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THE EFFECTS OF AN ART-BASED VISUAL PERCEPTION PROGRAM ON SELECTED PSYCHOLINGUISTIC ABILITIES OF LEARNING DISABLED CHILDREN

by

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*GMVR Teacher's Manual is available upon request

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Sondra Battist Gair

CHAPTER I

INTRODUCTION

Educators continually seek to improve the quality of educational programming for all children. In recent years a qualitative emphasis has focused on the process of learning rather than isolated end products. This led to investigations of the pre-cursors of learning that are involved with the stages and sequences of development as well as the individual learning styles of children. Both the cognitive and affective domains have been tapped in an attempt to make learning more meaningful in environments that are not always dynamic or creative.

Today the educator must begin to look at the total learning process in a multi-dimensional context. The various interactions of perceptual-motor and verbal-visual behaviors must be blended into a comprehensive theory of perceptual integration, where decoding and encoding of information allows for ease of skill building and development of potential ability within each child.

The current study was planned to determine some of the relationships between visual perception and the psycholinguistic process of which it is a part. It explored the development of art-based perceptual behaviors as an integral part of this process by dealing with the visual decoding processes of reception and association on the Representational level, closure and sequencing on the Automatic level, plus manual expression and visual expression in the encoding modality. In this manner, the study attempted to demonstrate how a comprehensive art-based perceptual program would significantly effect these behaviors.

The rational for using visual art learning as the foundation for this program, was the assumption that these behaviors tended to integrate perceptions and thereby facilitated total learning.

The study focused on children who were having problems with learning and whose profiles showed evidences of developmental lag in one or more of the channels of psycholinguistic functioning. It seemed reasonable to assume that if children with visual, motor and auditory problems, who lacked perceptual integration, could evidence gains through specific art-based perceptual experiences, then the effectiveness of this method as a teaching-learning tool would be assumed.

Purpose of the Study

Since the early Sixties, the field of Art Education has attempted to deal with research concerning the psychology of perception, cognition and communication. In the present study, a synthesis of these fields was necessary in order to structure a developmental program that combined psycholinguistic needs with art education behaviors. The problem was approached by using the principles of art and design as the basis for a strong, sequentially developed visual perception program. It explored the idea that by building art-based perceptual behaviors, children could be helped to learn in new ways that were not fully realized by the schools. The need for this type of program was clearly observed in children with learning disabilities, for nowhere could perceptual integration needs be defined as well as in these learning profiles. In this context, real learning, not the watered down busy work that so often passes for elementary school art activities, became a necessity. Therefore, a sequentially presented art-based program was

developed that could not only effect specific psycholinguistic abilities, but could also build skills in those areas where deficiency was shown.

According to the authors of The Illinois Test of Psycholinguistic Abilities used in this study...It is the hypothesis of remediation that the rate of development of psycholinguistic abilities can be changed by intervention..this became the major task of the study. In order to develop the program of intervention, two major questions were considered: 1) Could art-based perceptual training effect the rate of development of psycholinguistic abilities? 2) If a child, who has had his development altered by this program were to integrate and internalize these changes, would his receptive-expressive performance level be markedly effected? These questions were basic to the study.

Organization of the Study

This study considers the effects of visual perceptual art-based training in elementary school classrooms. It attempts to show that the classroom teacher can accomplish much in a short period of time, with a miniumum of special equipment and a brief amount of training. It assesses a program called the Gair Method of Visual Remediation (GMVR), by demonstrating its effect on specific psycholinguistic abilities and the development of visual expression. It focuses on the child who is less able to function in areas of learning as measured by the ITPA (Illinois Test of Psycholinguistic Abilities), and asks whether a program such as the GMVR will improve these basic abilities along with the receptive-expressive achievement level, as measured by the GAT (Gair Art Test) and GARS (Gair Art Rating Scale).

Chapter I has introduced the study and stated its purposes. Chapter II presents the problem and its setting. The statement of the problem and the subproblems are followed by definitions of the visual-perceptual and perceptual-motor channels of information processing, plus the GMVR, the GAT and GARS instruments, and a definition of learning disabilities. The hypotheses follow the delimitations and assumptions. Chapter III reviews related literature on the following: theory and research in perception and learning, theory and research in art education, theory and research involving art and special education, theory and research concerned with the use of the ITPA. Methodology is found in Chapter IV, where the research is described as it relates to the time schedule, the subjects, the setting, personnel, procedures and the GMVR program. A description of the history and development of the Gair Art Rating Scale is also found in this chapter. The results and discussion of statistical testing for each of the six subproblems and their hypotheses is presented in Chapter V. Finally, Chapter VI summarizes Chapters I through V and presents conclusions and discussion of the findings as well as some recommendations and suggestions for further study. The Appendices includes tabulations of data, statistical computations, the Gair Art Test and Gair Art Rating Scale.

CHAPTER II

THE PROBLEM AND ITS SETTING

This chapter states the problem and the subproblems. Terms are defined and delimitations and assumptions are presented. The hypotheses formulated from the subproblems are stated, and finally, the importance of the study is discussed.

Statement of the Problem

The purpose of this study is to determine the effects of an art-based visual perception program on selected psycholinguistic abilities of learning disabled children, as measured by The Illinois Test of Psycholinguistic Abilities. It will also determine the effects of this program on the receptive-expressive performance of these children as measured by The Gair Art Test and Gair Art Rating Scale.

The Subproblems

Subproblem I. Will an art-based visual perception program effect the visual reception of learning disabled children as measured by the ITPA?

Subproblem II. Will an art-based visual perception program effect the visual association of learning disabled children as measured by the ITPA?

Subproblem III. Will an art-based visual perception program effect the visual closure of learning disabled children as measured by the ITPA?

Subproblem IV. Will an art-based visual perception program effect the visual sequential memory of learning disabled children as measured by the ITPA?

Subproblem V. Will an art-based visual perception program effect the manual expression of learning disabled children as measured by the ITPA?

Subproblem VI. Will an art-based visual perception program effect the receptive-expressive performance of learning disabled children as measured by TheGair Art Test (GAT) and Gair Art Rating Scale (GARS)?

Definition of Terms

Visual Perception

The term visual perception referred to in this study is defined as the ability to receive visual information from the environment on both the Automatic and Representational levels, to cognitively associate the visual information as well as obtain closure and sequence it so as to be able to encode or send it out again in the form of oral, graphic or gestural behavior. Certain basic principles are believed to underlie all visual stimuli and these are the visual properties spoken of by Gibson in her explaination of the inter-relatedness of perception and environment. "Stimulation changes, but the environment and the objects in it have permanent properties. It is the permanent properties of the space we live and the things it

contains that must be preceived in order to behave adaptively."[1,2]

The Visual Channels

a) Visual Reception. The term visual reception denotes the ability to gain meaning from visually received stimuli. Such stimuli are part of a multi-dimensional and complex continuum where infinite variations of color, form shape and stuctural elements are all present. In this study, the Illinois Test of Psycholinguistic Abilities refers to the term visual reception as meaning the ability to understand the significance of pictures.[3,4]

b) Visual Association. Visual association describes the ability to relate visually received stimuli in a meaningful way. This is an organizing process that involves more of the logical-mathematical abilities where the child must make visual analogies utilizing a repetoire of previous visual data plus short and long term memory.[5]

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[1]Eleanor J. Gibson, Principles of Perceptual Learning and Development. New York: Appleton-Century-Crofts 1969, Chapters 1-6.

[2]J.J. Gibson and E.J. Gibson, "Perceptual Learning: Differential or Enrichment"? Psychological Review, 1955.

[3]S.A. Kirk, J.J. McCarthy, and W.D. Kirk, The Illinois Test of Psycholinguistic Abilities: Revised edition (Urbana, Illinois: University of Illinois Press, 1968.

[4]John N. Paraskevopoulos and S.A. Kirk, The Development and Psychometric Characteristics of the Revised Illinois Test of Psycholinguistic Abilities (Urbana, Illinois: University of Illinois Press, 1969)

[5]Ibid.

c) Visual Closure. Refers to the ability to perceive visual material presented in incomplete form by making use of the child's previous experiences with visual stimuli. In this study visual closure will be defined as the ability to recognize the whole from parts otherwise stated as the ability to attain form.[6]

d) Visual Sequential Memory. This involves the ability to reproduce from memory sequences of visually received stimuli. In this study memory of this nature will be restricted to short-term, immediate recall unless specified differently. Sequential visual units may be presented temporally, spatially or all units singly or together. The arrangement of units may appear horizontally, vertically, close together or far apart. Therefore the specific content of the visual stimuli or form must be held constant by the child over time.[7] Perceptual constancy includes many problems involving the visual concepts of size, shape and color and a child must learn to discriminate invarient qualities in visual data if he is to attain this goal. He must be taught to see that invarients are present throughout all transformations and it is the learning of these invarients that allows for the perception of the permanency of things.[8]

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[6] Ibid.

[7] Ibid.

[8] Gibson, op.cit.

Manual Expression. The ability to express ideas by means of gestures is called manual expression. This function of motorically encoding information involves body and facial expressions plus use of the eyes as a factor in decoding necessary visual data.[9]

Visual Expression. In this study, the ability to express ideas by means of graphic-motor behavior has been called visual expression. This ability involves the use of the body (arm and hand) and the eyes working in unison so as to produce a graphic work. This work is specified as being separate from the act of writing, although many of the elements of writing are present in the task. Written words, letters, symbols and calligraphic line may be included, but the primary concerns are the basic principles of design and their use in a visual format. This channel of visual encoding appears to operate on both Representational and Automatic response levels of psycholinguistic ability. On the Representational level, the child uses this channel to express the visual stimuli he has identified (reception), and found to have meaning (association). This element of meaning is crucial to the choice of visual data that the child expresses in his graphic work. On the Automatic level, the child must bring to the visual expression task the ability to deal with form (closure), plus the memory of the mental image (sequential memory), so as to restructure it in whatever medium he chooses. The visual expression channel was found to operate on both the cognitive-conceptual level, as well as the habit-instinctual level. Motoric ability was not found to relate proportionally to visual expressive achievement, as manual problems could be solved by alternative methods wherever high motivation and lack of fear was evidenced.

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[9]Kirk, op cit.

The GMVR, the GAT and the GARS

The GMVR, or the Gair Method of Visual Remediation is a visual learning program combining the areas of visual perception, graphic-motor expression and the affect level of development. These combined psycho-motor areas are focused on a series of seven basic concepts that are concerned with the basic principles of artistic design. The concepts involved, relate these principles to selected psycholinguistic abilities and learning achievement skills. The measurement items designed to test this program are called the GAT, or Gair Art Test and the Gair Art Rating Scale. These instruments were developed in order to rate specific levels of achievement in perceptual encoding tasks based on the sequentially presented GMVR. The present study refers to the GARS as a quantitative measure of receptive-expressive behaviors that are concerned with art-based perceptual learning.

Learning Disabilities. The term learning disabilities, is meant to describe a dysfunction or lag in development in any one or more of the channels of communication through which a human being decodes and encodes information. Therefore, if a subject receives information well in one modality but organizes and expresses it poorly in another, that subject will give evidence of an inability to learn and the personal profile will reflect this accordingly. This is what is known as "intra-individual differences", or differences in learning ability within the individual.

a) The Illinois Test of Psycholinguistic Abilities. This test, now in its second edition (1968) and known as the ITPA was developed by S.A. Kirk and J.J. McCarthy. It is used in the present study to provide numerical measurements of intra-individual differences in order to define a profile of abilities for each child to whom the test is administered.

The Delimitations

Delimitation 1. This study considers twenty learning disabled children ranging from seven to twelve years of age.

Delimitation 2. This study was attempted in one school.

Delimitation 3. The GMVR program used in this study was carried out by the regular special education classroom teacher. It was not confounded by other programs of a similar nature during the entire time it was in use.

Delimitation 4. Only the selected tests were attempted. Additional testing was not allowed by the school personnel who determined that the children would be overtested, thereby negating any possible gains.

Delimitation 5. The same five subtests of the ITPA were administered as pre- and post-tests because no other form of the test is available.

Delimitation 6. The possible effects of practice, of a "Hawthorn effect" or a "washout effect", combine to limit this study.

Delimitation 7. Other art education experts judging the products of this study may have rated differently, based on their area of experise.

The Assumptions

Assumption 1. It is assumed that art behaviors form a synthesis of cognitive and perceptual abilites that are unique to the art experience and that these behaviors interact with the receptive, associative and expressive modes of communication that can culminate in visual expressive performance.

Assumption 2. It is assumed that these specific art-based perceptual behaviors can be learned through visual art training and that

they can be taught systematically by this method.[10,11]

Assumption 3. The GMVR program assumes perceptual integration to be a basic educational need, whereby the visual-verbal and visual-motor channels are linked together through a performance based visual expression program.

The Hypotheses

Hypothesis I. As a result of an art-based visual perception program, the visual reception scores of learning disabled children, as measured by the ITPA, will be significantly changed.

Hypothesis II. As a result of an art-based visual perception program, the visual association scores of learning disabled children, as measured by the ITPA, will be significantly changed.

Hypothesis III. As a result of an art-based visual perception program, the visual closure scores of learning disabled children, as measured by the ITPA, will be significantly changed.

Hypothesis IV. As a result of an art-based visual perception program, the visual sequential memory scores of learning disabled children, as measured by the ITPA, will be significantly changed.

Hypothesis V. As a result of an art-based visual perception program, the manual expression scores of learning disabled children, as measured by the ITPA, will be significantly changed.

Hypothesis VI. As a result of an art-based visual perception program, the receptive-expressive performance of learning disabled

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[10]June King McFee, Preparation for Art, Belmont, California: Wadsworth, 1961.

[11]June King McFee, "Perception-Delineation Theory". unpublished doctoral dissertation, Stanford University, California, 1957.

children as measured by the Gair Art Test and Gair Art Rating Scale, will be significantly changed.

