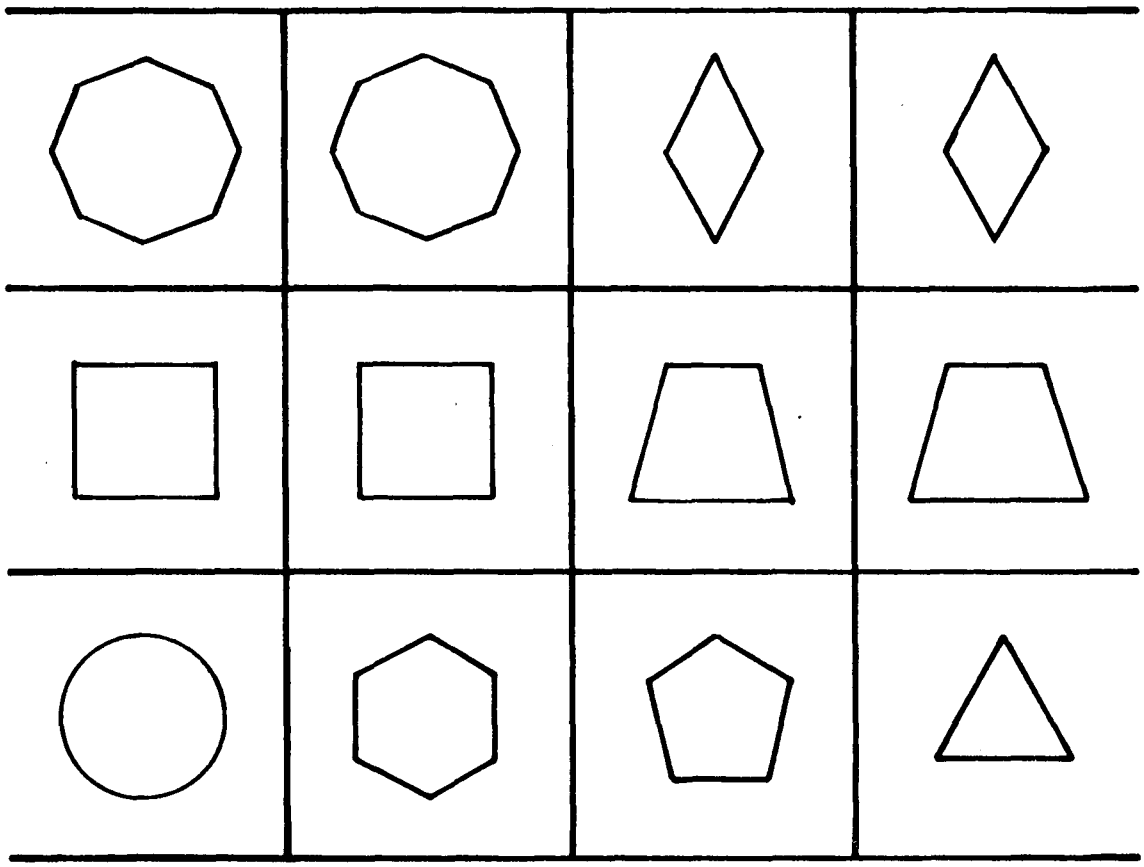
MEMORY FOR DESIGN EXERCISE, SHEET 1/2

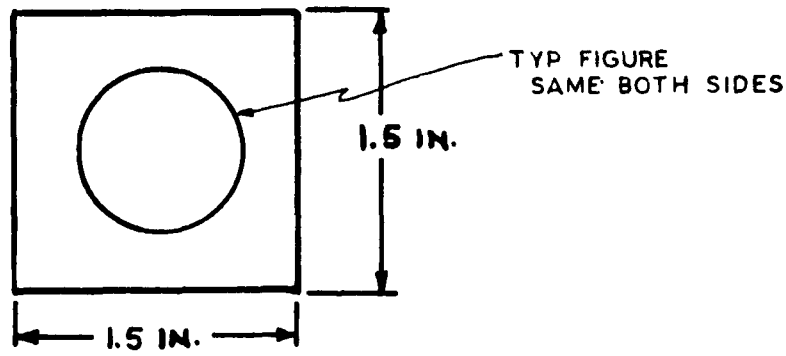




TYP CARD
1/16 ART BOARD

MEMORY FOR DESIGN EXERCISE, SHEET 2/2





TYP CARD
1/16 ART BOARD

VISUAL MOTOR SEQUENCING EXERCISES

Auditory Memory of Word Pairings

Teach the child to give a specific word response to a stimulus word. After establishing the first pair, introduce a second pair. Interchange. Then add more sets gradually.

bus - school
game - baseball
boots - cowboy
pool - swimming
knife - sharp
rubies - red
board - black
sharpener - pencil
brush - hair
tree - pine
string - shoe
wing - airplane
screen - television
grass - green
dime - silver
star - bright

Auditory Memory-Action Tasks

Listen to and then carry out the following directions:

1. Walk over to the door, open it, close it, and come back to your seat.
2. Pick up a book, open it, point to the ceiling, close the book.
3. Get up, walk around your chair, hop on your right foot, raise your hand, sit down.
4. Walk to the window, look out, wave your left hand, turn around, come back.
5. Open your book, turn to page 5, close your book, put it under your seat, take your pencil, write your name on a piece of paper.
6. Get up, walk a straight line, hop on your left foot, raise your right hand, wink your eye, walk back, sit down.
7. Get up, turn around in a circle, touch your toes, sit down on the floor, stand up, whistle, sit down in your chair.
8. Sit in your chair, point your finger at Tammy, then at Wade, then at Linda.

9. Point your finger at John, then at Billy, then at Mary, then at Jeanie, then at me, etc.
10. Point your finger at the ceiling, at the floor and at the door, at the blackboard, and at a book, etc.
11. Pick up a book, take it to the teacher's desk, pick up a pencil, put it on a chair, look out the window, put the pencil on your desk, bring your book back to the desk, then to your seat.
12. Stand up, turn around, walk backwards to the wall, touch your toes, point to your ear, blink your eyes, come back.
13. Open your book, turn to page 20, copy down 5 words, turn to page 25, say the first word on the page, close the book.
14. Open the book, turn to the table of contents, find the page for Chapter 3, turn to the page, close the book.
15. Go to the board, write your name, write your age, write your address, come back, turn around, scratch your head, sit down.
16. Pick up your pencil, draw a circle, then a square, then a triangle, then an egg, put your pencil down.
17. Take your pencil, draw a box, then a balloon, then a moon, then a star, put your pencil behind your ear.
18. Cross your legs, scratch your ear, toss your head, shake hands with your neighbor, uncross your legs.
19. Walk around your chair, hop on your left foot, whistle a tune, rub your nose, giggle.
20. Stand up, stretch your hands, point your finger, touch your toes, wiggle, sit down.

Possible instructions and comments to give while conducting the exercises on auditory memory:

Did Susan follow the directions? What did she do?

Did she forget anything? What?

Did she do the tasks in the right order?

How did you remember what to do?

Did you think through the directions?

Did you keep repeating the directions?

Could you hear the directions again in your mind?

Auditory Memory-Sentences

Repeat these sentences:

1. Tom woke up early because he was going fishing with his dad.
2. Mary woke up her doll and dressed her in her best clothes.
3. Father drove the car to the gas station to get air in the tires.
4. The dog chased the rabbit across the fields and down the path.
5. Early in the morning the children started off on a trip to a lake a mile away.
6. John owned one horse, two dogs, three cats, and four turtles.
7. Mary has one doll house, two dolls, three books, and four dresses.
8. The day was bright and sunny, and everyone felt like going for a swim.
9. At 2 o'clock in the afternoon the teacher asked the children to get ready for their trip to the dairy farm.
10. The boys rode their bicycles down Main Street to the drug store and bought some candy and gum.
11. It was time to wash the car for father, and he offered to pay us if we did a good job.
12. There were many books about animals in the library, and Tom and Joan wanted to read all of them.
13. The children had to walk down a street, through a vacant lot and across the bridge before they could get to Grandmother's house.
14. Before going shopping with Mother, Joe and Maria had to make their beds, straighten their rooms, and empty their waste baskets.
15. At recess time, third graders can play ball, jump rope, climb on the bars, or run around the playground.
16. The morning was warm, so the children decided to stop the ball game and to go swimming instead.

Sound Blending Exercises

A. The instructor will pronounce each blend or syllable separately and assist the student in pronouncing the whole word:

pen	airplane	very
crayon	circle	please
cup	kitten	ever
glass	thimble	taken
plate	morning	given
apple	water	letter
banana	beautiful	child
brush	reading	people
paper	children	other
knife	trouble	injury
candle	city	funny
hammer	bring	gradual
table	writer	fortunate
tree	temperature	favorite
plate	learning	thunder
stool	however	whistle
foot	maybe	theater
brick	never	digestion
train	water	comfortable
baby	flight	disagreement
school	frighten	happiness

B. The instructor will read the entire sentence, sounding separately the blends or syllables only for the words in parentheses:

The boy climbed up the (mountain).