Importance of the Study

This study is important because it demonstrates that intervention through art-based perceptual learning can change the rate of psycholinguistic development. The GMVR program has appeared to be a useful tool in building perceptual skills as well as shaping receptive-expressive performance. The study is important because it shows that with minimum training, a regular classroom teacher can administer a developmentally structured program concerned with art-based perceptual learning. What appears to be of greatest importance is the fact that significant learning occured through this program, that a psycholinguistic channel called visual expression played a large part in this learning, and that it was possible to remediate learning disabilities through this channel. The implication is that if this could be accomplished with 20 learning disabled children, others, who are not disabled may also benefit.

CHAPTER III

THE REVIEW OF RELATED LITERATURE

Introduction.

This chapter reviews four distinct areas of literature that must be surveyed in order to provide comprehensive insights into the present study.

1) To fully understand the relationship between perception and learning it is necessary to attain historical perspective on the vast body of theory and research that has grown up around this topic.

2) To discover how artistic training relates to this body of knowledge, the field of Art Education must be surveyed so as to learn what specific interactions have occurred within this unique area of cognitive and affective endeavor.

3) In order to give relevancy to this study, it must be determined whether the uniqueness within the art experience can be specified and researched with regard to sequential learning. It is the opinion of the researcher that if art behaviors are truly a part of the learned repetoire of developing humans, they should be taught with confidence and used as diagnostic and remedial tools by all educators. In this context, art learning must be explored in relation to the field of Special Education.

4) Finally, the specifics of this study rest on the importance of perceptual integration to the total communication process. This requires a review of the diagnostic test for decoding and encoding known

as the Illinois Test of Psycholinguistic Abilities (ITPA). Although the subject of much controversy, this quantitative device serves as a focal point for all the surveyed research as it relates to the present study. The ITPA Model becomes a theoretical pivot around which educational and perceptual concerns are focused.

A. Theory and Research in Perception and Learning

The following is a brief review of literature concerned with theory and research in perception and learning.

The Empiricists believed that knowledge came from experience and experience cam via the senses. Helmholtz (1821-1894) dealt with the unconscious inference and stated that all perception was wholly dependent on previous experience, the inference being the accumulation of past experience. This differed from Association theory exemplified by Titchener's Context theory which was developed in 1919. Titchener supposed that naming, plus kinesthetic appraisal, gave meaning to visual sensations. The philosopher William James broadened and extended this theory. He did this by introducing the concepts of discrimination and comparison into the psychology of perception thus making it interactive in nature.

Response and Motor theory came into prominence with the American Functional Psychologists in the early 1900's. They focused on response and behavior with Carr, Stratton, and Wooster proposing a Motor Theory to account for spatial relations between auditory,

visual and kinesthetic impressions of objects. This view stated that sensory impressions from different modalities were integrated by association with a common response. This proved to be an early version of the "acquired equivalence of cues" theory. At this time Arnold Gesell et al. considered the progressive stages of tridimensional differentiation plus the basic components of vision in infants. Prolonged looking, selectivity and complexity of infants' visual fixation was studies from a developmental viewpoint.[12]

With Koffka's Growth of the Mind (1924) and Kohler's Mentality of Apes (1925) Gestalt principles began to be applied to characteristics of whole relational patterns and sensory experiences. An isomophism between neural processes and perception was assumed and insightful learning, the sudden reorganization of the perceptual field, was considered to be the source of behavior. Street (1931) and Leeper (1935) pointed to the fact that for Gestalt theorists, the importance of sensory reorganization in learning was vital but the importance of learning for sensory reorganization was not recognized.[13,14] Gottschaldt (1926), working with embedded line patterns attempted to disprove that learning defined as past

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[12]Gibson, op. cit.

[13]K. Koffka, Principles of Gestalt Psychology. New York: Harcourt, Brace, 1935.

[14]W. Kohler, Gestalt Psychology. New York: Liveright, 1929.

experience had a roll in perceptual organization. The Gottschaldt experiment was unable to prove that learning does not alter or influence perception. It is interesting to note Postman's 1963 objections to the Gottschaldt experiments based on the fact that they were designed to prove a null hypothesis.

Werner's Differentiation Theory was related to the Gestalt approach but was more genetically slanted. He stressed increase of differentiation and hierarachical integration as the fundamental law of development. He saw developmental psychology in terms of phylogenetic and ontogenetic studies of contrasting levels of mentality. He cited "physiognomic perception" as a high degree of fusion between person and thing, subject and object. Children and primitives were said to exhibit this syncratic, diffuse and rigid perceptual organization.[15]

The preceding traditional theories are what the Gibson's refer to as "enrichment theories", where something is added to preliminary registration of the environmentally produced stimuli.[16] This addition, accomplished by the perceiver, was thought to lie in various processes such as hypothesis, inference, cuing and distortion produced by affect and attitudes. All of these devices were considered to be part of the mediating process.

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[15]H. Werner, Comparative Psychology of Mental Development New York: Science Editions, 1961 (revised edition).

[16]J.J. Gibson and E.J. Gibson, op. cit.

In Cognitive Theory the role of probabalistic cue-learning is part of the Functional psychology developed by Egon Brunswik (1955). Perception and behavior are thought to be functions of the object which is the source of stimulation and which is "distal". Stimuli are considered as cues which are limited as indicators of objects. According to Brunswik new cues are incorporated through association by contiguity of which the perceiver is unaware. Brunswik's probabilistic theories were not affirmed by other researchers.[17]

Transactionalism dealt with the private world of individual purposes, values and life histories. Ames, Cantril and Ittelson felt that perception could be illusory and rest on assumptions peculiar to individuals and cultures. Kilpatrick (1954), after working with a monocular distorted room designed by Ames, stated that he believed learning played a major role in visual spacial that he believed learning played a major role in visual spacial perception. He distinguished a learning process that he termed "reorganization learning" (actual learned alteration of the way a stimulus pattern is perceived).[18]

Judg mental and Problem Solving theories emphasized past experience and the inferential nature of perception where sensory

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[17]E. Brunswik, "Representative Design and Probabilistic Theory in a Functional Psychology." Psychological Review, Vol. 62, 1955.

[18]W.H. Ittleson, The Ames Demonstrations in Perception. Princeton, New Jersey: Princeton University Press, 1952

input is assigned or matched to a schema, concept or category. Bartlett (1932) and Vernon (1954) defined the "schema" as an organized model, a classification of past experiences as a mediation device for perceiving objects in the enviroment. Perceptual learning was the acquiring of schemata, through integration of experiences from differing modalities and associating them simultaneously.[19,20] Piaget employs this concept of schemata plus a Motor Copy theory. Here, acquisition of schema is the fundamental process of perceptual learning, it is also probabilistic in nature and subject to distortion while the thought processes are not. The role of the motor copy appears to be indirect, by way of the schema formation, in order to help it become assimilated and generalized.[21]

Bruner (1957) stated that problem solving and inference are models for perception which are arrived at by a series of hypotheses, trial, check and matching to a "category." Perception involves an act of categorization and all perceptual experience is the end product of this process. Perceptual learning becomes the learning of appropriate modes of coding the environment and allocating inputs to appropriate categorical systems. Bruner stressed the dependence

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[19]M.D. Vernon, "The Functions of Schemata in Perceiving," Psychological Review, Vol. 62, 1955.

[20]M.D. Vernon, "Cognitive Inference in Perceptual Activity," British Journal of Psychology, Vol. 48, 1957.

[21]J. Piaget and B. Inhelder, The Child's Conception of Space, New York: Humanities Press, 1956.

of perception on personality variables. According to Gibson, Bruner's categorization is not the same thing as discrimination. Categorization emphasizes common features (equivalences) whereas discrimation stresses differences. Bruner admits this point in defining two aspects of recognition as discriminative skill and discriminative matching. While discriminative matching is said to be sorting into categories, discriminative skill is not explained by the Bruner cue-inference-categorizing model of perception.[22,23]

Response-oriented theories explore the motor-copy representation of external stimuli (similar to the schema) but stress integration of responses instead of images. The Soviet theories of perception fall into this class. They stress practice and the conditioned reflex as being the basic mechanism of integration and development for perception. Manipulation, eye-tracing and copying movements (purely muscular) are said to lead to formation of a conditioned response. According to Zaporozhets (1960) "the hand teaches the eye" and touch provides the basis for visual form perception. Soviet psychologists have elaborated their theory to include auditory perception as well.

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[22]J.S. Bruner and L. Postman, "Emotional Selectivity in Perception and Reaction," Journal of Personality, Vol. 16, 1947.

[23]J.S. Bruner, G.A. Miller and C. Zimmerman, "Discriminative Skill and Matching in Perceptual Recognition," Journal Experimental Psychology, Vol. 49, 1955.

J.G. Taylor (1962) built on the S-R assumptions of Hull when he postulated that response is mediated by neural linkage with perception being the simultaneous results as determined by the momentary preperties of the environment. D.O. Hebb (1962) accepted the Soviet theory that form perception is generated by a copying process, but rejected the idea that response is the basis of perceptual integration. Sensory processes were said to be separated from perceptual processes which depended on mediation and learning, for example, color is sensory but form must be integrated. The mechanism for this integration was termed the "cell assembly" which grows into a superordinate assembly and exists apart from sensory cortical projection areas (thus the distinction between sensation and perception). Later experiments with shape on the retinal image of humans, dark-reared animals along with Gibson's "visual cliff" experiments, tended to cast doubt on several aspects of this theory.

Discrimination theories fall into both response and stimulus orientations. Postman (1955) was an Associationist who developed a response oriented theory based on discrimination rather than motor copy theory. He assumed that there was no likeness between the response and the distal object but the response itself provided the discriminability. Since the response gave rise to new stimulation it was considered to be additive mediation. Several experiments were

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[24]E.J. Gibson, op. cit.

conducted regarding pre-differentiation, acquired distinctiveness of cues, labeling and acquired equivalence, but most of these dealt with recognition and generalization and did not prove out their basic assumptions. Other researchers found that a Stimulus Oriented Discrimination theory seemed more promising than response orientation.

Stimulus theory suggests the idea that the stimulus object itself provides information and stimulation. It assumes that the environment is rich in potential information that can be perceived by a sensitive exploring organism. As the organism develops it detects the properties of stimuli, differentiates them, learns correspondence of variables between stimuli and is soon able to perceive distinctive features and invarient relationships over space and time. This theory states that what is learned in perceptual learning is: increased specificity, the detection of properties, patterns, and the distinctive features of phonemes (research by Jakobson and Halle 1956, Cherry 1957 et al.) and graphemes (research by Gibson, Pick Osser 1962, Piaget and Inhelder 1956). According to Gibson, the process by which invarient relationships are discovered is abstraction. This is not necessarily a conscious search nor is it an associative one (a relation is separated out from a complex not added on), it involves filtering out of irrelevant stimuli, exploratory activity (scanning, focusing) and selective attention all acting together as mechanisms of perception. Since perception, in this theory, is viewed not as a passive reception, but as an active search, it is therefore adaptive,

self-regulating and internally reinforced by the reduction of perceptual uncertainty. This reduction of uncertainty is equated with obtaining information. Since information intake has increased, perceptual learning has occurred and the person notes distinctive features of objects and invarients of events. This in turn reduces the amount of information to be processed so that as a result the brain is able to handle more of the total input.[25]

E.J. Gibson has adopted the word "ecology" to define the adaptive relationship between behavior and the environment. She theorizes that there is structure in the world and in the stimulus and it is this structure, considered as a global array, that gives the receiver information about the world. Stimulation changes but the environment and the objects in it have permanent properties. It is the permanent properties of the space we live in and the things in it that must be perceived in order to behave adaptively. Gibson elaborates further on structure by citing the environment as the source of stimulation that is received by the sensory systems without intervening instrumentation or calculation. She distinguishes between distal objects as sources of stimulation, and the stimulation itself, which is proximal to the sensory systems. Therefore, perception is not of stimuli itself, it is of the distal objects. Stimulation only carries information over time and space. Perception there-

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[25]E.J. Gibson, op. cit.

fore, extraction of this information and increasing the ability to extract it is what perceptual learning is all about.

J.J. Gibson (1961) proposed on "ecological optics" to deal with optic information that corresponds to environmental facts.[26] This involved analyzing structures of boundaries, moving edges, transitions, gradients and transformations over time. Gibson stated that the near environment conveys information directly but representations convey information indirectly and symbols convey information still more indirectly. The information existing in the structure of stimulation is potential, therefore it is not necessarily picked up by the individual receiver due to levels of structure in stimulation ranging from simple to complex. Both perceptual learning and artistic learning attempt to increase understanding pickup of structure in stimulation.

Egon Brunswik (1956) was another researcher who stressed this concept of "ecology" in his work.[27] He dealt with the correspondence between the distal environment and perception through proximal cues.

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[26]J.J. Gibson, "Ecological Optics", Vision Research, Vol. 1, 1961.

[27]E. Brunswik, Perception and the Representative design of Psychological experiments. Berkeley, California: University of California Press, 1956.

Both Brunswik and Bjorkman (1966)[28] accept an ecologically oriented point of view, but define it by the associating process of matching cue to object. This differs from Gibson's theory where structure is perceived directly and stimulus information corresponds directly with the object or event. Transactionalists such as Ittleson (1951) and Ames (1952) worked along these lines with cultural conditioning and perceptual bias. They argued that a particular type of environment conditions a person's experience so that he is biased and weights his perceptions in order to correspond to the world that he is familiar with. An ecologically oriented stimulus theory disagrees with this, insofar as object discrimination and discovery of invarients is not regarded as a passive weighting task. Rather, perception is an active search that though undoubtedly influenced by ecological differences, is not bound by them.

Most certainly a person trained in the dynamics of visual form, who is aware of the qualities of line, pattern, texture, shape, form and color is much better able to discriminate objects and events and discover their invarient relationships than one who is not. That same person, though raised in a limiting environment will be more receptive to unfamiliar visual stimuli, less fearful of it and more apt to be open to veridical perceptions. In an attempt to probe the

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[28]M. Bjorkman, Predictive behavior: "Aspects based on an ecological orientation." Scandinavian Journal of Psychology, Vol. 7, 1966.

threshold of perception by simulating an ecologically significant environment, Gibson and Walk experimented with the "visual cliff".[29] This was extended by Walk in 1966 and centered on discrimination of depth-at-an-edge as well as edge avoidance in human infants. These experiments (also performed with animals) determined that the majority of infants do perceive a patterned or textured drop off and ultimately avoid it. One important factor was the "surfaceness" of the visual array that caused visual support to be distinguished from actual support. Infants tended to test the glass on which they were to crawl over the depressed surface, thus proving to themselves both the appearance and feeling of safety.

B. Theory and Research in Art Education

In the 1950's, Herman A. Witkin was concerned with the problem of bodily orientation to the vertical despite conflicting visual and kinesthic cues. Witkin used the terms "field-dependent" and "field-independent" to describe these observed modes of perception.[30] Field-dependence, according to Witkin, was the inability to separate an item from the field or to overcome an embedded context. Field-independence was the ability to perceive objects apart from the context in which they occurred or to deal with a field analytically. These modes of perceiving were designated as "global"

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[29]E.J. Gibson, op. cit.

[30]H.A. Witkin, H.B. Lewis, et al. Personality Through Perception, New York: Harper and Row, 1954.

(field-dependent) and "analytical" (field-independent).[31] In the intervening years researcher's found that a variety of perceptual and cognitive tasks, plus personality characteristics, seemed to correlate positively with the "field-dependency theory." A number of studies indicated that certain individuals were consistent in their abilities to make correct judgements or to overcome the influences of embedded contexts based on their perceptual mode. Consistency in the subject was evident despite variations in the specific features of the tasks employed.[32]

June King McFee was the first art educator to systematically explore the words of Witkin, relating "perceptual style" in art to his field-dependent/independent theory. McFee's emphasis was on the importance of perceptual-cognitive style and perceptual learning in art.[33] This work began ten years of research that came to be referred to as the "Stanford Studies in Perceptual Learning."[34] McFee identified the learned nature of perceptual behavior in art and

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[31]H.A. Witkin, R.B. Dyke et al. Psychological Differentiation, New York: John Wiley and Sons, 1962.

[32]Jessie J. Lovano, "The Relation of Conceptual Style and Mode of Perception to Graphic Expression". Studies in Art Education, Vol. 11, No. 3, Spring 1970.

[33]June King McFee, Parparation in Art, Belmont, California: Wadsworth, 1961.

[34]Standford Studies in Perceptual Learning concerned the work of Salome, 1964, Rouse, 1963, Efland, 1965, Kensler, 1964, Silverman, 1962 and McWhinnie, 1965.

stressed the importance of that learning to the individual's perceptual-cognitive style. This work, in time, led to serious questioning of the theories of Viktor Lowenfeld who had previously dominated the profession of Art Education. It was Viktor Lowenfeld who had dichotomized the visual art expression of children into broad classifications based on the general appearance of the artistic productions. The terms "Visual" and "Haptic"[35,36] were accepted usage in Art Education until Witkin's classification of psychological perception came into being.

In one study, Rouse compared Lowenfeld's haptic-visual theory with Witkin's perceptual theory.[37] She stated Lowenfeld's expressive types accordingly: the visualizer, depends on visual experiences from the environment, thus all representational work is protrayed from the point of view of observer and analyzer who is concerned with surfaces and not subjective meaning. This type looks at parts so as to synthesize them into wholes. The haptic type, "feels as a participator", with the self being projected into the work and the

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[35]Viktor Lowenfeld, "A Test for Visual and Haptical Attitude", American Journal of Psychology, No. 58, 1945.

[36]Viktor Lowenfeld, Creative and Mental Growth, New York: MacMillan Co. 1957.

[37]Mary J. Rouse, "A New Look at an Old Theory", N.A.E.A. Journal, Vol. 7, No. 1, Autumn 1965.

world being perceived in terms of touch and kinesthetic sensation. Whereas Lowenfeld believed these differences to be genetically determined and rooted in the psychological makeup of the personality, Rouse contrasted this with Witkin's concept of individual differentiation. Witkin stresses a clear separation of what is identified as belonging to the self and what is external to it. The "differentiated person" would therefore function easily in part-whole relationships with an articulated and structured perceptual performance. This individual would have the ability to lift out, reorganize and restructure the visual field. An "undifferentiated person" who is globally oriented would be unarticulated, unable to separate figures from background contexts and would lack flexibility in problem solving. This type of perceiver would also have a poor body image and concept. Witkin felt that while perceptual style remains stable, changes can be noted in increased amounts of analytical behavior. Rouse used tests such as the Maccoby-Rau verson of Witkin's Embedded Figure Test, Marlin's sophistication of Body Concept Tests and actual tempra paintings done by 74 fourth, sixth and eighth grade children judged on a Visual/Haptic/Indefinite rating scale (according to Lowenfeld's criteria). She found that both Visuals and Haptics scored high on the perceptual tests while the middle group (Indefinites) were significantly lower in perceptual performance. The maturation factor did not seem to increase visualization abilities to any significant degree.

Research into painting style and perceptual competency suggested important tie-ins with maturity levels, degrees of flexibility and the role of art in general learning. With the publication of McFee's landmark book in 1961, Art Education began to develop a more comprehensive view of the behaviors needed in the teaching and learning of art. McFee attempted to structure a learning theory for art to meet these needs and labeled it Perception - Delineation (P-D) Theory. It described the perceiving process that culminated in the production of visual symbols which were considered to be the products of perception. Barkan, Efland, McWhinnie, et al. were concerned about certain components of P-D theory due to the fact that it did not include specific objectives for teaching art as well as defining goals of instruction that would include aesthetic modes of inquiry (e.g. art history and art criticism).[38]

Other researchers saw the P-D theory as an information handling process governed by set and prior experience that was valid as far as it went but fell short in its attempts to deal with creativity, appreciation and affective response. The concept of set was, in fact, a major focus in P-D theory for it explained not only a way of responding to visual information (mode of inquiry) but also a way of teaching (set induction). This meant that the theory drew heavily upon cognitive oriented theorists like Thurstone (1944), Werthheimer

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[38]Arthur D. Efland, "An Examination of Perception-Delineation Theory", N.A.E.A. Journal, Vol. 8, No. 2, Spring 1967.

(1950), Attneave (1954) and Bruner. Whereas earlier theorists tended to regard information handling in terms of innate development, the Cognitive theorists stressed the inter-action with the environment. Set and closure became prime factors in organization of the visual field and evidence pointed to a significant correlation of these factors with verbal reasoning abilities (Thurstone 1944, Batzum 1951, Pemberton 1952).

Since Witkin had noted that "flexibility of closure" was psychologically related to field-dependence, studies relative to this factor were undertaken by Efland 1965, Kensler 1964, McWhinnie 1965 and Johnson 1964. Contrary to expectation, these researchers found that conditions mitigating against closure did, in fact, produce better learning. This finding was consistent with the theory of perceptual learning presented by Solly and Murphy (1960) who found that the process of perception results in a stable structure termed a "Percept" with closure occuring in the act of forming this percept. "Man constantly strives to organize and structure his environment, to make order out of chaos. When in the midst of this struggle, he masters an impoverished environment, his is gratified".[39] Therefore, these percepts act as self reinforcers and take the form of an emotional-affective response thus stopping the perceptual act.

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[39]C.M. Solley and G. Murphy, Development of the Perceptual World. New York: Basic Books, 1960.

Guilford (1957) saw manipulation of closure as an ability of creative people and compared it with Thurstone's term "flexibility of closure". Irvin Child (1966), in studying aesthetic response, identified the ability of creative personality types (Myers-Briggs Type Indicator) to prolong perception and closure rather than attempting a quick classification and judgement. Elkind takes this thinking one step further when he characterizes creativity as a kind of flexibility applied to acts of closure, a basic element one learns in developing information handling skills. Creativity is seen here as being directly aligned with information handling and a relationship is established between Affective response and information processing.

Another dimension of P-D theory that McFee attempted to deal with was individual differences in handling visual information. Here, she, along with Mary Rouse, challenged Lowenfeld's visual/haptic dichotomy using Witkin's field dependent/independent theories as a basic for assumptions. However, subsequent research by Efland, Kensler and McWhinnie[40] found little correlation regarding the idea that highly field-independent people were better able perceptually to attend to works of art. It was noted by McWhinnie (1966) that in fact, field independent students did not tend to prefer complexity

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[40]Harold J. McWhinnie, "The Effects of a Learning Experience Upon the Preference for Complexity-Assymetry in Children's Drawings," unpublished Doctoral Dissertation, Stanford University, 1965.

in works of art (measured by Barron-Welsh Art Scale) and that tests such as the Hidden Figures Test relates more closely to the psychological function of closure manipulation than differences in prior learning.

In his more recent writings (1967) Witkin has dwelled less on distinct modes of perceptual style and more on cognitive style in general. "A person's typical mode shows itself in perceptual functions mediated by a single sense modality or by a combination of sense modalities. Characteristics of perception are evident in intellectual functioning mediated by symbolic representations. Therefore the concept of style is appropriate because it cuts across both perceptual and intellectual activities. Cognitive style characterizes cognitive functioning pervasively and it continues in a very stable way over time."[41]

Elkind and Koegler explored field-independence and concept formation (1963) and found a relationship in the ability to glean meaning from "things" rather than words. They concluded that a delineation of cognitive style requires careful analysis and a full range of tests. In line with these findings are Arnheim's attempts to bridge the gap between the visual and cognitive mechanisms while theoretical thinking relies on imagery. Abstraction tends to operate as the connection between the two functions. Arnheim cites both the

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[41]H.A. Witkin and P. Oltman, "Cognitive Style", International Journal of Neurology, Vol. 2, 1967.

experience of the artist and the psychology of perception as keys to perceptual imagery and productive thinking.[42]

In recent research Rudin tested figure-ground differentiation with the Rod and Frame Test under different perceptual sets. He found that the ability to change sets, thus shifting figure-ground orientation, is more an operational definition of ego-autonomy.[43] While Barrett and his staff (1967-8) related perceptual style to perceptual and visual functioning and found that differences in perceptual style were not so much a function of individual visual characteristics but psychological differences. These findings supported Witkin's original concept.[44] Pillsbury et al. (1969) studied E.G.G. correlates of perceptual style and reported differences in the alpha activity of field-dependent and field-independent groups.[45]

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[42]Rudolph Arnheim, "A Study of Visual Factors in Concept Formation", U.S. Office of Education Final Report, O.E.C. 1-6-061741-1196, 1968.

[43]S.A. Rudin, "Figure-ground Differentiation Under Differing Perceptual Sets", Perceptual and Motor Skills, Vol. 27, 1968.

[44]Gerald V. Barrett et al. "Relation of Perceptual Style to Measures of Visual Functioning", Perceptual and Motor Skills, Vol. 25, 1967.

[45]Judson A. Pillsbury, "E.G.G. correlates of Perceptual Style: Field Orientation", Psychomatic Medicine, Vol. 29, No. 5, 1967.

In that same year Altman and Capobianco investigated eye dominance and perceptual style finding that subjects with incompletely established dominance and perceptual style finding that subjects with incompletely established dominance were significantly more field-dependent than those with clearly established dominance. This is consistent with the view that lateralization is the result of greater differentiation of physical and psychological functioning.[46]

A 1965 article by Salome pointed up the need for synthesis in the area of reading, art and visual perception. Salome undertook an investigation of perceptual training in reading readiness programs that included the Ginn Basic Reading Program (1965), Scott-Foresman "Before we Read" (1962), The Bank Street Readers (1965), Bobbs-Merril Series (1959), Ethel S. Maney's Visual Discrimination Program, Ruth Cheves Visual-Motor Perception Materials and the Frostig Program for the Development of Visual Perception. The opinion set forth in the article was that direct perceptual training is not utilized in Art education but is included in reading readiness programs. Though Salome claims that their objectives differ, the training in one area seems to effect the training in the other.[47]

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[46]Philip K. Oltman and F. Capobianco, "Field Independence and Eye Movement", Perceptual and Motor Skills, Vol. 25, 1967.

[47]Richard A. Salome, "Perceptual Training in Reading Readiness and Implications for Art Education", Studies in Art Education, Vol. 10, No. 1, Fall, 1968.

Dissertations by Rosen[48] and Barrett[49] at the University of Minnesota (1965) supported this relationship. However, the Salome article goes on to clarify the fact that what a child learns in reading is not, in practice, related to art and vice versa.

Schachtel (1959) hypothesized that there is a preference for proximal (near) receptor stimulation in infancy and with maturation a gradual shift occurs to preference for distal stimuli.[50] Both Montessori and Piaget (Piaget and Inhelder, 1956) had previously emphasized the importance of early tactile exploration in the subsequent development of visual perception.[51] However, intramodal shape perception studies (Gliner, Pick, Pick and Hales, 1969; Pick and Klein, 1967) in which tactile performance is compared with visual, the predicted shift is not clearly demonstrated. Northman and Black presented a study that investigated the developmental course of visual vs. haptic performance in both exploratory behavior

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[48]Carl L. Rosen, "A Study of Visual Perception Capabilities of First Grade Pupils and the Relationship Between Visual Perception Training and Reading Achievement", Unpublished Doctoral Dissertation, University of Minnesota, 1965.

[49]Thomas C. Barrett, "The Relationship Between Selected Reading Readiness Measures of Visual Discrimination and First Grade Reading Achievement", Unpublished Doctoral Dissertation, University of Minnesota, 1965.

[50]E. Schachtel, Metamorphasis. New York: Basic Books, 1959.

[51]Jean Piaget and B. Inhelder, The Child's Conception of Space. London: Routledge and Kegan Paul, 1956.

and shape perception tasks using similar stimulus forms for all tasks.[52] They found that older children (6th grade) performed better than younger and vision was superior to touch at all three grade levels (K - 3rd - 6th). This agrees with Gliner's study (1969) where the visual system was found to be relatively well developed by Kindergarden.[53] Northman and Black found that visual memory improved from K - 6th, where haptic memory only improved between 3rd and 6th with no change from K to 3rd. Visual exploration was more rapid than haptic and judgements were made more efficiently. No significant correlation was observed between performance in the two modalities. Nor correlation was found between exploration times and accuracy, nor between performance on the memory task and exploration time on the preference task. As far as the visual and haptic preference of the S s, each grade level explored longer in the haptic modality but K and 3rd grade spent a greater portion of exploration time in the visual mode than did the 6th grade. The older children were more poficient in visual scanning and visual processing while all grade levels were relatively inefficient in haptic exploration.