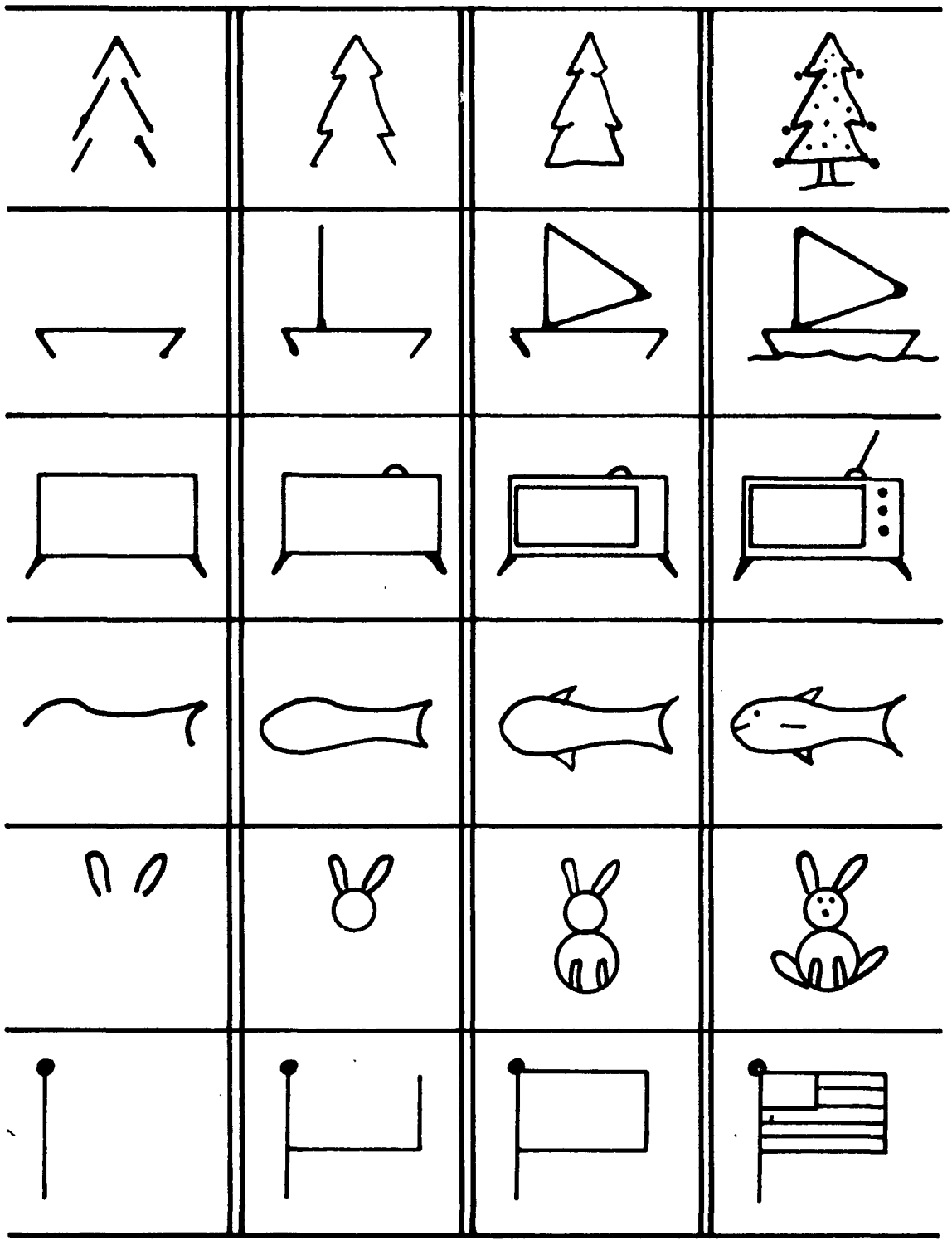
It is all right for little girls to (giggle).

Playing ball can be (exciting).

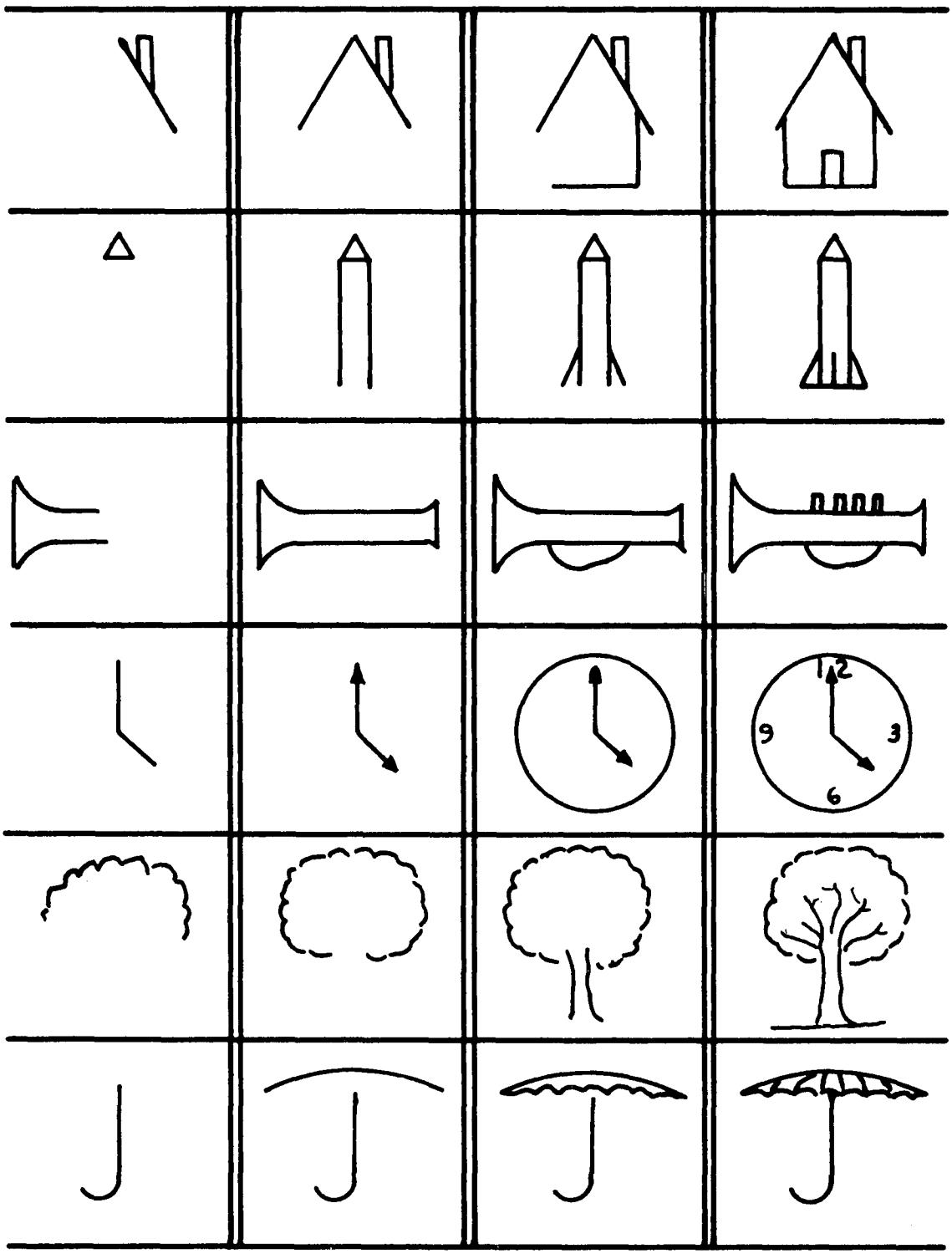
We get out of bed at (seven) o'clock in the (morning).

It was cold so he put on a (sweater).

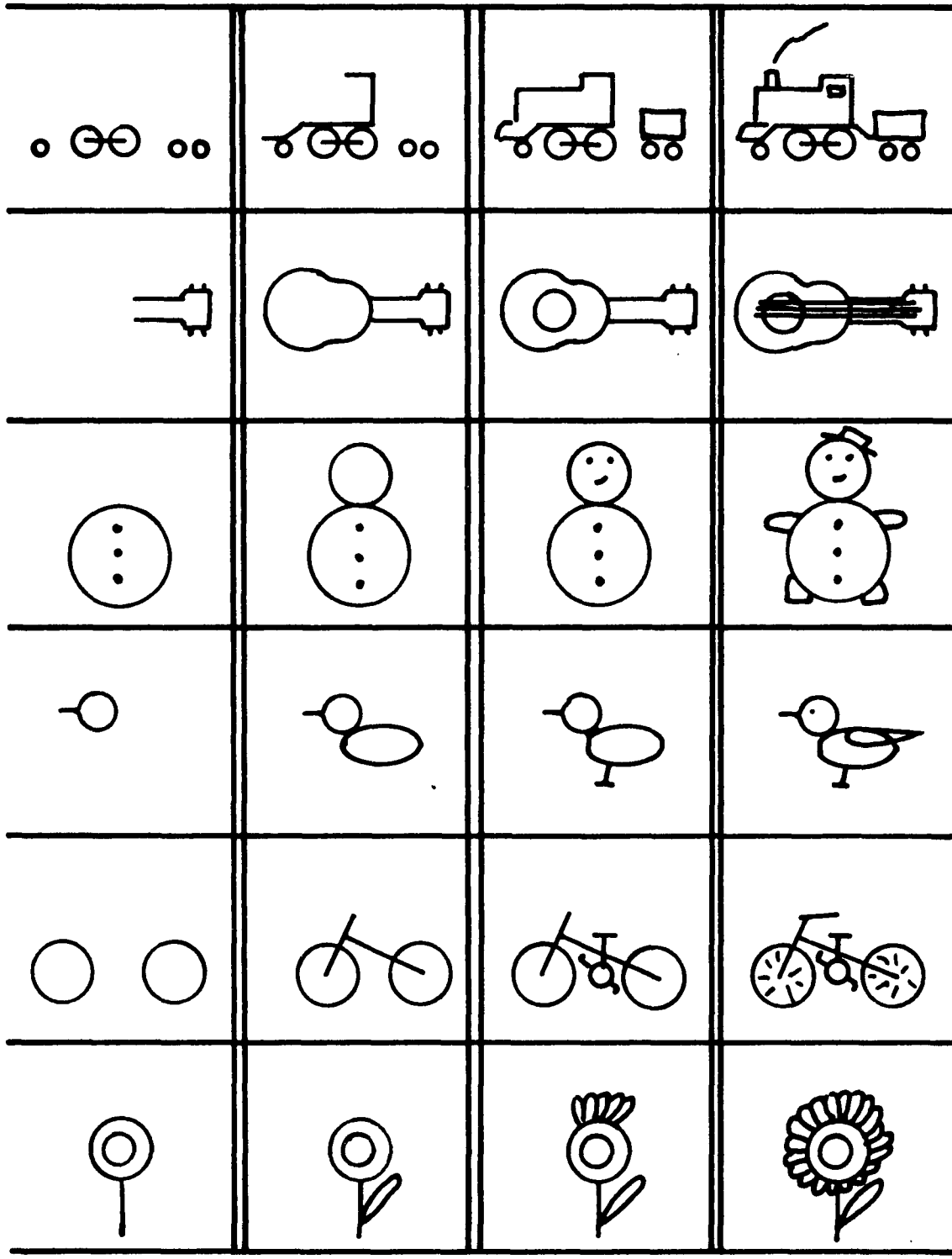
Every morning she (brushes) her teeth.
He drove his car at a (terrific) speed.
Some children live in the (country), some live in the (city).
The teacher said, "Now it is time to (listen)."
It was his birthday so the (children) brought him (presents).
We get up in the morning and go to bed in the (evening).