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[52]John E. Northman and K.N. Black, "Ontogeny of Visual and Haptic-tactual information processing", Purdue University, 1971.

[53]C.R. Gliner, A.D. Pick, H.L. Pick and J.J. Hales, "A Developmental Investigation of Visual and Haptic Preferences for Shape and Texture". Monographs of the Society for Research in Child Development, 1969, Vol. 34, No. 130.

However, it is interesting to note that girls spent more time in visual exploration and boys spent more time in haptic, (Haptic here meaning tactile).

Grossman (1970) performed a study concerning perceptual styles, drawing skills and creative abilities where he supports the view that the analytically oriented (visual) child is able to represent his perceptions more accurately in his drawings than children who are more globally oriented,[54] Lowenfeld's original descriptive term for haptic orientation. He postulated that since representational drawing skills may be related to perceptual orientation, art training should include strategies that develop the ability to observe the environment analytically. Salome had supported this view in 1965 when he foresaw that perceptual training relevant to representational drawing could increase the amount of bisual information children included in their artwork.[55] He also implied the necessity of a sequential program of visual training experiences that would reinforce art and other learning experiences. In 1970 J.J. Lovano related conceptual styles and mode of perception to graphic expression and found that there was a developmental trend from an initial global mode of processing information to a

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[54]Marvin Grossman, "Perceptual Style, Creativity and Various Drawing Abilities", N.A.E.A. Journal, Vol. 11, No. 2, Winter 1970.

[55]Richard A. Salome, "The Effects of Perceptual Training Upon the Two-Dimensional Drawings of Children", Studies in Art Education, Vol. 7, No. 1. Autumn, 1965.

differentiated or anlytical mode as the subjects advanced in grade.[56] She found that differences in graphic expression of children of the same age seem to reflect differences in their modes of information processing. The subjects perference for analytical (visual) or global (haptic) mode was evident in the drawings as well as in cognitive style. This self-consistency in global/analytic behavior was hypothesized for all written, verbal and graphic expression.

In 1971 R.B. Kannegieter conducted an experiment concerning the effects of a learning program in activity upon the visual perception of shape in pre-school children.[57] This program was centered on early learning of shape discrimination, specifically the basic elements of shape (straight lines, parallel lines and angles). These components were selected on the basis of research in this area by Gibson, Hebb, Attneave et al. The mode chosen for teaching these elements was tactile/haptic perception. Tactile stimulation, tracing and manipulation of objects was selected as training variables that composed the perceptual-motor activity. Naming of the shapes and elements was taught to augment concept development. Perceptual integration was encouraged by practice over time. This experiment attempted to tap the abilities of copying,

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[56]Jessie J. Lovano, "The Relation of Conceptual Styles and Mode of Perception to Graphic Expression", N.A.E.A. Journal, Vol. 11, No. 3, Spring, 1970.

[57]R.B. Kannegieter, "The Effects of a Learning Program upon the visual perception of Shape", N.A.E.A. Journal, Vol. 12, No. 2, Winter, 1971.

transfer and visual memory through a series of 14 lessons involving motor and perceptual taining with two-dimensional media. The results of past test indicated that a learning program of this type would help pre-school children to perceive shape more accurately, promote transfer of critical elements to similar shapes and resist the process of forgetting. The importance of directed teaching and learning was stressed as a vital part of this early training program.

In an experimental study of slide-tape experiences on the paintings of elementary school children, V.M. Brouch explored art learning and a supplementary program (slide/tape) that would enrich the visual field.[58] Much research has been centered around media and audio-visual communication where findings showed that longer eye fixations and more detailed examinations occured when students were directed to look at specific items in a given field.[59] Smith and Bolyard found that sequentially presented and repeated slides taught concepts without verbilization.[60] Allen, in his review of

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[58]V.M. Brouch, "An Experimental Study of the Effects of Synchronized Slide-Tape Learning Experience on Tempra Painting of 3rd, and 4th Grade Children", N.A.E.A. Journal Vol. 12, No. 3, Spring, 1971.

[59]V.L. Mickish, "The Relationship of Art Viewing Skills and Artistic Visual Perception", unpublished Doctoral Dissertation, Arizona State University, Tempe, Arizona, 1970.

[60]D.M. Smith and A.J. Bolyard, "Interaction of Words and Non-Wordal Stimuli in Programmed Sequences of Concept Formation Tasks", A.V. Communication Review, Vol. 14, Winter, 1966.

research, cited evidence that calling attention to specific visual data plus overt verbalization of responses during visual persentations followed by practise sessions in the desired skills, tended to increase learning from instructional media.[61] Wilson related this concept to the alteration of perceptual mode in perception of paintings.[62] Brouch found, in her 1971 study, that the use of slide/tape presentations enriched the visual field, comprehension and retention of concepts about art - all this being reflected in the art products of the groups studied. She pointed out that the greatest gains were made in concepts and abilities where the audio-visual packages were used and supported by the classroom teacher (in contrast to the art specialist). The type of visually presented material, the time periods allotted, the flexibility of use and the allowance for depth in exploration of art concepts were all stressed as essential to the success of this program.

C. Theory and Research Involving Art and Special Education

Art for Special Education has received low priority in the curriculum as well as in research. The activities suggested in most curriculum guides are project and material oriented "busy work" that

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[61] W.H. Allen, "Audio-Visual Communication", Encyclopedia of Educational Research, 3rd Edition, New York: MacMillan Co., 1960.

[62] B.G. Wilson, "An Experimental Study to Alter Students Perception of Paintings", N.A.E.A. Journal, Vol. 8, Autumn, 1966.

is usually unrelated to other activities and lacking in any real perceptual learning. Frostig, Vallett, Kepart and Barsch have indeed developed programs that use the various components of visual perception and the pre-cursors of art training but their programs have been a) aimed at young children (3-7) b) oriented towards psychomotor development c) kinesthetic in nature and d) mainly devoid of any real artistic learning. As Lovano-Kerr points out in a recent study, "what a child has learned and how much he has developed as the result of specific art experiences is usually not known or measured".[63] The few studies that dot the field are centered primarily around mentally retarded children and none relating art training and psycholinguistic disabilities.

In 1961 Wiggin completed a three phase project determing the most popular art activities specified by special education teachers. The results showed that the most popular activities listed by the teachers were popular with the teachers and not the students and that these were extremely limited in scope.[64]

Gaitskell and Gaitskell (1953) conducted a three year study to find the most efficient teaching methods in art for mentally retard-

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[63]J. Lovano-Kerr and S. Savage, "Incremental Art Curriculum for the Mentally Retarded," Exceptional Children, Vol. 39, No. 3, 1972.

[64]R.G. Wiggin, "Art Activities for Mentally Handicapped Children", Studies in Art Education, 1961, Vol. 2, (1).

ed children and to discover the modes of expression resulting from these various methods. The study involved 514 children enrolled in 55 schools. Of these children, 380 were taught in groups of 20 to 25 pupils for 20 weeks by the same person who later analyzed their output in art. The remaining 134 children completed art work under the guidance of several other teachers whose classrooms were not visited. The IQ range of all these children was 50 to 89, with a median of 70, and a chronological age range of 7-6 to 16. They produced 3,674 pieces of art for analysis. In addition, 20 children were selected from the initial group of 514 and were paired with their nonretarded counterparts in mental age and then in chronological age. Five drawings and paintings from each child in these groups were analyzed to assess whether or not differences existed between the art production of mentally retarded children and that of nonretarded children. From their observations Gaitskell and Gaitskell concluded that:

1. Children with IQ's of 50 to 89 have the ability to participate in a program of art education and to profit from these experiences.

2. Mentally retarded children follow the same stages of development in artistic expression as nonretarded children but at a slower pace.

3. Mentally retarded children tend to select subject matter for their expression within the framework of their experience.

4. Mentally retarded children respond well to the same teaching methods used in teaching art to nonretarded children; however, slow learners require more individual attention.

5. Mentally retarded children can use the same basic tools and materials as nonretarede children in an art program.

Apparent weaknesses in this study stems from the fact that no mention is made of instructions given in art productions or the conditions of learning plus evidencies of biased judging and lack of specific criteria.[65]

The 1971 study by Bryant and Schwan again considered the mentally retarded. It was the belief of the investigators in this study that mentally retarded children can express themselves artistically and can understand certain art forms. The project was divided into 2 phases. The purpose of phase 1 was to develop an instrument to test the pupil's knowledge of the elements of art before and after the experimental treatment. Phase 2 involved developing an overall lesson plan which consisted of 15 art lessons focusing on line, color, shape, value, and texture. These characteristics were specific to the investigators' testing instrument.

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[65]D. Gaitskell and M.R. Gaitskell, "Art Education for Slow Learners", Peoria, Illinois: Bennet & Co., 1953.

Thirteen subjects ranging in chronological age from 8-0 to 12-9 with an IQ range from 108 to 59 were given the Bryant-Schwan Design Test (Bryant & Schwan, 1971) and the Peabody Picture Vocabulary Test as pretests and post-tests. The investigators found that mentally retarded children were capable of learning limited art concepts through systematic teaching. They also concluded that terminology could be learned if presented in a way that the child could react by using all three of the major domains: cognitive, affective, and psycho-motor.[66]

A special project involving creative art for minimally brain injured children was undertaken at the University of Houston Clinical Education Laboratory with 8 children from ages 7 through 9. This research theorized that incentive, motivation, perception and manipulation was tapped in art activities and that these behaviors were involved with self-image and stage of creative development. Art activities were designed to provide these experiences, develop skills and allow for activity-based reinforcement that was independent of outside rewards or teacher approval. The subjects were pre and post-tested with the Frostig Development Test of Perception and showed gains in all areas tested.[67]

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[66]A.P. Bryant and L.B. Schwan, "Art and the Mentally Retarded Child". Studies in Art Education, Vol. 12 (3), 1971.

[67]J.S. Carter, "Creative Art for Minimally Brain-Injured Children." Academic Therapy, Report 8, 1971.

At present Lovano-Kerr is developing an art program for mentally retarded using the incremental behavioral objective method. Two central themes have been identified, that of body and self awareness and that of spatial representation. Slides are used extensively in the program as well as much visual motor involvement over a period of 36 lessons. There are plans to keep a record of incremental learning for each child based on the Eisner 14 point Visual-Verbal Spatial Representation Scale (Eisner 1969).[68,69]

D. Theory and Research Involving the Use of the ITPA

The Illinois Test of Psycholinguistic Abilities (revised edition) was selected for use in the present study because it is a diagnostic instrument designed primarily for use with children encountering learning difficulties. The battery provides basic information as to the child's level of performance in twelve areas of psychological development and allows identification of strengths and weaknesses in the pattern of intraindividual differences or discrepancies in growth.[70]

The term individual differences often has two meanings. It can mean inter-individual differences, or the variability among

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[68]E.W. Eisner, "The Drawings of the Disadvantaged: A Comparative Study", Studies in Art Education, Vol,.2 (1), 1969.

[69]J. Lowano-Kerr, op cit.

[70]John N. Paraskevopoulos and S.A. Kirk, op cit.

members of a group, or it can mean intra-individual differences that focus on differences of ability within a single child. This latter concept led to psychometic tests that could measure a number of specific and discrete areas of psychoeducational development. These areas could then be compared to determine discrepancies in growth as well as developmental problems within the child. This type of assessment is concerned with rate of development and is diagnostic rather than classificatory, since it considers deficient areas needing remediation. It also delineates strengths within the child as well as weaknesses from which a program of remediation can be developed. This is the principle use of the ITPA.[71]

In 1961 an experimental edition of the ITPA was published (McCarthy and Kirk, 1961). The purpose of this test was to explore clinically as well as experimentally the applicability of a diagnostic intraindividual test of this nature and to determine through idiographic and nomothetic research the effects of remediation on deficits revealed by the various subtests. The development of the experimental edition of the ITPA has been described by Kirk and McCarthy (1961) and by McCarthy and Kirk (1963). A summary of research studies in the United States and abroad was reported by Bateman (1965) and idiographic research on clinical cases has been

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[71]S.A. Kirk, Educating Exceptional Children, Boston, Mass.: Houghton Mifflin Co., 1972.

published by Kirk (1966,67,68). The present vision of the ITPA was initiated in 1965 in an effort to improve the subtest of the battery and to add tests not included in the original edition.[72]

The Model

The theoretical basis for the ITPA grew out of Osgood's (1957) principles concerning the communication process. The clinical model on which the test is based is an adaptation of the Osgood model which provided greater applicability to the field of education and in particular to remedial education. Therefore, the ITPA is used to delineate areas of difficulty in communication more than to assess overall abilities. It is, in effect, a diagnostic test of specific cognitive ability as well as a molar test of intelligence.

The present model postulates three dimensions of cognitive abilities:

1) Channels of Communication; these include various combinations of sensory input and response output.

2) Psycholinguistic Processes; these include receiving and understanding visual and auditory information, organizing and manipulating percepts, concepts and symbols and the expressive process whereby internalized information is expressed by word or gesture.

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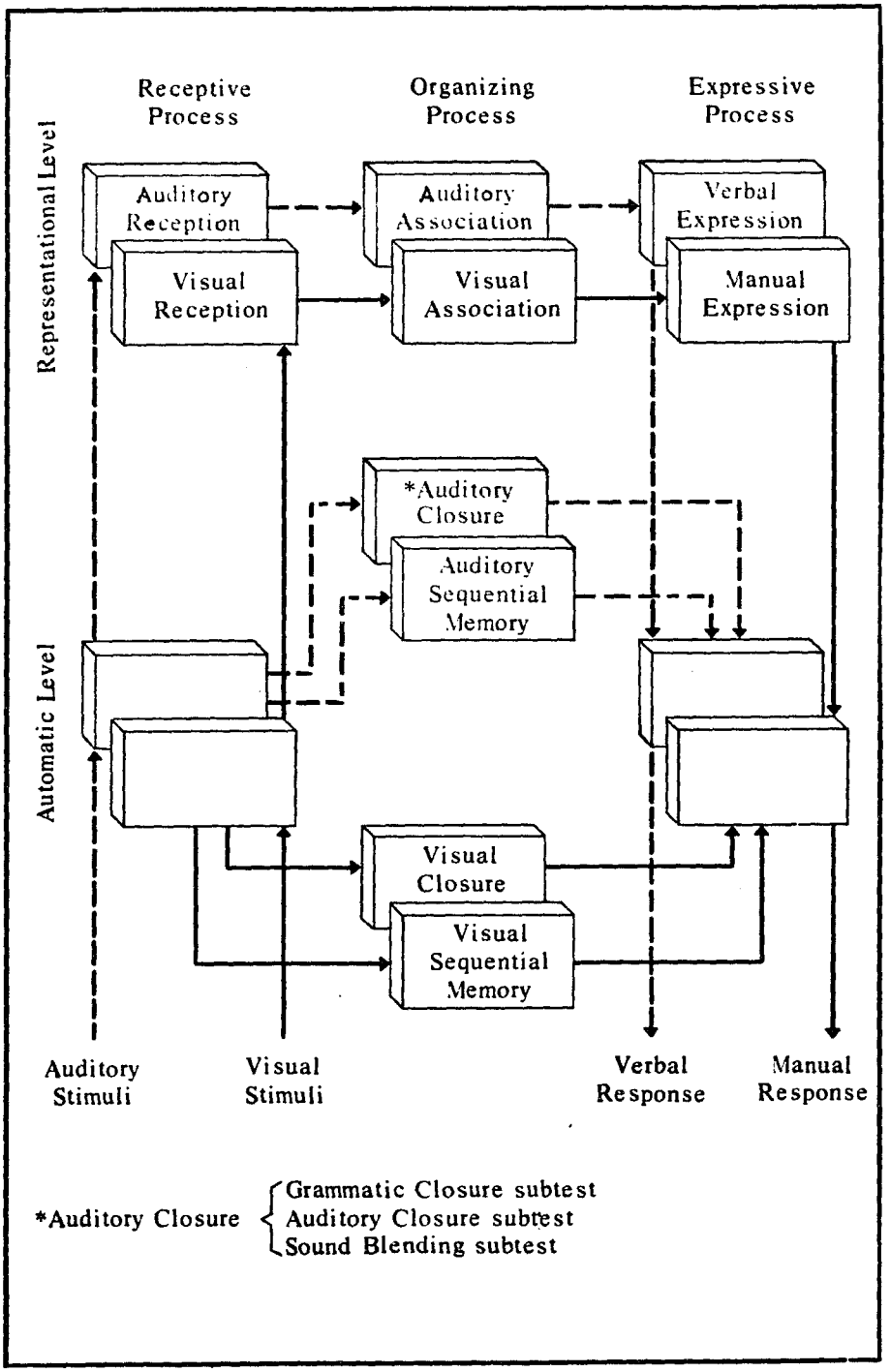
[72]J.J. McCarthy, and S.A. Kirk, "The Illinois Test of Psycholinguistic Abilities. Examiner's manual. Urbana: University of Illinois Press, 1968. (2nd Edition)


Receptive Process
Organizing Process
Expressive Process
Representational Level
Automatic Level
Auditory Reception
Visual Reception
Auditory Association
Visual Association
Verbal Expression
Manual Expression
*Auditory Closure
Auditory Sequential Memory
Visual Closure
Visual Sequential Memory
Auditory Stimuli
Visual Stimuli
Verbal Response
Manual Response
*Auditory Closure
Grammatic Closure subtest
Auditory Closure subtest
Sound Blending subtest

3) Levels of Organization; these include the Representational level and the Automatic level.

Review of Research

Cripe studied the learning and perceptual behavior related to the performance on selected aspects of the ITPA. It was concluded that 1) differences measured by the ITPA, if existent are extremely subtle, or 2) that discrepancies in a child's ability to learn auditory and visual stimuli are not measured by this test. Data related to the total group's response to the stimulus items indicate that the effect of visual transformation upon auditorily-coded information is variable. Whereas the visual presentation of linguistic materials resulted in less efficient learning, visual transformations of non-linguistic materials resulted in much more efficient learning behavior.[73]

Golden and Steiner investigated the relationship between specific auditory and visual functions and reading performance the authors concluded that poor readers appeared to be lacking in auditory rather than in visual functions.[74]

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[73]A.G. Cripe: Auditory and Visual Learning, Related to ITPA Sensory Channels. Ph.D. Purdue University, 1966. D.A.: 27:635B

[74]N.E. Golden and S.R. Steiner: "Auditory and Visual Functions in Good and Poor Readers." Journal of Learning Disabilities, 1969, 2, pp. 46-51.

Several factor analytic studies of the ITPA have been conducted. Ryckman and Wiegerink factor analyzed the correlation matrices of eighteen studies involving the ITPA. One of the basis for this research was to investigate one of the major assumptions underlying the use of the ITPA . . . that the test actually assesses "single abilities" which are mutually exclusive. The factor analytic pattern at the lower age levels and a more differentiated and specific language pattern at the upper age levels. For young children, at the lower end of the standardization population age range, the authors do not believe the assumption about "single abilities" is tenable. Another result drawn from the research idicated that while "factor loadings were not identical, they were similar enough to indicate that different populations of children at similar age levels tend to produce similar factors on the ITPA". The authors believe that if this consistency appears in future research, it migh have important clinical use.[75]

Wisland and Many's factorial study of the ITPA was designed to determine the effectiveness of the ITPA test with children who have above average intelligence. Most of the research conducted, using this instrument, has been with children who have learning disabilities or are handicapped in some manner. The results of the

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[75]D.B. Ryckman and R. Wiegerink: "The Factors of the Illinois Test of Psycholinguistic Abilities: A Comparison of 18 Factor Analyses." Exceptional Children, 1969, 36, pp.

study reveal that as many as nine factors may be involved in the test, with three factors accounting for 79 per cent of the total common-factor variance of the entire test. The general psycholinguistic factor appeared consistently on each of the nine sub-tests. Three other factors which appeared were: general sequencing, visual-motor sequencing and an auditory factor involved in vocabulary activity.[76]

Brown and Rice attempted to verify an inference contained in the literature that a poor performance on the Automatic-Sequential sub-tests of the ITPA may be related to poor academic achievement. The author's concur with the inference generated by Bateman and Wetherell that a poor performance on the Automatic-Sequential sub-tests of the ITPA may be related to poor academic achievement. They believe that the Auditory-Vocal Sequential sub-test, a refined digit-span test, may have useful predictive validity for academic achievement is low IQ children. They, further, state that additional research is needed with Auditory-Sequential Function sub-tests, especially the Immediate Auditory Recall test, to ascertain their usefulness as screening devices for detecting young children destined for difficulty in academic achievement.[77]

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[76]M. Wisland and W.A. Many: "A Factorial Study of the Illinois Test of Psycholinguistic Abilities with Children Having Above Average Intelligence." Educational and Psychological Measurement, 29, 1969, pp. 367-376.

[77]L.F. Brown and J.A. Rice: "Psycholinguistic Differentation of Low IQ Children." Mental Retardation, 1967, 5, pp. 16-20.

O'Grady investigated the psycholinguistic abilities of primary school age children with learning disabilites. He investigated the degree to which general intelligency, level, social class level, and special education placement, alone and in combination, accounted for special psychological deficits in primary school age children. Psycholinguistic abilities were selected for measurement as an important area frequently associated with learning disabilities. Numerous significant interactions were found between intelligence level, social class level, educational placement and ITPA sub-test scores. The higher "social" class learning disabilities subjects showed deficits in visual-motor areas whereas the lower social class group showed the more typical auditory-vocal deficit. The emotional problems group, disadvantaged subjects showed a marked deficit on Auditory-Vocal-Automatic suggesting the cumulative effect of lower social class and emotional disturbance. Overall, the results indicated that children in classes, not only for learning disabilities but, also, for emotional problems, have deficits in total language abilities. The author suggests areas for further research.[78]

Swearengen investigated the psycholinguistic abilities of beginning first-grade children in relation to their reading achievement. This study was done for a two-year period: the first

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[78]D.J. O'Grady: Psycholinguistic Abilities in Primary School Age Children with Learning Disabilities. Ph.D., 1968, University of Cincinnati. D.A.: 29-1848B.

year's study evaluated the psycholinguistic characteristics and assessed the differences in boys and girls, in unilingual and bilingual children. During the second year, an instructional experiment, using techniques suggested by the items in selected sections of the psycholinguistics test, and comparing resultant growth of the children in these abilities and in reading. Skills in the auditory-vocal channel were shown to be significantly better predictors of reading achievement than those in the visual-motor channel. Both the automatic and representational levels of oral language were found to be relatively high predictors of reading skills.[79]

Kass examined some psycholinguistic correlates of reading disability. She believed that some reading problems have their roots in poor educational methods, sensory defects, lack of intelligence or excessive absence from school. However, "most reading problems defy such explanation and are enigmas to teachers, parents, and clinicans." The author concluded, from the results of her research, that there is a correlative relationship between the disabilities (reported) and the lack of reading achievement. Not all children with a reading disability will have these particular psycholinguistic dysfunction

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[79]M.B.M. Swearenger,: The Psycholinguistic Abilities of Beginning First-Grade Children and their Relationship to Reading Achievement. Ed.D., 1966, The University of New Mexico. D.A.: 27-1808A.

discussed are ones which might be considered in planning for remediation of reading problems.[80]

Lombardi studied the psycholinguistic abilities of Indian children in first and third grades of integrated and segregated schools using the 1968 edition of the ITPA. He attempted to answer three questions: 1) How Indian children compared to the 1968 standardization group for the ITPA, 2) Whether there was a difference in psycholinguistic abilities for first and third grade children, and 3) Whether there is a difference between Indian children attending integrated schools (with other ethnic groups) compared with those Indian children in segregated schools. The Visual Sequential Memory Test was the only sub-test in which the Papago sample were significantly higher (.05) than the normative group. The author believes this exception "appears to be relative to specific mental development associated with their culture".[81]

Hirshoren investigated the prognostic utility of the total language score and the subtest scores of the IPTA and that of the Stanford-Binet, all obtained at the beginning of kindergarten for predicting school achievement at the beginning of second grade.

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[80]C.E. Kass: "Psycholinguistic Disabilities of Children with Reading Problems." Exceptional Children, 1966, 32, pp. 533-539.

[81]T.P. Lombardi: "Psycholinguistic Abilities of Papago Indian School Children." Exceptional Children, 36, 1970, pp. 485-494.

at the representational level.[82]

Ten Brink wrote a critique of Hirshoren's ITPA validity study in which he discussed the five major conclusions drawn by Hirshoren. The reader is referred to the Ten Brink critique and Hirshoren reply. Two comments, however, extracted from the articles cited are noteworthy of repetition: 1) The conclusion that the ITPA is a success based on one study or that it is a failure based on another study is not justified, and 2) "further research must be carried out before claims about the predictive validity of the ITPA can be accepted as truth. This especially true since the revised edition of the ITPA has become available."[83]

Conslusion

If this study were to single out one pervasive human need from the wealth of literature considered, it would be the need for perceptual integration so as to better facilitate survival. This has been attempted by a body of research dealing with the nature of experience and the role of the senses in learning. Historically, this data has been labeled and diverted into either-or positions of perceptual versus cognitive

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[82]A. Hirshoren: "A Comparison of the Predictive Validity of the Revised Stanford-Binet Intelligence Scale and the Illinois Test of Psycholinguistic Abilities." Exceptional Children, 1969, 35, pp. 517-521. a."_____, Response to Ten Brink's Critique," Exceptional Children, 1969, 35, pp. 354-356.

[83]T.D. Ten Brink: "Critique of Hirshoren's ITPA Validity Study." Exceptional Children, 35, 1969, pp. 351-354.

behaviors, with few unifying theories that considered the problems of multi-dimensional learning. As a result of this type of research education became extremely compartmentalized into verbal, visual and motor areas, with little emphasis on the total receptive-expressive process. Much attention was aimed at the cognitive level of development, while emotional and creative modes of learning were minimized. The expressive encoding channel was often considered to be a theraputic, or recreational component of the curriculum, quite apart from the logical-mathematical concerns of learning. Art education was overlooked by many schools that did not recognize its potential as a primary learning channel for perceptual integration.

The 1972 quote by Lovano-Kerr provides an introduction for the following study as well as a summation of past research. "What a child has learned and how much he has developed as a result of specific art experiences is usually not known or measured." The GMVR study attempts to deal with this problem through an art-based perceptual training program. It focuses on the learning disabled child because here the intra-individual differences can be observed along with subtle relationships within the learning continuum. Past research has indicated that these children, in fact all children, need to be perceptually integrated in order to survive. By learning to function in the "real"world, with trust and without fear, the chances for survival are heightened. The GMVR study considers this problem within its program of intervention.

CHAPTER IV

METHODOLOGY

This chapter presents the research design of the study. It outlines a description of the subjects, the experimental setting, personnel employed in the study and procedures used to carry out the program. This chapter includes a description of the GMVR treatment, data collection and analysis and the instruments used in the study, the ITPA, the Gair Art Test and Rating Scale.

The Research

This evaluative study was attempted to determine the effects of an art-based visual perception program on selected psycholinguistic abilities of learning disabled children, as measured by The Illinois Test of Psycholinguistic Abilities. It will also determine the effects of this program on the receptive-expressive performance of these children as measured by The Gair Art Test and Gair Art Rating Scale. Since the ITPA is a developmental test, the GMVR program had to significantly increase scores on this test beyond what would be developmentally predictable. The rational for this is stated in the ITPA Manuel..."It is the hypothesis of remediation that the rate of development of psycholinguistic abilities can be changed by intervention."