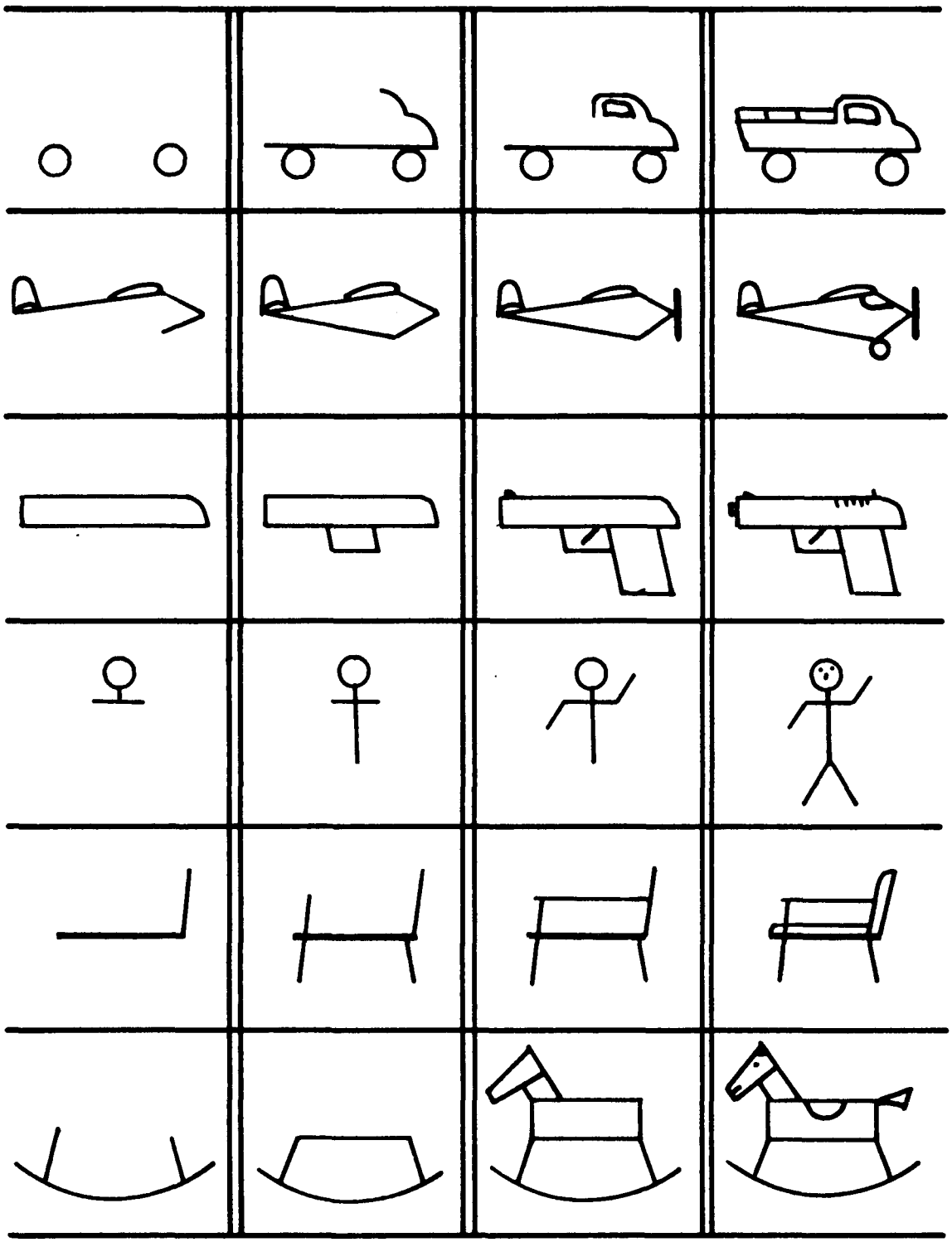
VISUAL CLOSURE - EXERCISE 1



VISUAL CLOSURE - EXERCISE 2



VISUAL CLOSURE - EXERCISE 3



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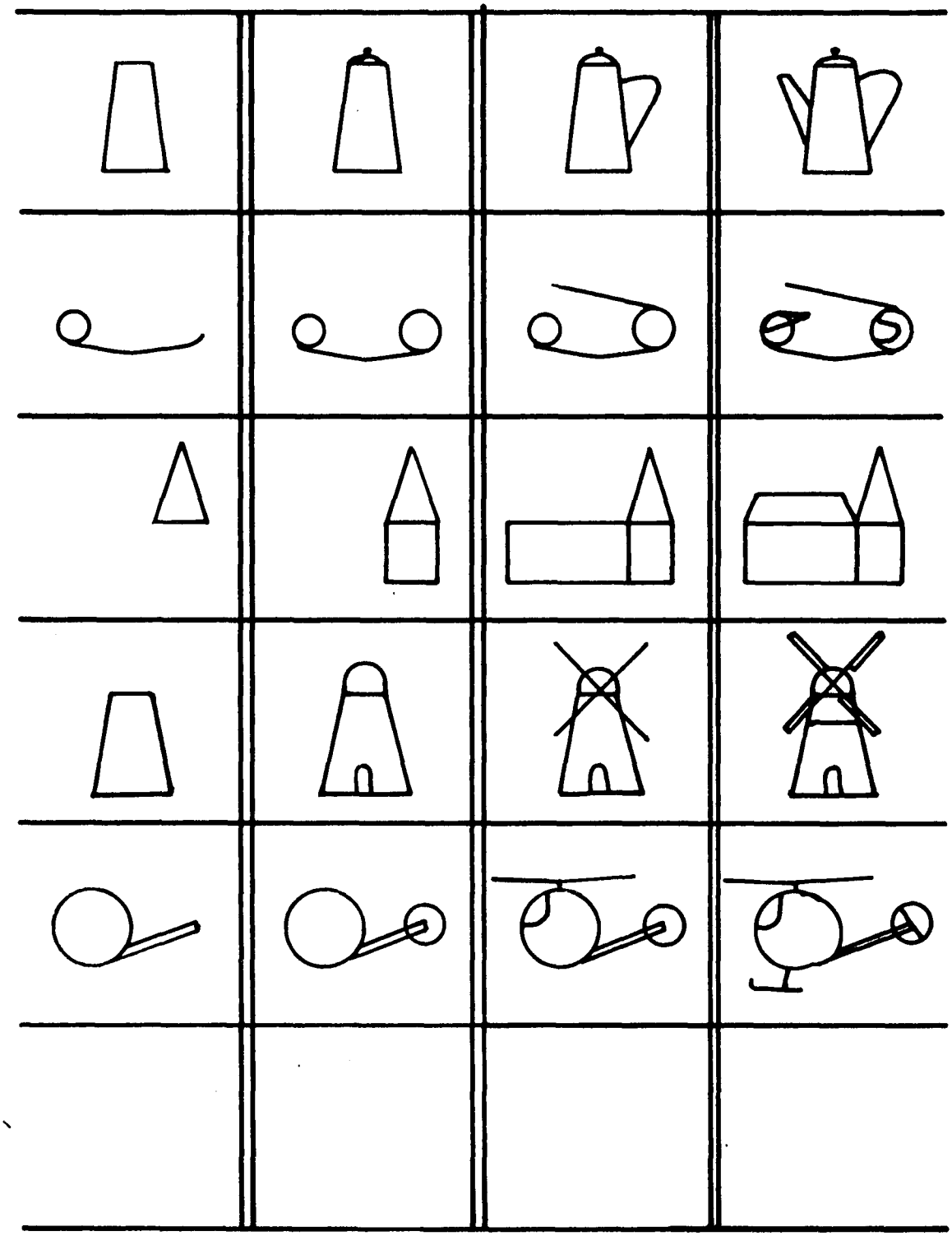

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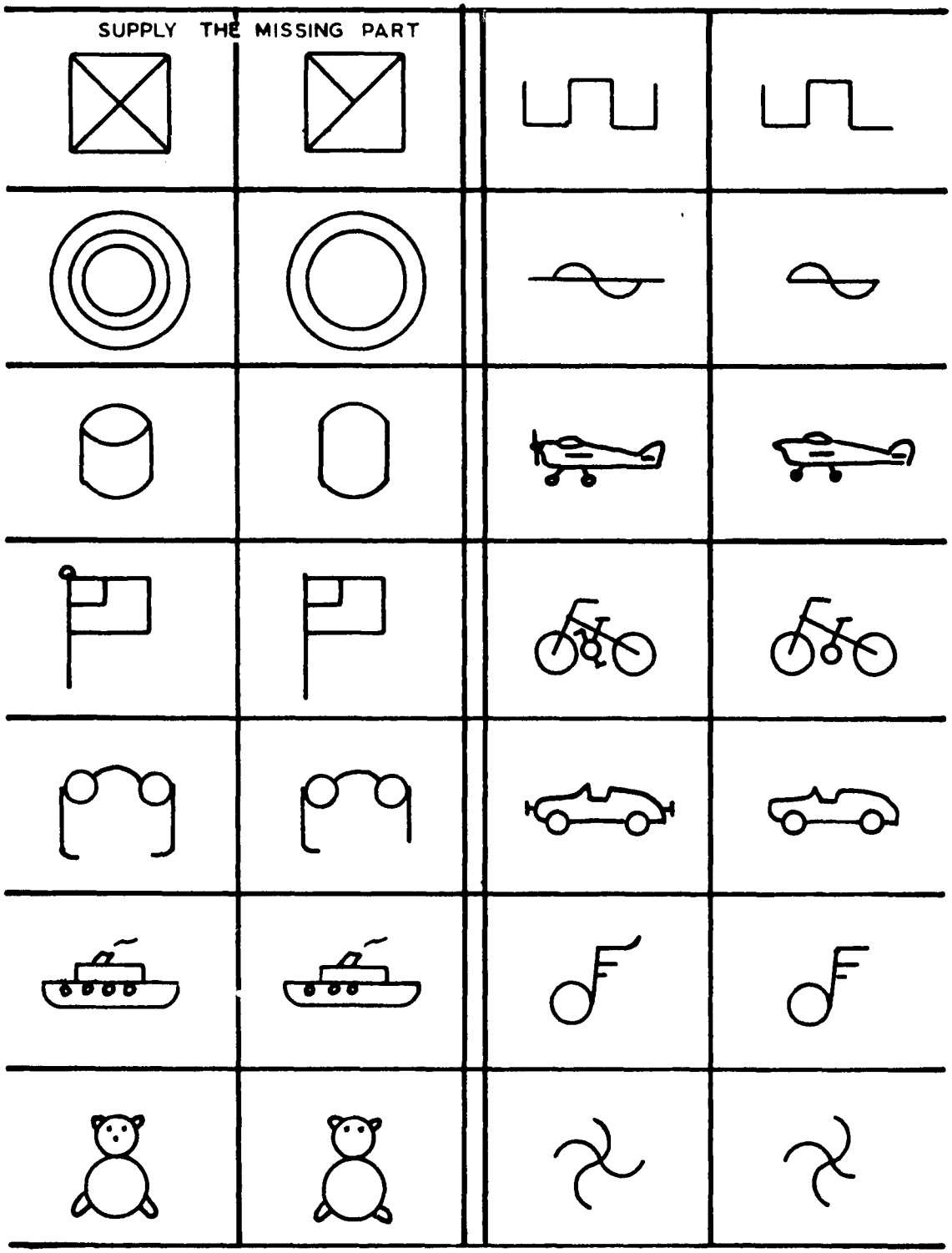