The research time schedule included the following: 1) All children were diagnosed at the time of entrance into school by a battery of appropriate tests. These tests determined the status of each child as having a learning disability. 2) Five ITPA visual subtests were

administered to the group of 20 children who comprised the entire population of children 7 to 12 years of age. These subtests were given in February by outside (non-school employed) testers. The Gair Art Test was also administered at this time. 3) Immediately after testing was completed, the GMVR program was begun and functioned five days per week, one hour per day, for exactly seven weeks. 4) At the conclusion of the GMVR program, the five ITPA visual subtests were again administered by independent testers, and the Gair Art Test was repeated. 5) The Gair Art Rating Scale (GARS) was used to judge the products that resulted from the pre and post Gair Art Test. 6) The Rating Scale (GARS) judgements were accomplished by three nationally known art-education experts. Dr. John Mahlman is a researcher, author and lecturer and is presently serving as Executive Director of the National Art Education Association (NAEA). Beverly Davis is Managing Editor of Art Education Magazine. Jack Hammond is an artist, former art teacher and a director of NAEA. 7) The products to be judged, were coded, so that neither the judges nor the researcher knew which items represented pre- or post-tests. The art education experts were also unaware of the nature of the GMVR program, as well as the type of subjects who produced the work they were judging. 8) Every possible precaution was taken so that no one viewing the products could differentiate between pre- and post-test items. An outside, unbiased aide was used for this coding procedure. 9) Judges were not permitted to comment or compare notes until all work was completed. Each judge completed 80 GARS scales containing 20 items per scale. Judging was completed in three hours. 10) Analysis was begun after all data was gathered.

Description of the Subjects

The subjects in this study consisted of 20 children ranging from 7 years, 7 months of age to 11 years, 3 months of age. Six of the children were females and fourteen were males. All of the children in the study had been attending a special school for children with learning disabilities in the Washington, D.C. metropolitan area. The group of twenty had a wide range of perceptual, psycho-motor and psycho-social problems as well as cerebral, neurological and organic dysfunctions. The IQ levels ranged from a low of 72, to a high of 125, with a mean of about 102. On the average, the majority of these children had been attending this special school for at least one year. Each child was given a full test battery at the beginning of the September semester and an "individual profile" was constructed at that time.

Most of the children in the GMVR program had extensive psychological testing before entering school and these records were made available. They revealed a population of generally hyperactive children (many of whom were taking medication), poorly coordinated in gross or fine motor performance, with poor attention spans, laterality, auditory and tactile discrimination, and several lacking in perceptual integration. Many children were diagnosed as exhibiting patterns of extreme behavioral rigidity, inadequate internal controls and passive-aggressive behaviors. One child had the use of his left side only, another had one eye, and a third was so hostile that theraputic, rather than educational efforts, were more in order. This comprised the population on which the GMVR was to be tested.

The Setting, Personnel and Procedures

The study was conducted in a private, non-profit school for learning disabled children ranging from ages 4 through 12. The school curriculum was geared to a multi-disciplinary approach and employed a staff of teachers who seemed open to new approaches and sensitive to children's needs. It was agreed that the GMVR program would be the only art-based visual remediation procedure used with the twenty children for the entire duration of this study.

The testors employed by the researcher were professional diagnosticians and teachers in the field of Special Education. The five ITPA subtests were administered immediately before and after the GMVR program, in accordance with the specifications outlined in the ITPA test Manual (see footnote 3). The Gair Art Test was administered at the same time, within the regular classroom setting, as the test was designed to be a simple art task that could be completed in one class period. The pre- and post-test products were collected, coded and submitted to the three art-education experts.

The staff who conducted the GMVR program, was comprised of the regular Special Education teacher and aides employed by the school. The program was fitted into the daily classroom routine and the only equipment added to the normal environment was a Carousel projector and a tape recorder. Both of these instruments were familiar to the 20

children and had been used in other learning activities. Since the regular classroom teacher and the aides specified that they had no previous art training, a "GMVR Teacher's Manual" was provided for the teaching staff and a one day, in-service training program served to acquaint them with basic equipment and procedures of the program.

No special materials were needed for this program beyond the ordinary supplies found in any classroom. Regular school paper, paste, scissors, paint brushes and felt tipped pens were all that were required. The Teacher's Manual listed the specific materials that were needed for each task. Since the showing of programmed slide segments (twenty slides each) was required twice weekly, this took place directly in the classroom where the children worked. Each twenty slide segment was shown at the beginning of the week and repeated at the end so as to reinforce visual learning. Specialized vocabulary was written on the chalkboard and discussed, and the in-progress tasks were displayed around the room in an uncluttered fashion. The general environment appeared to stress structure, purpose and utilization of creative energy.

Discription of the GMVR Program

The GMVR combines perceptual components such as figure-ground relationships, scanning and focusing, whole-part relationships and analagous thinking with basic principles of artistic design and filters them through an art-based training program. This program is aimed at elementary school children (6 through 12 years of age) who have given evidence of learning disabilities. The GMVR is a sequentially

programmed curriculum designed to be used by regular classroom teachers without previous art training. The program provides art oriented visual-motor experiences that are compactly presented, on a daily basis, within the regular classroom environment. The GMVR is concerned with effecting development and correcting learning disabilities at the visual perceptual level.

Basic Components of the Program

1. Four areas of communication are dealt with in this training program; looking, listening, saying and doing. In the seven week period the child looks at a series of 140 programmed slides (one carousel contains all of the visuals) that deal with seven major concepts divided up into segments of 20 slides each. The seven concepts upon which the program is built are as follows:

1) Differences and similarities through pattern.

2) Outline through shape.

3) Figure-ground relationships through negative and positive space.

4) Scanning and focusing through aesthetic identification.

5) Dots and lines through movement and rhythm.

6) Two and three dimensional shape through light, dark and texture.

7) Structure: whole-part relationships and visual analogy.

The slides are accompanied by a cassette-tape that cues the child to specific visual stimuli through verbal associations that are explored within each of the 20 slide segments. The slides and tapes are paced for the teacher in order to allow ease of handling and equal portions of time to each concept. The title slides are for the benefit of the

teacher and are not spoken. The Teacher's Manual accompanies the GMVR program and gives full instructions to the teacher regarding equipment and procedures.

2. The teacher is provided with a Vocabulary List based directly on the presentation concerning each group of slides. Each list contains new words that are heard and repeated throughout that specific segment. The teacher may use this vocabulary orally as a direct follow up to the presentation or, list the words on a board especially designated for this purpose, use them as part of discussions or as part of the regular language arts period. The art vocabulary serves as a symbolic memory jog for visual concepts that have already been seen and heard. This dimension of the program acts to reinforce what is presently in progress and is not be made the main focus of this training.

3. The teacher is provided with an outline of 4 art lessons that are directly concerned with each 20 slide segment. At least one project must assigned immediately following the slide-tape presentation. However, the teacher may choose to discuss the slides and vocabulary immediately after the viewing as long as the main thrust remains the project itself. The teacher explains the project carefully and materials are then given out. It is important that the materials be set up in advance and are readily available so that the child's attention will be directed from a) slide-tape viewing, b) brief discussion culminating in the assignment, c) doing the assignment.

Steps in Presentation

1. The teacher shows the first 20 slides with accompanying tape, alert to individual responses. Both slides and tape can be stopped at any point in the presentation in accordance with the specific needs of the class.

2. After the presentation the lights are put on and a brief discussion stressing what was seen and heard takes place. This leads into the presentation of the art project that is based on the visual information in the slides.

3. The teacher presents the art projects in this timesequence: Week one - Concept one - Projects 1, 2, 3, 4. A new project is presented each day. The slides may be shown again at mid-week or a only few at a time to clarify the concept being explored.

The teacher is urged to keep the goals of the GMVR program clearly in mind. The seven basic concepts are the major focus of the program and must not be lost sight of, no matter how much the teacher diverges from the material itself. Divergence is stressed in this program because it is assummed that no one knows the students as intimately as the classroom teacher. It was felt that the GMVR could not be merely grafted on so as to meet children's needs in a vacuum. Therefore, teachers were urged to adjust the material to specific situations, they could stop the tape or slides where necessary, use the vocabularies whenever appropriate, and alter procedures when learning styles and timing mechanisms so indicated. It was suggested that a

record or daily log be kept of special problems so that they could be handled with greater ease when they occurred again. In general, the teacher's were urged to be understanding, flexible in approach and creative in the use of the program.

The Instruments

The Standardization of the ITPA. The Psycholinguistic Age Norms for the 12 ITPA subtest were derived from the responses of approximately 1,000 average children between the ages of two and ten. This sample was selected as being of average performance on traditional measures of intelligence, school schievement, socio-economic status and of intact motor and sensory development. Based on the ITPA scores of this group four types of norms are provided: a) Psycholinguistic Age norms for each subtest, b) Scaled Score norms for each subtest, c) Composite Psycholinguistic Age norms and, d) Stanford-Binet Mental Age estimates. All of these norm tables are available in the ITPA Manual.[84] Although these published norms can be useful as guidelines, serving as a broad basis in evaluating children with learning disabilities, it is stressed that for many other purposes, accurate and relevant information can be obtained only when local or special norms are established. Instead of providing norms based on the performance of a general population, the ITPA authors felt that standardizing the test on a more narrowly defined population, chosen to suit the specific purpose of the test would be a more practical and effective procedure. (Anastasi, 1961) This approach

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[84]S.A. Kirk, James J. McCarthy and W.D. Kirk, ITPA Examiner's Manual, (revised edition), Urbana, Illinois, 1968.

was taken in obtaining normative data for the ITPA.[85]

The Validity and Reliability of the ITPA. An ordered series of steps were taken to insure that the subtests of the ITPA would have face and content validity. Activities were selected which typified each function as delineated by the model. Difficulty level and discriminatory power (item correlation with total score) were used as the primary criteria for the final choice of items. Item analysis provided information on homogeneity and age differentiation. On the basis of this information, poor items were abandoned or revised, new ones identified and the order of presentation modified to arrive at graded difficulty levels.[86]

The Visual Reception Subtest. Internal consistancy reliabilities range from .82 to .93 with a median of .90 for the eight age groups of average children. Five month test-retest reliabilities are .69 for 4 years olds, 156 for 6 year olds and .66 for 8 year olds. Among the eight age groups considered by the test as a whole, median reliabilities for the difference scores between Visual Reception and the rest of the subtests range from .74 to .89. Median correlations between the Visual Reception Subtest and the other subtests range from .06 to .48, the highest correlations being with the two association tests and Grammatic Closure.

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[85] J. Paraskevopoulous, Op. cit. pp. 50-52.

[86] Ibid. pp. 28.

The Visual Association Subtest. The median internal consistency coefficient is .89 for the eight age groups. Five month stability coefficients are .75 for 4-year olds, .45 for 6-year olds and 167 for 8 year olds. Difference scores between Visual Association and other subtests show median reliabilities ranging from .73 to .83 Intercorrelations between Visual Association and other subtest range from .10 to .44, the highest correlations being with Auditory Association and Grammatic Closure.[87]

The Visual Closure Subtest. The median internal consistency coefficient is .74 for the eight age groups of average children. Test-retest stability over a five month period is .72, .70, and .82 for the three groups stated above. Median reliabilities for difference scores between Visual Closure and other subtests range from .70 to .83. The correlations between The Visual Closure Subtest and the other subtests range from .08 to .36, the highest correlations being with the two association tests and with Grammatic Closure.[88]

The Visual Sequential Memory Subtest. The median internal consistency coefficient is .82 for the eight age groups of average children. It might be noted here that the coefficients for this and all of the previous subtest have been corrected for restricted intelligence range. The stability coefficients over a five month period are .71, .38, and .28 for the three specified age groups.

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[87] Ibid. pp. 32, 33, 37.

[88] Ibid. pp. 43, 47.

Median reliabilities of difference scores between Visual Sequential Memory and the other subtests range from .72 to .84. Intercorrelations of Visual Memory and the other subtest range from .08 to .28, the highest correlations being with tests utilizing the visual channel.

The Manual Expression Subtest. The median internal consistency coefficient is .88 for the eight age groups of average children (corrected for restricted intelligency range). Five month stability coefficients are .67, .70 and .55 for the three age groups. Difference scores between Manual Expression and other subtests have median reliabilities ranging from .75 to .89. Intercorrelations of Manual Expression and other subtest range from .06 to .40, the highest correlation being with Verbal Expression.[89]

The Derivation of ITPA Scores. Several scores with differing properties may be obtained and used in an analysis of ITPA test performance. These include: raw scores, psycholinguistic age scores (PLA), the psycholinguistic quotient (PLQ), scaled scores (SS), estimated Stanford-Binet mental age (MA), and an estimated IQ.[90] The raw score is the numerical representation of test performance. The scaled scores are linear transformations of the raw scores. For each age level and subtest (or composite), the mean performance of the

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[89] Ibid. pp. 40.

[90] Ibid. pp. 76, 77.

standardized group equals 36 with a standard deviation of 6. This scale was used by the authors of the ITPA in order to prevent direct comparison of ITPA scaled scores with other scales (such as the Wechsler). The Stanford-Binet Mental Age and IQ Estimates was used in deriving the PLA scores.[91,92]

Scaled scores were used in treatment of the ITPA date in the present study. These scores take into account not only the mean performance of the normative groups, but also the variability of scores about the mean. This makes it possible to assume that score units on the subtests are comparable both within and across age levels. For these reasons scaled scores are appropriate in making comparisons among the test-retest scores as well as in evaluating the individual's standing relative to the normative group or to another child. Scaled scores are linear transformations of raw scores and can be used in correlational analysis, as in analyses evaluating mean differences between groups, especially in studies of mean group performances of nonequivalent chronological ages.[93]

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[91] Ibid. pp. 80-85.

[92] Ibid. pp. 87

[93] J.N. Paraskevopoulos and S. Kirk, The Development and Psychometric Characteristics of the Revised Illinois Test of Psycholinguistic Abilities, Urbana, Illinois: University of Illinois Press, 1969.

The Gair Art Test (GAT)

The Gair Art Test (see Appendix B) was developed in conjunction with the GMVR program as a pre- and post-test. It yeilds creative art products that can be perused and rated on the GARS. The Gair Art Test consists of one simple design task, plus one task involving a self-portrait in an environment. The teacher can administer this test to an entire group, or individually, without varying the verbal cues. The test requires no special materials or setting for its use. Although the tasks are open ended, the teachers are cautioned not to allow an undue amount of time for the completion of each portion. One, or both tasks can be administered on the same day. At the conclusion of the GMVR program, each child had a total of four creative products that each judge rated separately. The total number of creative products to be rated by each judge was 80.