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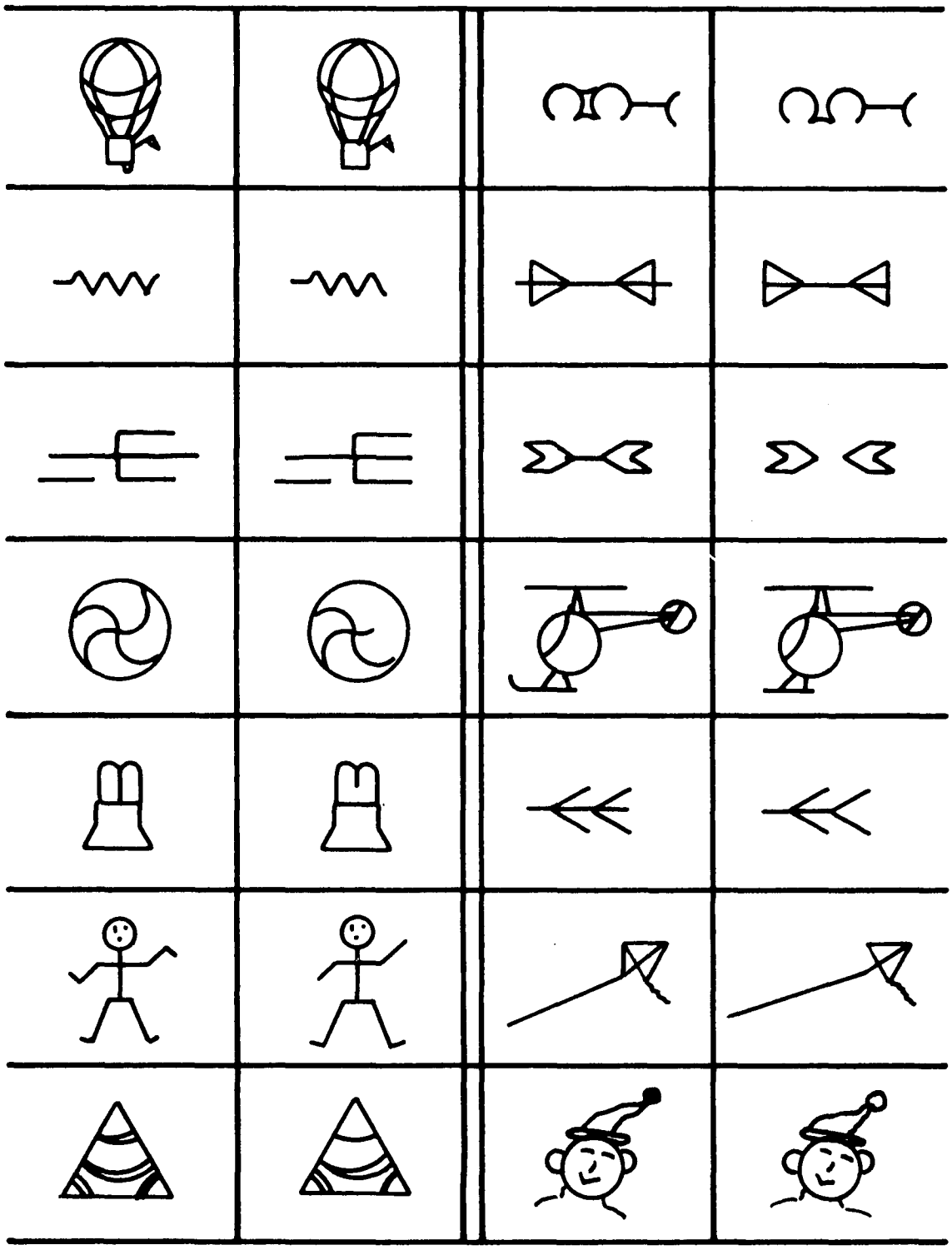

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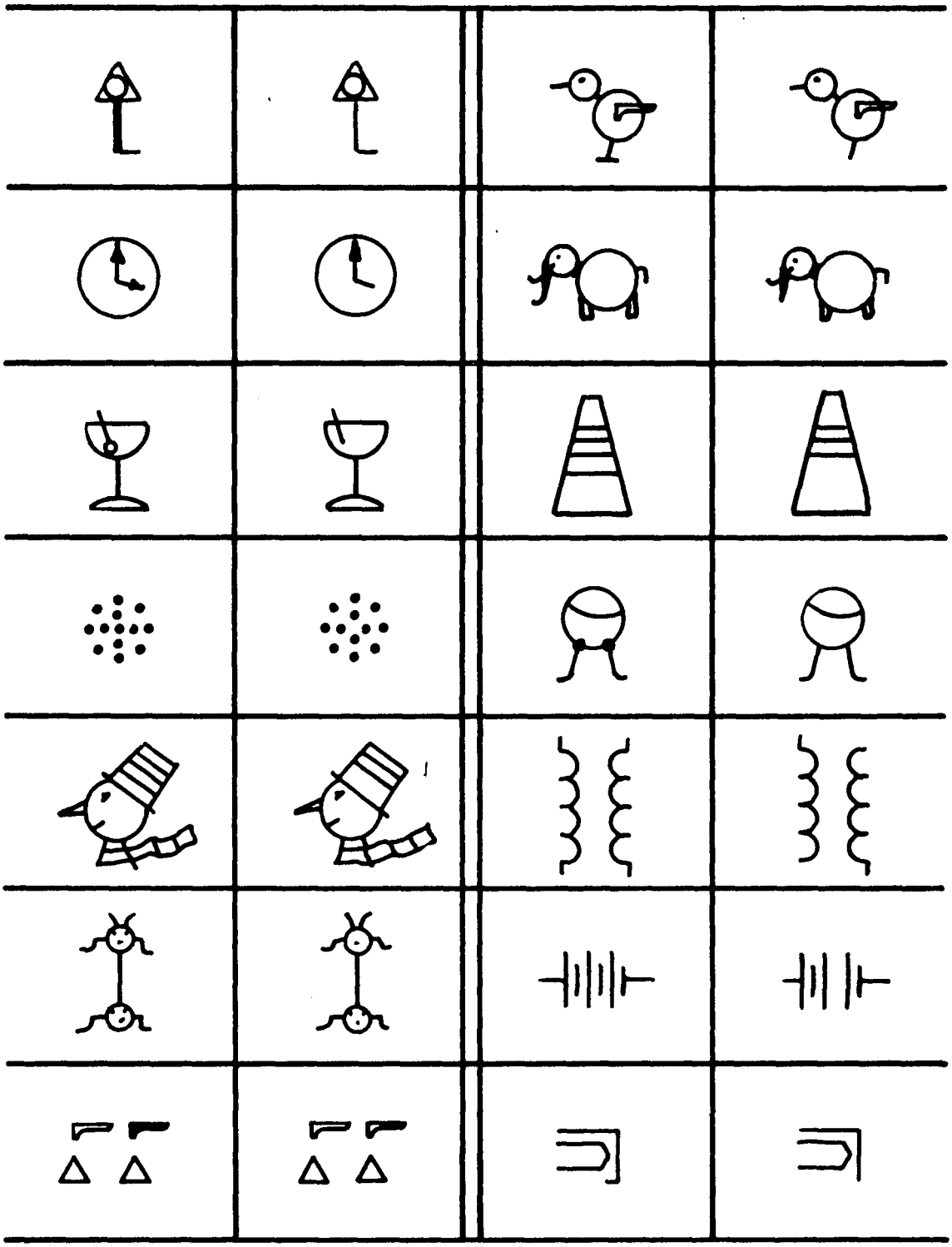


VISUAL CLOSURE-EXERCISE 8

cold	co d	bottle	bot le
lady	laay	building	bui ding
coat	co t	startle	start e
came	can e	stammer	stamme
boat	boct	store	slore
bright	bri ht	tight	ti ht
happy	hapl y	bicycle	bic cle

VISUAL CLOSURE - EXERCISE 9

haughty	haught	beautiful	bea tiful
stand	sta d	chain	chair
show	snow	bone	bo e
picture	pi ture	boar	b ar
from	f om	swing	swi g
excellent	excel ent	bird	bi d
skin	ski	fume	fum

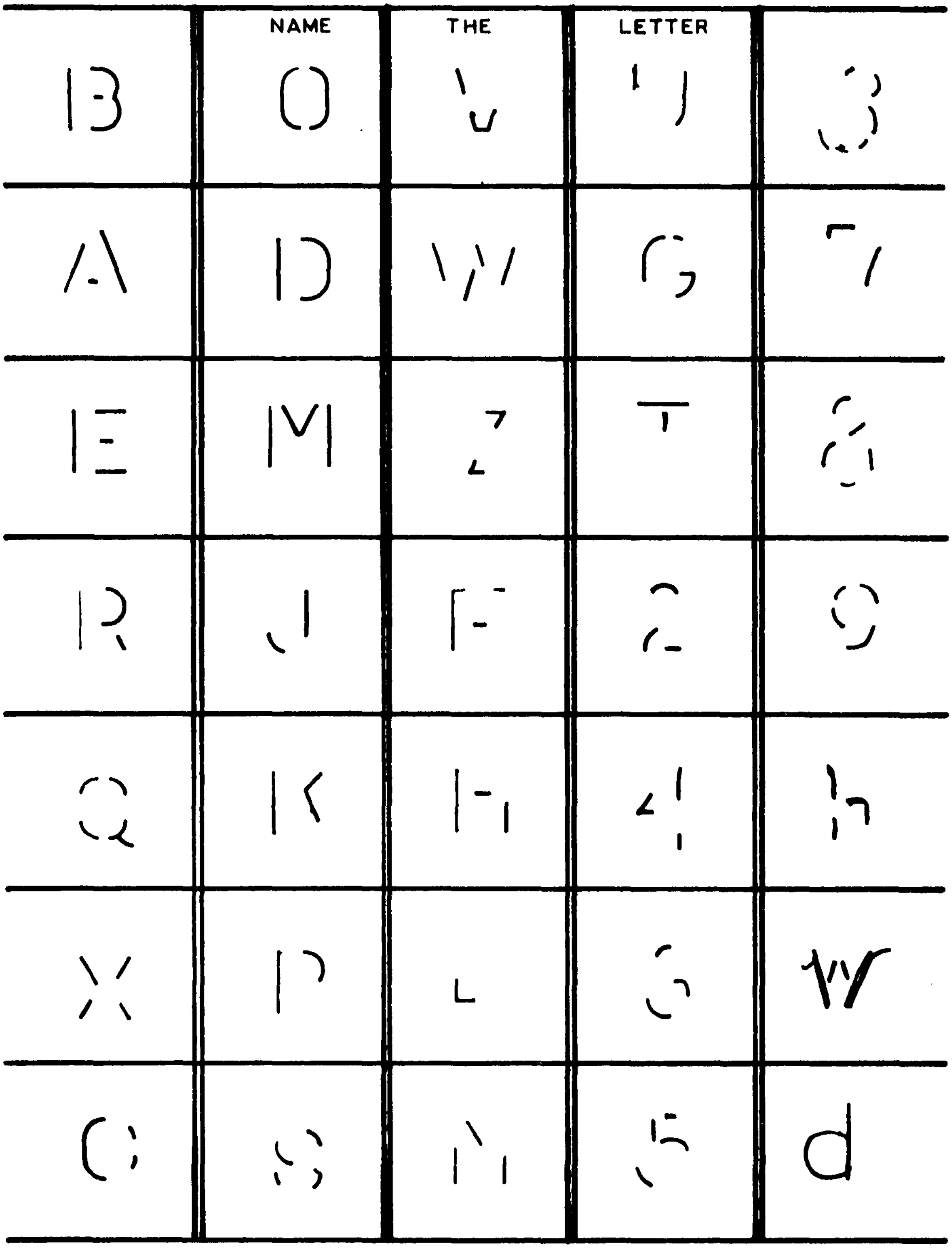
VISUAL CLOSURE - EXERCISE 10

bishop	bishoo	wonder	wond r
tusk	tu k	crow	row
temper	te per	escape	escap
grass	gross	card	car
trip	trio	root	ro t
windy	wi dy	stampede	stamped
vanish	vanis	plunge	plu ge

VISUAL CLOSURE - EXERCISE 11

taste	t o	zipper	z ı p o er
coast	coa t	tender	tencer
summer	sun mer	hero	nero
profit	pro ıt	wonder	wond r
soak	sook	deer	de r
wind	wıno	funny	fun y
zebra	ze ra	rabbit	rab ıt

VISUAL CLOSURE - EXERCISE 12



VISUAL CLOSURE-EXERCISE 13

c<u>a</u>t	f_n	m_n	bl_w
d_g	g_n	m_t	_at
b_y	h_t	tr_p	_it
b_g	h_m	tin_	_end
b_t	yo_	c_r	_and
f_t	h_r	b_ne	b_n

VISUAL CLOSURE-EXERCISE 14

b_g	_ive	bal_	roa_
_ig	_ock	gir_	spee_
_all	the_	do_	tak_
_ing	trai_	bi_	wit_
_ay	som_	fa_	ha_
_air	thin_	mi_	han_

VISUAL CLOSURE - EXERCISE 15

w_ter	somethi_g	ma_y	pi l_ow
ham_er	fat_er	an_ther	win_
appl_s	lo_ng	la_nd	can_ry
h_rd	anim_l	fo_d	ho_se
af_er	child_en	peo_le	pl_ne
do_n	beg_n	stran_e	mov_e

VISUAL CLOSURE - EXERCISE 16

Closure Exercises

Auditory Closure

A. Supply the missing word:

On my head I wear a hat, on my hands I wear _____.
On my hands I wear mittens, on my feet I wear _____.
I see with my eyes, I hear with my _____.
I sit on a chair, I sleep on a _____.
A boy is young, a grandfather is _____.
Streams are shallow, oceans are _____.
I put food on a plate, milk in a _____.
I cut with a knife and stir with a _____.
I dig with a shovel and sweep with a _____.
Brother will grow up to be a man, sister to be a _____.
A farmer drives a tractor, a pilot flies a _____.
I throw with my arms, I write with my _____.
In the daytime it is light, at night it is _____.
Cotton is soft, a brick is _____.
A fire is hot, ice is _____.
An airplane is fast, a donkey is _____.
A ruler is narrow, a door is _____.
Two is an even number, five is _____.
A plate is round, a box is _____.
The sun rises in the east and sets in the _____.
A triangle has three sides, a square has _____.
A plane flies, a fish _____.
I read books, I sing _____.
Mother carries a purse, Father carries a _____.
In January it is winter, in July it is _____.
A block is square, a ball is _____.
A midget is small, a giant is _____.
In the morning the store will open, at night it will _____.

In the morning school will begin, in the afternoon it will _____.

Some mornings we get up early, some nights we stay up _____.

Candy is sweet, pickles are _____.

A car is heavy, a balloon is _____.

A baby is weak, a father is _____.

In the classroom we work, at recess we _____.

When it's funny I laugh, when it's sad I _____.

Some people are rich, others are _____.

In the morning we are clean, after playing we are _____.

When I start to drink the glass is full, when I finish the glass is _____.

B. Underline the correct word:

The boy _____ to the river.
went, want

The mother _____ the baby.
was, saw

Dinner is _____ the table.
on, no

Mother stuck herself with a _____.
pin, pen

The teacher called, "Play _____."
bell, ball

The dog begged for a _____ of food.
bit, bet

When it is cold it will sometimes _____.
show, snow

Elephants do not come into houses because they are too _____.
big, dig

Mothers go _____ to buy food.
shipping, shopping

The girl wore a _____ hat.
red, rid

It is a _____ way home.
long, lung

_____ of the children came early.
All, Ill

He walked _____ the house.
onto, into

There were many _____ on the trees.
leafs, leaves

The girl ran when she saw the three _____.
mice, mouses

Mother said, "_____ before you cross the street."
Spot, Stop

He ate too _____ peanuts.
mary, many

The letter came through the _____.
mail, main

Mother said, "Don't _____ the plate."
drop, drip

The new boy felt _____ on his first day at school.
strange, stale

He had _____ and potatoes for his _____.
meat, mean meal, meat

On his _____ he has _____ fingers.
hard, hand five, fine

I sit on a _____, I sleep on a _____.
chair, chain bed, bad

He wants to learn how to drive a _____.
can, car

They rode across the _____ at daybreak.
train, trail

He wanted to go _____ with the gang.
along, among

She praised the girl _____ story was the best.
whose, while

If you are careful, you won't _____ the glass.
brick, break

Two _____ went fishing.
men, mans

He likes cookies _____ than ice cream.
batter, better

It was _____ after they went to _____.
quite, quiet bed, bad

C. Supply the missing word:

On Saturday we _____ _____ have to go to school.

All of the leaves have _____ down.

We have five _____ and five toes.

He _____ the package before his birthday.

He _____ a letter to his brother.

The boys like to go _____ when it is hot.

The teacher asked her to _____ her book to the front of the room.

There are many _____ in the zoo.

In winter the weather is _____ than in summer.

She sang so _____, the people clapped their hands.