The Gair Art Rating Scale (GARS)

Preliminary Development. The development of the GARS began in 1969 when the author was employed as a resource teacher for Maryland public schools. A preliminary "Study of Art Criteria" was then carried out at The American University under the guidance of Dr. Edith H. Grotberg. This study examined the feasibility of using rating scales, with classroom teachers, that were based on specific perceptual-cognitive criteria. The rating scale developed by the author was used as an evaluative device for the creative art products of elementary school children. The study considered how teacher's assess the creative output of their pupils when faced with specific criteria as set forth in a rating scale. It also

considered which criteria best defined the teacher's perception of creative work and whether these perceptions effected their rating judgements. Five teachers were used to judge twenty art products with a twenty-two item rating scale. The criteria used in the scale cited specific perceptual, cognitive and affective behaviors that each teacher was asked to look for. This brief study concluded that rating scales could be used effectively as tools for evaluating perceptual, cognitive and artistic achievement in creative tasks. However, the choice of criteria was critical if the evaluation was to be accomplished with objectivity and discernment.

A second form of the rating scale was developed for use in college-level Teacher Education classes. In this capacity, the author worked with Dr. Harold McWhinnie and his students at the University of Maryland. Several new dimensions were added here that considered the basic principles of form perception. Questions concerning the teaching and learning of form led to the development of new criteria in the rating scale. The concept of an art-based, sequentially developed program with a rating scale specifically designed to test its effects, seemed to be the next logical step. The GMVR program with the Gair Art Test and Rating Scale was the result of these preliminary steps.

Use of the GARS in the Present Study. The Gair Art Rating Scale (see Appendix B) is based on the sequentially presented GMVR program. It is structured according to the seven basic concepts (specified earlier) upon which the program is designed. Whereas each of the slide-tape presentations, vocabularies and art-based tasks reinforces discrete

learning, the GARS determines, quantitatively, how much of that learning has been achieved. If a child has learned from the GMVR program, his products resulting from the Gair Art Test (GAT) will reflect this accordingly and the GARS scores will rise.

The GARS is attempting to measure how much a child has learned about visual form. It considers perceptual questions of seeing similarities and differences, of being able to identify a figure from a complex ground and the ability to shift visual form into other contexts with fluency, flexibility and without loss of meaning. The child demonstrates his understanding of these complex visual behaviors by manipulating the visual properties of artistic design (such as line, shape, color and texture) on increasingly complex levels. If for example, a child has learned to recognize a pattern of related shapes and differentiate them from a pattern of contrasting ones, his ability to perform tasks that show this new learning should be effected. Art-based tasks were used to demonstrate these abilities for the following reasons: a) they allow the child to react emotionally, b) they allow the child to think divergently, c) they allow the child to problem solve and make judgments based on his own perceptions, d) they allow the child to use the imagination and fantasy levels of perception. The GARS was designed to test if these qualities were observable in completed tasks and to do this in the most objective way possible.

Raters who use the GARS must be familiar with its terminology in order to systematically judge the presence or absence of the specific perceptual qualities. (It should be noted that the scale may be used

to judge any creative product, independent of the GMVR and GAT, providing that the rater is acquainted with the basic elements of design and perception.) Each item on the scale is designed to be self explanatory and provide no overlap. The rater is asked to look carefully at the creative product and judge it on a scale of 1 (low) to 5 (high) in relation to the property described by the item. A raw score is then obtained on each product.

Data Collection and Analysis

The Data. Primary data consisted of the following:

a) Scores obtained by administering the Visual Reception Subtest of the Illinois Test of Psycholinguistic Abilities (revised edition).

b) Scores obtained by administering the Visual Association Subtest of the ITPA (revised edition).

c) Scores obtained by administering the Visual Closure Subtest of the ITPA (revised edition).

d) Scores obtained by administering the Visual Sequential Memory Subtest of the ITPA (revised edition).

e) Scores obtained by administering the Manual Expression Subtest of the ITPA (revised edition).

f) Scores obtained by administering the Gair Art Test and Rating Scale (GARS).

Criteria for the Admissibility of Data

Only the four visual perception and the manual expression

subtests were used out of the complete battery of twelve ITPA subtests and were admissible as data. Scaled scores were used in the statistical manipulation of the ITPA data. The GARS yeilded raw scores only and these were treated statistically. The only creative products that were considered by the three art experts were the two tasks resulting from the Gair Art Test before the GMVR and the two tasks resulting from the test after completion of the program.

Statistical Procedures

1. Data were analyzed for all variables and the means, standard deviations, variances and standard errors were computed.

2. All data were tested for significant differences between pre- and post-tests for the ITPA subtest means, the total means for the five subtests and the GARS. A t-test and a Wilcoxon Matched-Pairs Signed-Rank test were calculated for these data.

3. Histograms were constructed from the data for each of the ITPA subtests, the ITPA mean and the GARS. (see Appendix A, Figure 1, 2, 3 and 4).

4. Tables of fractional performance improvement were constructed for each ITPA subtest and the GARS items.

5. A correlational study was performed among the subtests and the GARS scores. This included a Pearson Product Moment Correlation and a Kendall-Rank Correlation Coefficient (Tau).

6. An item analysis of the GARS was performed using the Pearson Product Moment, the Kendall-Rank Correlation and the Spearman-Rank Coefficient (Rho).

7. A rudimentary cluster analysis was performed in order to determine the principal item clusters within the GARS.

8. The relationship among high and low scorers and high and low gainers on the ITPA subtests were analyzed using highest and lowest fractional improvements on the GARS cluster items.

All computations were made on the IBM 360/70 Computer System at The American University Computation Center.

CHAPTER V

RESEARCH RESULTS

The effects of the GMVR treatment were observed, described and tested for statistical significance in the six areas outlined by the subproblems. The final results of this study concerning selected psycholinguistic abilities as measured by five subtests of the ITPA, plus receptive-expressive performance as measured by the GARS, are analyzed and discussed in this chapter.

Analysis of the Data

This study has asked what effects an art-based visual perception program would have on specific areas of visual decoding and encoding in children who are having problems with learning. Five of the subproblems categorized the specific areas of psycholinguistic abilities into visual perception, visual association, visual closure, visual sequential memory and the expressive area of manual expression. These subproblems considered the question of effect of this type of training on specific abilities measured by the ITPA. The sixth subproblem concerned the question of receptive-expressive performance and asked how behaviors might be effected in the specialized skill area measured by the GARS. Each of the six hypotheses asserted that there would be a change in scores effecting psycholinguistic abilities and receptive-expressive performance after the sequentially presented GMVR program. This program was administered daily within the regular school setting, over a period of seven weeks, to a group of twenty learning disabled children.

Table 1 summarizes the t-tests between subtest scores before and after treatment in all areas of concern to this study. The results of this statistical procedure show that there has been a significant difference in visual reception, visual association, visual closure, visual memory, manual expression and quality of art achievement after the GMVR treatment. All of these differences are shown to be highly significant with a probability of error at the .01 level or better. Appendix Table 1 displays the matrix of scaled scores from the ITPA subtests that provided the data for statistical treatment. Appendix Tables 2 and 3 display the same information for the raw scores from the Gair Art Rating scale (GARS).

Since the t-test assumes a normal distribution, analysis of score histograms (see Appendix A, Figures 1 through 4) demonstrate that in this small number of subjects there is no normal distribution, only a tendency towards normality. Therefore, both parametric and non-parametric tests of difference were performed. Scores were tested again using a Wilcoxon Matched-Pairs Signed-Ranks test (see Table 11). This test considered the relative magnitude and direction of difference in pre- and post-test scores that were ranked from high to low. The results of this test show highly significant differences between each ITPA pre- and post-test, pre- and post ITPA total means, and pre- and post GARS.

Figure 1 displays the ITPA and GARS data in terms of percentage gains, or fractional improvement, after GMVR training. This graph illustrates the areas where the twenty children made the greatest gains. Receptive-expressive performance made the highest gain as measured by

TABLE I

T-TEST FOR SIGNIFICANT DIFFERENCE
BETWEEN ITPA SUBTEST SCORES,
MEANS AND GARS

VARIABLES	t-VALUE	PROBABILITY OF ERROR*
1 and 2 (Vis.Reception)	2.516	$<$=.01
3 and 4 (Vis.Assoc.)	3.623	$<$=.001
5 and 6 (Vis.Closure)	2.170	$<$=.025
7 and 8 (Vis.Memory)	2.142	$<$=.025
9 and 10 (Man.Exprsn)	3.587	$<$=.001
11 and 12 (GARS)	5.496	$<$=.0005
12 and 13 (ITPA Means)	3.356	$<$=.001

* one-tailed test

TABLE II

WILCOXON MATCHED-PAIRS SIGNED-RANK
TEST OF SIGNIFICANT DIFFERENCE BETWEEN
ITPA SUBTEST SCORES, MEANS AND GARS

	VARIABLE 1 IS SUBTRACTED FROM VARIABLE 2	
Visual Receptn. pre-post	NUMBER OF PAIRS HAVING DIFFERENCES	18
	SUM OF RANKS OF + DIFFERENCES	171.0
	SUM OF RANKS OF - DIFFERENCES	0.0
	VALUE OF STANDARDIZED NORMAL SCORE, Z	- 3.724
	COMPUTED PROBABILITY OF OBTAINING A VALUE OF Z AS EXTREME AS THE ONE FOUND BY THE TEST	0.0001
	VARIABLE 4 IS SUBTRACTED FROM VARIABLE 3	
Visual Assoc. pre-post	NUMBER OF PAIRS HAVING DIFFERENCES	17
	SUM OF RANKS OF + DIFFERENCES	0.0
	SUM OF RANKS OF - DIFFERENCES	153.0
	VALUE OF STANDARDIZED NORMAL SCORE, Z	- 3.621
	COMPUTED PROBABILITY OF OBTAINING A VALUE OF Z AS EXTREME AS THE ONE FOUND BY THE TEST	0.0001
	VARIABLE 6 IS SUBTRACTED FROM VARIABLE 5	
Visual Closr. pre-post	NUMBER OF PAIRS HAVING DIFFERENCES	20
	SUM OF RANKS OF + DIFFERENCES	1.5
	SUM OF RANKS OF - DIFFERENCES	208.5
	VALUE OF STANDARDIZED NORMAL SCORE, Z	- 3.864
	COMPUTED PROBABILITY OF OBTAINING A VALUE OF Z AS EXTREME AS THE ONE FOUND BY THE TEST	0.0001
	VARIABLE 8 IS SUBTRACTED FROM VARIABLE 7	
Visual Memry. pre-post	NUMBER OF PAIRS HAVING DIFFERENCES	15
	SUM OF RANKS OF + DIFFERENCES	0.0
	SUM OF RANKS OF - DIFFERENCES	120.0
	VALUE OF STANDARDIZED NORMAL SCORE, Z	- 3.408
	COMPUTED PROBABILITY OF OBTAINING A VALUE OF Z AS EXTREME AS THE ONE FOUND BY THE TEST	0.0003
	VARIABLE 10 IS SUBTRACTED FROM VARIABLE 9	
Manual Expr. pre-post	NUMBER OF PAIRS HAVING DIFFERENCES	18
	SUM OF RANKS OF + DIFFERENCES	0.0
	SUM OF RANKS OF - DIFFERENCES	171.0
	VALUE OF STANDARDIZED NORMAL SCORE, Z	- 3.724
	COMPUTED PROBABILITY OF OBTAINING A VALUE OF Z AS EXTREME AS THE ONE FOUND BY THE TEST	0.0001
	VARIABLE 12 IS SUBTRACTED FROM VARIABLE 11	
GARS pre-post	NUMBER OF PAIRS HAVING DIFFERENCES	20
	SUM OF RANKS OF + DIFFERENCES	0.0
	SUM OF RANKS OF - DIFFERENCES	210.0
	VALUE OF STANDARDIZED NORMAL SCORE, Z	- 3.920
	COMPUTED PROBABILITY OF OBTAINING A VALUE OF Z AS EXTREME AS THE ONE FOUND BY THE TEST	0.0000
	VARIABLE 14 IS SUBTRACTED FROM VARIABLE 13	
ITPA Means pre-post	NUMBER OF PAIRS HAVING DIFFERENCES	20
	SUM OF RANKS OF + DIFFERENCES	0.0
	SUM OF RANKS OF - DIFFERENCES	210.0
	VALUE OF STANDARDIZED NORMAL SCORE, Z	- 3.920
	COMPUTED PROBABILITY OF OBTAINING A VALUE OF Z AS EXTREME AS THE ONE FOUND BY THE TEST	0.0000

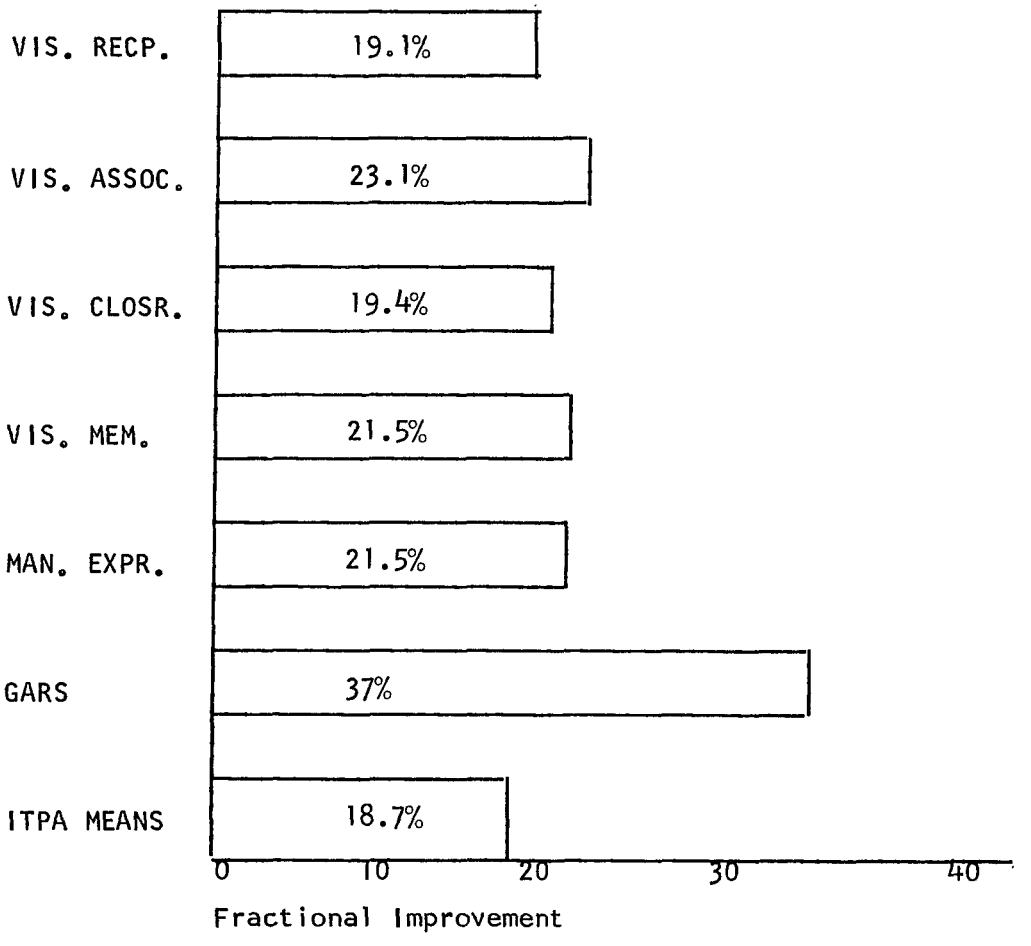

Figure 1. Fractional Improvement After GMVR Treatment on ITPA Subtest, ITPA Means and Gair Art Rating Scale

the GARS. Visual association made the second highest gain, as measured by the ITPA and visual memory and manual expression gained equally. The ITPA means for all five subtests made a 18.7 gain after the GMVR program.