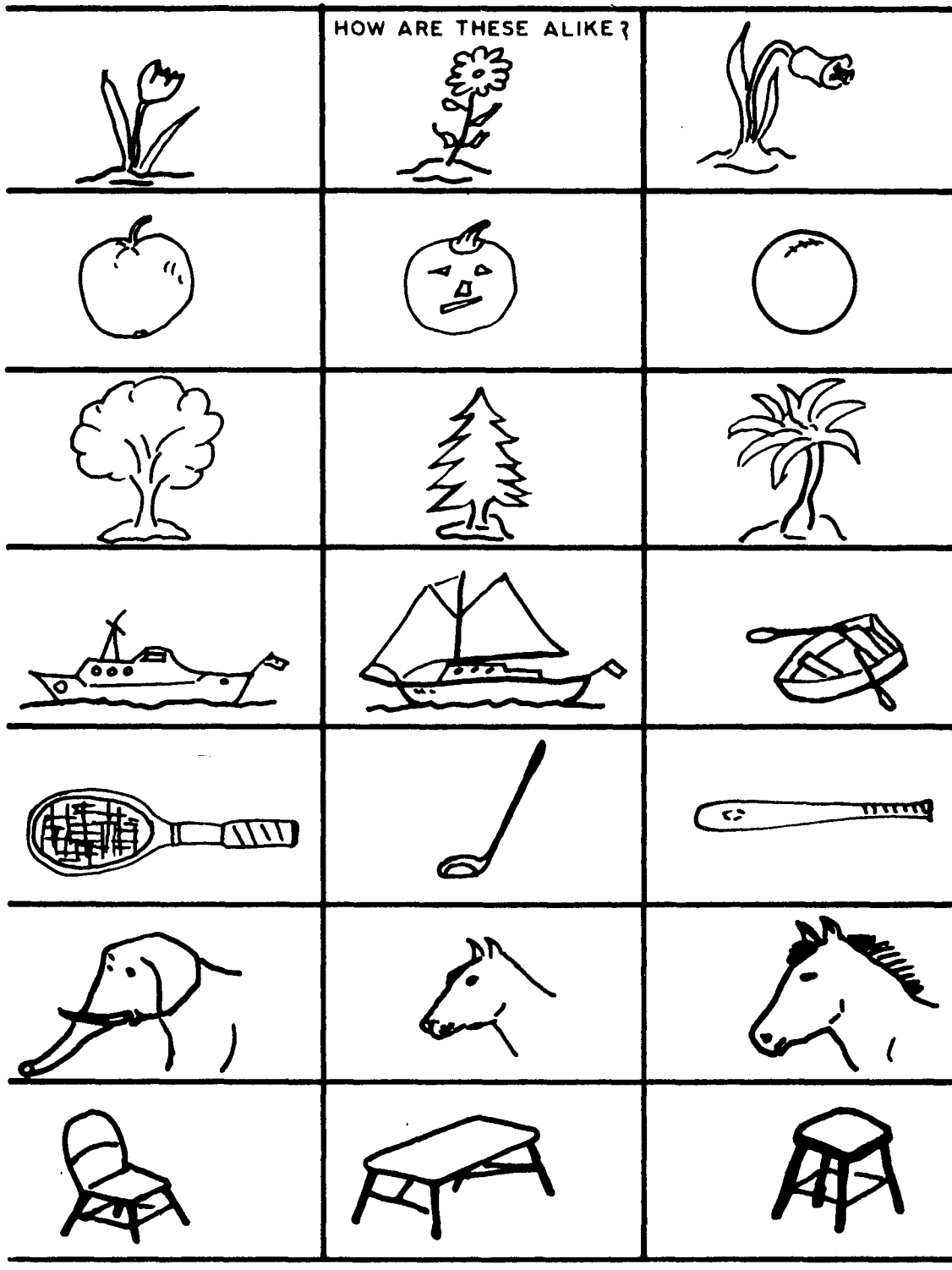
Jane, Tammy, _____ Mary wanted to play.

She _____ to the store to buy some bread.

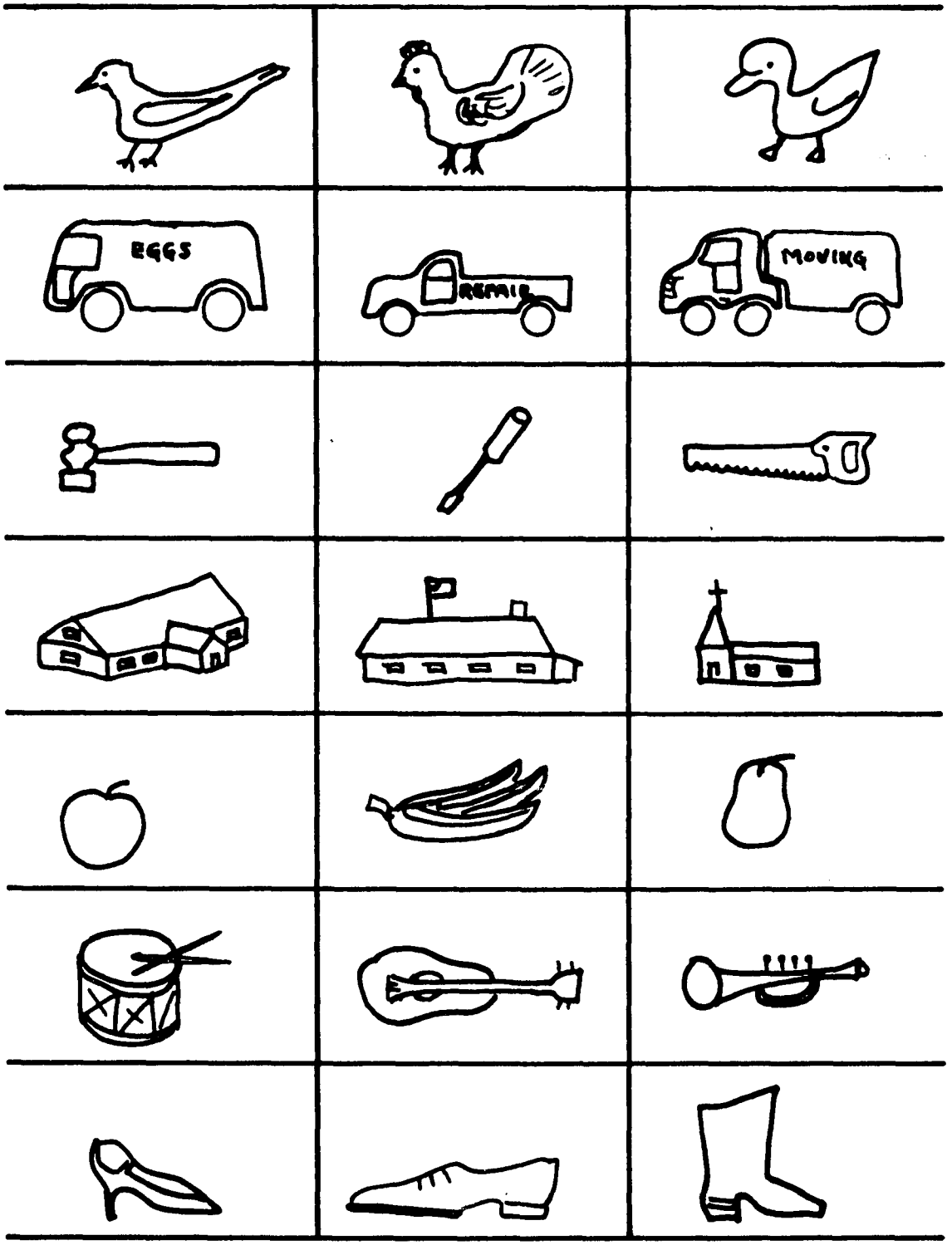
Tom likes to _____ his bike.

All the children _____ busy at home.

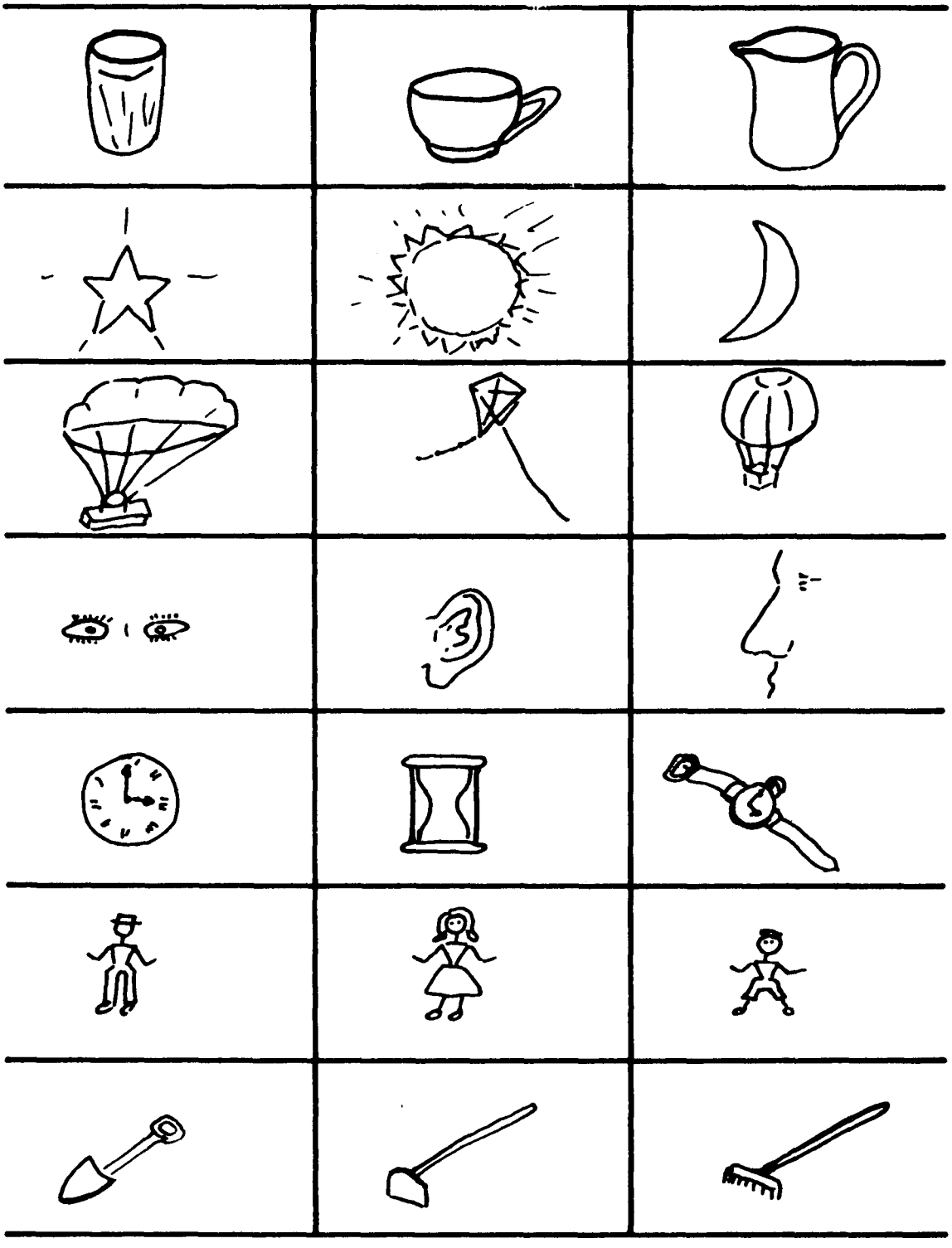
Tammy did not forget _____ feed the dog.



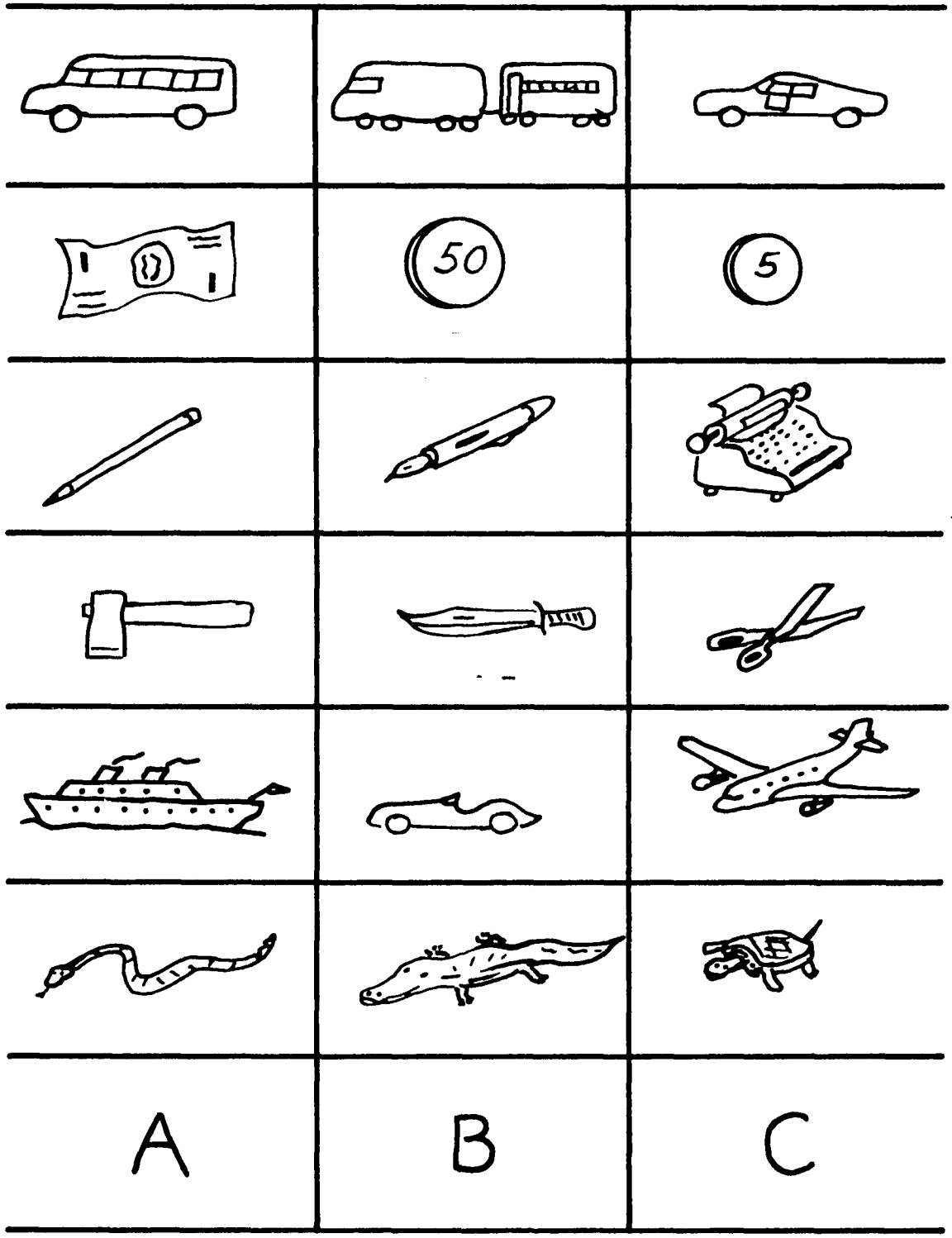
VISUAL CLASSIFYING-EXERCISE 1



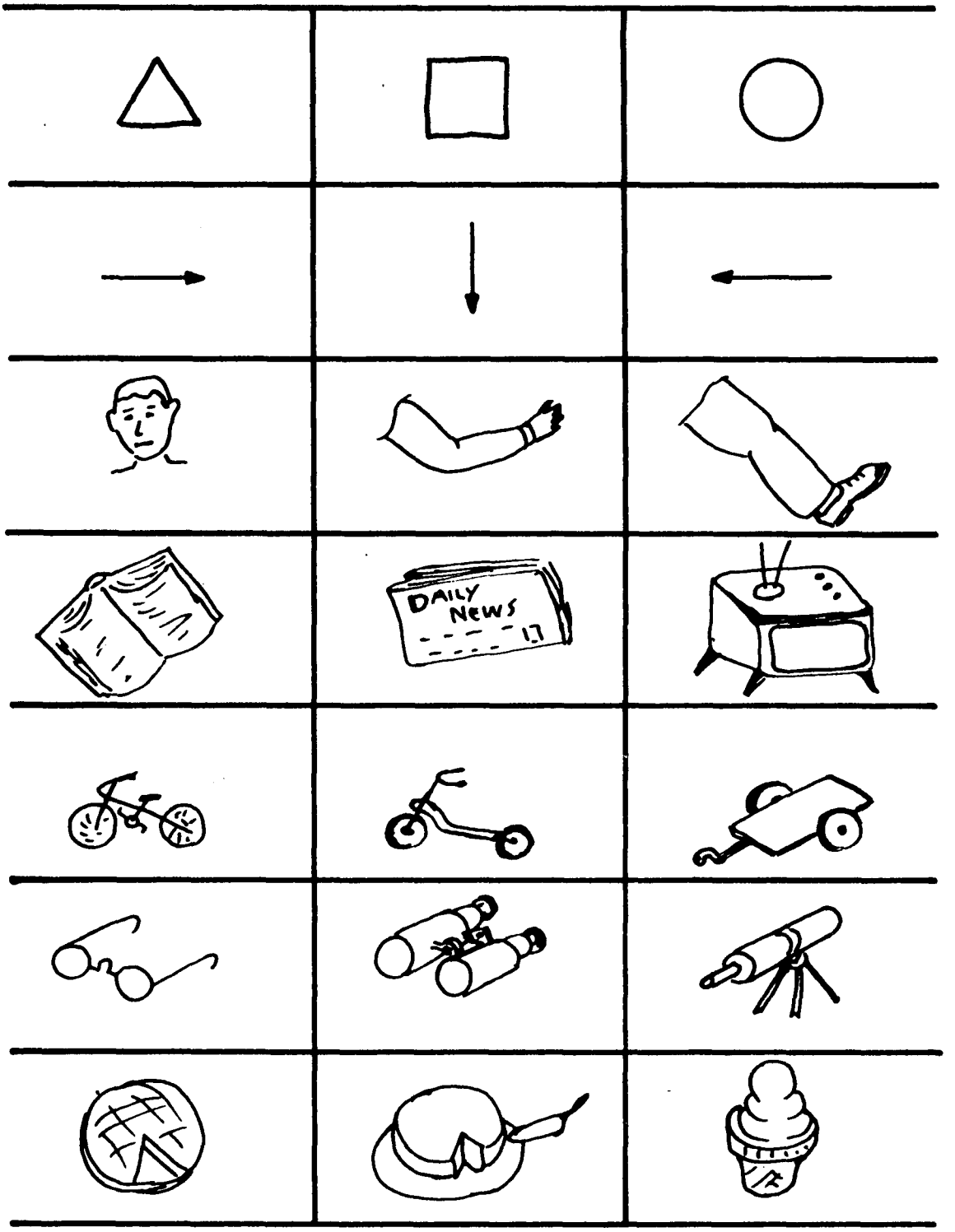
VISUAL CLASSIFYING - EXERCISE 2



VISUAL CLASSIFYING - EXERCISE 3



VISUAL CLASSIFYING - EXERCISE 4



VISUAL CLASSIFYING - EXERCISE 5

		
		
		
		
2	4	6
3	5	7
		

VISUAL CLASSIFYING - EXERCISE 6

Classification Exercises

Verbal

A. How are these things alike?

Airplane, parachute, kite, balloon
Chair, bench, stool, couch
Fire, lamp, sun, candle
Cup, glass, bottle, mug
Needle, pin, nail
Watch, clock, speedometer
A, C, D, F
Sweater, coat, jacket
Goggles, glasses, binoculars
Mother, father, sister, brother
Thunder, gunshot, jet plane, explosion
Necklace, earring, bracelet, pin
Pies, cakes, jello, ice cream
Roast beef, hot dog, hamburger, steak
Paper, pen, envelope, stamp
Elevator, airplane, rocket, escalator
Teacher, nurse, bus driver, principal
Steering wheel, tire, basketball, orange
Arithmetic, reading, spelling, writing
Penny, nickle, dime, quarter
John, Jane, Patsy, Tom
Meat, potatoes, vegetables, dessert
Milk, water, pop, tea
Blouse, coat, pants, sweater
Hands, arms, legs, feet
Blue, gold, red, brown
Apple, orange, peach, banana
Beans, corn, peas, carrots

Eggs, bacon, toast, milk
Potato chips, cookies, kool-aid, apples
Crayon, chalk, pencil, pen
Lake, ocean, river, pond
Star, moon, sun, planet
Dog, cat, mouse, elephant
Drum, guitar, piano, trumpet
Candy, sugar, kool-aid, frosting
Wood, nails, hammer
Wood, bricks, cement blocks, adobe
Lawn mower, rake, shovel, wheelbarrow
Cloud, snow, cotton
Turkey, chicken, sparrow, robin
Basketball, football, horseback riding, swimming
Shoes, socks, boots, slippers
Lion, elephant, tiger, kangaroo
Cow, horse, dog, cat
Painter, carpenter, bricklayer
Knife, scissors, axe, razor
Box, jar, carton, pail
Lizard, snake, gila monster, turtle
Morning, noon, afternoon, night
Up, down, right, left
Warm, cool, hot, cold
East, west, north, south
Tent, house, hotel, camper
Tree, man, spider, cow
Yarn, thread, string, wire
Forest, mountain, lake, meadow
2, 4, 6, 8, 10
3, 5, 7, 9, 11
Square, triangle, circle, rectangle
Policeman, fireman, soldier

Car, bus, train, plane
House, school, church, store
Eyes, ears, nose, mouth
Sun, clock, watch

B. Which item does not belong?
Cat, dog, bird, rat
Ice cream, snow, ice, water
Coke, root beer, milk, 7-up
Lamp, headlight, sun, song
Sock, bonnet, cap, hat
Breakfast, hotel, lunch, dinner
Pan, teapot, cookie sheet, stove
Sunglasses, binoculars, television, microscope
Chair, stool, plate, bed
Car, bike, truck, station wagon
House, school, store, ball park
Glove, sock, shoe, slipper
Ears, nose, eyes, toes
Drums, violin, piano, guitar
Rose, daffodil, orange, violet
Crayon, chalk, paper, pen
Globe, basketball, circle, brick
Airplane, star, moon, planet
Water, milk, bread, coffee
Pin, needle, thread, clothes pin
Skirt, coat, sweater, jacket
Brother, cousin, aunt, friend
Oatmeal, toast, wheaties, raisin bran
Soldier, sailor, boy scout, farmer
Grass, pink, green, black

C. Complete each of these:

Two, four, six, _____.
Knife, fork, and _____.
Table and _____.
Breakfast, lunch, and _____.
Morning, noon, and _____.
Mother, father, sister, _____.
Cat and _____.
Bread and _____.
Sun, moon, and _____.
Thunder and _____.
Red, white, and _____.
Needle and _____.
Salt and _____.
Aunt and _____.
Peanut butter and _____.
Meat, potatoes, and _____.
Shoes and _____.
Coffee, tea, and _____.
Eyes, ears, nose, and _____.
Fingers and _____.
Up and _____.
Right and _____.
Ball and _____.
Long and _____.
Ice cream and _____.
Wash cloth and _____.
Husband and _____.
Bacon and _____.
Hammer and _____.
Coat and _____.
Cowboy and _____.
Girls and _____.

APPENDIX B

TEACHING INSTRUCTIONS

A set of teaching instructions which was used in conjunction with the practice exercises presented in Appendix A is contained in this section. Additional comments and suggestions are also included.

Perceptual Speed Instructions

Exercises 1-20

"Today we are going to play a game. It will be fun, but you will have to use your eyes carefully. First I will pass out the papers and you are to put your name on the blank side. (Papers passed out upside down.) Then when I tell you, you will turn over your paper. On this first sheet we will practice the game. All right, turn your papers over. Now look at the first line of figures. Put your finger on the figure in the small box at the left side of your paper. (Instructor demonstrates.) Now find another picture just like it in the long box. Fine. Now, when I say 'Start', find the figure which matches the one in the small box in all the other frames on this page. Do you have any questions? If not, then START."

Additional Comments. "That was very good. Now remember, you will want to work quickly but not so fast that you make mistakes. Look carefully but quickly."

When errors were made, students were asked to correct these and to note the difference between their original answer and the model. "How does your selection differ from the picture in the small box? (Rotation, reversal?) Remember to work quickly but accurately. How quickly can you complete each paper with no mistakes?"

Exercises 21-33

"Now we will play a slightly different game. Look at the first row on the page. You will find four figures. Three of these figures are alike, they look the same. One of them is different. Cross out the design that is different. Good. Now, remember, you want to work carefully and quickly. Cross out the design that is different. All right, START.

"Good, you have done nicely. Now you will want to observe even more carefully. What are some of the ways in which the designs differ? Yes, most of the lines are straight, but this one curves, and so it is different." (This sort of commenting can be continued until the students are well aware of the requirements of the task.) "All right, let's go on to the next page and do the same thing. Cross out the design that is different. BEGIN."

Memory Instructions

Visual Memory of Concrete Items

"I have hidden in another part of the room a tray which has a group of items on it. I am going to show you this tray full of items for thirty seconds. Then I will take the tray away and ask you to name all of the items which you can remember. (Shows and removes tray.) All right, (names a child), name the objects on the tray. Good. Does anyone remember any other items? What did you do to remember these? Did you see them in your mind? Did you say them over to yourself? Tell us.

"Now we will do something a little different. This time I am going to spread out several objects on the table. I want you to look at these very carefully now, because in ten seconds I am going to ask you to close your eyes tightly and while they are closed, I am going to take away one of the objects. Then I will ask you to open your eyes and tell me which one I have removed. All right. Close your eyes. Now open them. Which item is missing? (This exercise is repeated several times.)

"Now close your eyes again, because I am going to do something still different. (Instructor changes the order of the objects.) What have I done? How have I changed the order? Which items are in a different place? Can you put them back into their original order? Now let's try that again, using different objects.

"Now tell me, are the objects in this group alike in any way? Can you think of other ways in which they are similar? Do they belong to any class or group? (Give suggestions here, when answers are not forthcoming.)

"Here are some ways to help you remember some of the things you have seen. Try to see a picture of the items in your mind. Can you recall or see in your mind where the items were placed? Can you name the items? Do they belong to a class? Are they similar to other things you know about?"

Visual Memory of Pictures

"Today we will play a different memory game. Instead of asking you to remember the toys and objects placed in front of you,

I will show you some interesting pictures and I will ask you to remember certain things about them.

"In the first pictures that I show you I want you to remember what the picture is about, the main idea of the picture, and then try to remember some details which are related to the main theme.

(Show a sample picture.) "For example, in this picture what would you say is the main idea? (The instructor should comment on the answers.) Good, now tell us about some of the smaller details which clarify the main idea. (For example, 'What do you suppose the boys are trying to do? Is it early or late? How can you tell? Does this make any difference? What about their clothes and the state of the room? Do the colors tell you something?') As you look at the picture, ask yourself questions about it. This will help you to remember the main ideas and important details.

"Now I am going to show you a picture for thirty seconds, then I will remove it and ask you to tell me about it."

Memory for Design

"I am going to show you a design printed on a small card. I will show it to you for five seconds and then I will take it away. Look at it very carefully, because I will ask you to draw one just like it. Remember, look carefully but don't draw anything until I have removed the card. Good. You copied this design correctly. But here, your copy is different from the design I showed you. (Show the original.) How is yours different? Change yours so it looks just like this one. Good."

Designs in Sequence

The instructor places a series of design chips in a predetermined sequence. "Watch what I do. I am going to place these design chips in a certain order. You will be allowed to look at them for a few seconds. Then I will cover up my chips and ask you to reproduce with your chips the sequence you have just seen. (These directions can be repeated each time a new sequence is presented.) Look at my chips. (Covers them.) Now make yours look just like mine. Is your sequence like mine? If not, how is it different? Change yours so that it is the same as mine. Good. Now let's try another series."

Additional instructions might be, "Look at my sequencing of chips carefully. Give each design a name. Say the sequence rapidly to yourself. Try to visualize the sequence in your mind."

Auditory Memory of Word Pairings

"Today we will play a word-pairing game. Every time I say a certain word, I want you to respond with a specific word which I will tell you. For example, when I say bus, you will always reply school. All right, bus. Now when I say game, you say baseball. Boots, your word is cowboy." This form of instruction is continued until 16 pairs of words have been introduced and learned. The stimulus words are called out in any order and the student is requested to reply with the correct response.

Auditory Memory-Action Tasks

"Listen carefully. I am going to read to you a series of directions. When I have finished I will ask one of you to carry them out as well as you remember. After you have finished, return to your seat and the rest of the group can add comments and suggestions. Remember. Listen carefully. Try to remember all of the directions in sequence."

Auditory Memory-Sentences

"Now I am going to read a sentence to you. I want everyone to listen carefully, because I will ask one of you to repeat the sentence word for word."

Sound Blending Instructions

"I am going to pronounce some sounds, such as p-e-n. I want you to listen to these sounds and blend them together to make a word. Pen. Good. Now, let's try another set of sounds. Listen carefully, blend them together and tell me what the word is.

"This time I am going to read a sentence. In one word of the sentence I will say the sounds separately. Tell me what the word is."

Closure Instructions

Visual Closure of Incomplete Pictures (Exercises 1 - 5)

"I am going to show you a part of a picture in which you will find only a small portion or suggestion of the whole picture. See

if you can guess from this one clue what the rest of the picture might be.

"In this next picture an additional clue has been added. Now, what do you suppose the whole picture is? Let's add another clue. Now, what do you think the final picture will be? Good. Here is the completed picture. It's a _____. Now, let's try another picture."

Completion of Picture, Letters, Words (Exercises 6 - 16)

"Look at this first picture. (Indicate completed picture in left hand column.) Now look at this second picture. (The incomplete picture is in the right hand column.) How does it differ from the first one? Take your pencil and change the second picture so that it looks like the first one. Good. Now do the same with the rest of the exercises on this page. See how quickly you can do this, but try not to make any mistakes."

For some of the completion tasks, additional instructions are given. "These are more difficult, so let's practice with the first few. There is a letter missing in each of these words. Let's try to figure out the word even though the letter is gone. For example, what word begins with a d and ends with a g? Good. Now, fill in the empty space with the missing letter. What would that letter be?"

Observation of Indefinite Forms

"I am going to show you some inkblots one at a time. Here is the first one. What does it remind you of? Different people see

different things when they look at these. What do they make you think of?"

Auditory Closure

"I am going to read you some sentences, and in each sentence there will be a word missing. I want you to tell me the missing word.

"Now here are some more sentences in which there is a word missing. These are written on this practice sheet. We will read these sentences together, and you will choose which of two words best completes the sentence, and then you will write that word in the blank space in the sentence. For example, the boy _____ to
went, want
the river. Which of the two words makes sense in this sentence? Write that word in the space provided.

"And finally, here are some sentences in which there is a word missing, but there are no clues under the blank space. You are to think of the word you feel will make the most sense and write it into the blank space. If you have difficulty reading the sentence, I will help you. You may read the sentence out loud or to yourself."

Classification Instructions

Visual

"I am going to show you a page full of pictures. In each row you will find three pictures. These pictures are all alike in some way. Please tell me how they are the same. (Yes, in the first row of pictures they are all flowers.) How else are they alike? Good.

Now, here is another row of pictures. Here can you tell me an overall classification? What are some of the details that are similar?"

Verbal

"This time I am going to tell you the names of several items or things, and I want you to tell me how they are alike, how they are the same. What is similar? Can you tell me the overall classification into which all of these items fit? What are some of the details which are similar?

"Now, here is a different task. In this grouping of items which I am about to read to you, one of the objects does not belong. Which item does not fit and why?

"Finally, I want you to complete each of the lists I read to you. What should the next word be? Why?"

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