Table III shows the results of t-tests that were performed on the 20 items of the Gair Art Rating Scale (GARS) using pre- and post-test numerical data calculated from the ratings of the children's creative products. Differences for all items but three (item 9, 11 and 20) were found to be significant at the .01 level or higher.

A complete display of fractional improvement for all children, in each of the visual-perceptual and visual-motor areas, appears in Table IV. The amount that each child improved in each area of psycholinguistic ability is observable, however, some of the children did not improve at all in one channel, but made large gains in others. This pattern is very much in keeping with the "profiles" of learning disabled children.

The correlation matrix presented in Table V shows the Pearson Product Moment correlations of each set of ITPA subtest scores, subtest means and the GARS pre- and post scores. All ITPA pre-test shows high positive correlations with the post tests. The GARS pre-test shows a positive correlation of .359 with the post-test. All ITPA subtest data correlate negatively with the GARS except for the manual expression subtest that show a low positive correlation with the GARS. Manual expression is also the only ITPA subtest that shows negative correlations with other ITPA subtests (visual association and visual memory). This data suggests that manual expression has something in common with what

TABLE III

T-TEST FOR SIGNIFICANT DIFFERENCE
BETWEEN ALL 20 ITEMS ON THE GARS

Variables	t-value	p-value*
1 and 2 (Rel.line)	2.525	.01
3 and 4 (Rel.shape)	4.292	.0005
5 and 6 (Con.line)	2.746	.01
7 and 8 (Con.shape)	5.976	.0005
9 and 10 (Mood)	4.485	.0005
11 and 12 (Shap.ovr.)	5.941	.0005
13 and 14 (Neg.space)	5.458	.0005
15 and 16 (Outline)	2.956	.005
17 and 18 (Calligr.)	0.344	not signif.
19 and 20 (Rhythm)	3.550	.005
21 and 22 (Lin.var.)	1.634	.10
23 and 24 (Lt.Dk.)	4.020	.0005
25 and 26 (Texture)	3.971	.005
27 and 28 (Structure)	3.192	.005
29 and 30 (Detail)	3.936	.005
31 and 32 (Balance)	4.078	.0005
33 and 34 (Transfm)	4.915	.0005
35 and 36 (Symbols)	2.928	.01
37 and 38 (Color)	2.336	.01
39 and 40 (Transpar)	1.408	.01

*one-tailed test

TABLE IV

FRACTIONAL IMPROVEMENT (%) IN SCORES
ON ITPA SUBTEST, MEANS AND GARS

Subjects	Var. 1 (Rec)	Var. 2 (Assoc)	Var. 3 (Clo)	Var. 4 (Mem)	Var. 5 (Expr)	Var. 6 (Means)	Var. 7 (GARS)
1.	80.	15.	31.	14.3	11.1	18.7	12.6
2.	15.2	3.1	23.3	33.3	26.9	19.9	40.6
3.	20.6	11.1	20.	42.9	15.2	22.8	15.6
4.	26.3	52.	-7.7	16.	20.8	21.	4.1
5.	12.2	0.	27.5	25.7	18.2	16.9	8.3
6.	27.8	12.5	31.6	27.3	60.	31.1	65.8
7.	57.9	5.7	11.1	19.5	0.	14.3	18.6
8.	25.	38.7	53.3	15.4	18.2	29.1	68.
9.	51.9	7.1	40.	42.1	11.8	28.1	18.6
10.	16.3	0.	10.	53.1	50.	28.4	10.5
11.	10.8	11.1	20.6	0.	20.6	12.6	14.8
12.	0.	60.	14.3	16.1	20.8	21.5	32.2
13.	8.8	8.8	40.6	0.	18.2	15.2	47.3
14.	12.5	88.	3.7	3.8	6.3	6.7	114.8
15.	0.	70.	14.7	9.1	0.	14.8	25.3
16.	20.	0.	19.6	14.3	51.9	18.4	34.2
17.	8.1	50.	15.6	27.8	13.9	22.5	69.2
18.	17.1	25.	18.5	-46.7	26.7	7.5	44.1
19.	10.5	10.5	10.2	34.6	13.9	14.4	93.6
20.	48.1	7.4	28.2	0.	40.7	18.8	52.8

TABLE V

CORRELATION MATRIX FOR ITPA SUBTEST SCORES, SUBTEST MEANS AND GARS

Var.	V.R. pre 1	V.R. post 2	V.A. pre 3	V.A. post 4	V.C. pre 5	V.C. post 6	V.M. pre 7	V.M. post 8	M.E. pre 9	M.E. post 10	GARS pre 11	GARS post 12	$\bar{X}$ pre 13	$\bar{X}$ post 14
1.VR	1.000	0.866	0.503	0.335	0.627	0.608	0.348	0.402	0.277	0.677	-0.301	-0.047	0.761	0.723
2.VR	0.866	1.000	0.526	0.248	0.642	0.686	0.376	0.480	0.345	0.783	-0.174	-0.085	0.809	0.812
3.VA	0.503	0.526	1.000	0.372	0.286	0.305	0.708	0.743	-0.032	0.231	-0.440	-0.443	0.624	0.682
4.VA	0.335	0.248	0.372	1.000	0.530	0.393	0.511	0.382	0.533	0.449	-0.579	-0.184	0.614	0.585
5.VC	0.627	0.642	0.286	0.530	1.000	0.931	0.395	0.275	0.508	0.740	-0.497	-0.128	0.858	0.763
6.VC	0.608	0.686	0.305	0.393	0.931	1.000	0.455	0.307	0.488	0.743	-0.347	-0.050	0.865	0.809
7.VM	0.348	0.376	0.708	0.511	0.395	0.455	1.000	0.867	-0.038	0.181	-0.365	-0.434	0.661	0.763
8.VM	0.402	0.480	0.743	0.382	0.275	0.307	0.867	1.000	-0.179	0.129	-0.205	-0.378	0.591	0.746
9.ME	0.277	0.345	-0.032	0.533	0.508	0.488	-0.038	-0.179	1.000	0.703	-0.145	0.228	0.497	0.327
10.ME	0.677	0.783	0.231	0.449	0.740	0.743	0.181	0.129	0.703	1.000	-0.349	0.132	0.757	0.672
11.GARS	-0.301	-0.174	-0.440	-0.579	-0.497	-0.347	-0.365	-0.205	-0.145	-0.349	1.000	0.359	-0.464	-0.392
12.GARS	-0.047	-0.085	-0.443	-0.184	-0.128	-0.050	-0.434	-0.378	0.228	0.132	0.359	1.000	-0.249	-0.259
13. $\bar{X}$	0.761	0.809	0.624	0.614	0.858	0.865	0.661	0.591	0.497	0.757	-0.464	-0.249	1.000	0.943
14. $\bar{X}$	0.723	0.812	0.682	0.585	0.763	0.809	0.763	0.746	0.327	0.672	-0.392	-0.259	0.943	1.000

the GARS is measuring, and this property responds negatively, as does the GARS, on both Representational and Automatic levels, to what the ITPA is measuring.

The Kendall-Rank correlation was used to compute Non-parametric correlations between the ITPA subtests and the GARS. Table VI shows the relationships between ITPA and GARS pre-tests and ITPA and GARS post-tests. All correlations are negative with the amounts rising between pre- and post-tests in all areas except visual memory and manual expression where the correlations become slightly lower. This bears out the correlation matrix in Table V which shows visual memory and manual expression correlating negatively on both pre- and post-tests.

The data for the item analysis performed on the 20 items of the GARS are displayed in Appendix Tables 4 through 7. The correlation matrix shows the relationships between items on the pre- and post-test. Kendall correlations (Appendix Tables 8 through 11) and Spearman correlations (Appendix Tables 12 through 15) were performed on the data. An analysis of these tables led to the conclusion that the items seemed to form into clusters, with high correlations occurring within each cluster, and low correlations with items outside the cluster. Tables VII, VIII and IX show the results of the cluster analysis where Cluster I concerns the graphic concept of Line, Cluster II concerns the spacial concept of Shape, and Cluster III centers on the affective concept of Mood.

The Line cluster (Table VII), shows high correlations between items that have a direct bearing on the ability to use line in artistic

TABLE VI

KENDALL RANK COEFFICIENT (TAU)
COMPARING GARS PRE AND POST TESTS
AND MEANS

VAR.	11(GARS PRE)	VAR.	12(GARS POST)
1. VIS.REC.PRE	-0.205 p=.03	2. VIS.REC.POST	-0.076 p=.32
3. VIS.ASSOC.PRE	-0.304 p=.09	4. VIS.ASSOC.POST	-0.151 p=.18
5. VIS.CLO.PRE	-0.220 p=.09	6. VIS.CLO.POST	-0.032 p=.42
7. VIS.MEM.PRE	-0.202 p=.1	8. VIS.MEM.POST	-0.292 p=.036
9. MAN.EXPR. PRE	-0.028 p=.43	10. MAN.EXPR. POST	-0.111 p=.25
13. MEANS PRE	-0.239 p=.07	14. MEANS POST	-0.219 p=.09

and graphic tasks. Items such as related line, contrasting line, calligraphic or free-flowing writing line, line variation, rhythm and texture formed a correlational and conceptual synthesis. The cluster concerning Shape (Table VIII), showed high correlations between constrasting shape, shape transformation, structure, rhythm and balance. It should be noted that rhythm correlated highly with items that were contained in both Line and Shape clusters. This seemed logical, because if rhythm is interpreted as patterning motoric expression it can be expressed both linearly and spacially, depending on the mode of representation. The third cluster (Table IX), which is referred to as Mood, displays a range of items that appeared to group around the "affect" area of the expressive channel. Each of these items correlated highly and presented a cluster of subtly varied concerns that suggested contrast, difference and juxtaposition (e.g. contrasting shape, line variation, ligh and dark). The use of clor, detail and symbols effected the mood of creative products and correlated highly with each other, but not with other items outside of this cluster. It is suggested that detail, when considered as an affect or mood related item, becomes independent of cognitive concerns. Therefore, a child who includes much or little detail in an expressive work is not necessarily demonstrating cognitive or creative ability (e.g. Torrance's high elaborators), but rather, is making an emotional choice based on other concerns.

Table X provides an overall view of fractional improvement for the 20 children on each of the GARS items. This indicates a significant

TABLE VII

CORRELATIONS FOR GARS ITEMS IN CLUSTER I: LINE

	Rel.Line 1.	Con.Line 3.	Calligr. 9.	Rhythm 10.	Line Var. 11.	Texture 13.
Rel. Line 1.	—	.6632	.5095	.6243	.5239	.3037
Con. Line 3.		—	.7336	.4635	.4822	.3568
Callig. 9.			—	.5177	.4479	.3681
Rhythm 10.				—	.5891	.4824
Line Var. 11.					—	.7142
Textur. 13.						—

TABLE VIII

CORRELATIONS FOR GARS ITEMS IN
CLUSTER II: SHAPE

	Rel. Shape 2.	Con. Shape 4.	Rhythm 10.	Structr. 14.	Balance 16.	Shape Tran. 17.
Rel. Shp. 2.	—	.4755	.5541	.6735	.4405	.5251
Con. Shp. 4.		—	.6179	.5584	.5908	.3708
Rhytm. 10.			—	.7067	.5960	.5498
Struct. 14.				—	.6102	.6690
Bal. 16.					—	.4320
Shp. Trn. 17.						—

TABLE IX

CORRELATIONS FOR GARS ITEMS IN CLUSTER III: MOOD

		Con.Shp. 4.	Mood 5.	Lin.Var. 11.	Lt.Dk. 12.	Detail 15.	Symbls 18.	Color 19.
Con.Shp.	4.	—	.6325	.4770	.5778	.5791	.3358	.5045
Mood	5.		—	.5589	.7031	.8736	.5929	.5395
Lin.Var.	11.			—	.4845	.7362	.2532	.4800
Lt.Dk.	12.				—	.6435	.4367	.4920
Detail	15.					—	.6829	.6141
Symbls	18.						—	.5552
Color	19.							—

TABLE X

FRACTIONAL IMPROVEMENT (%) PER ITEM
ON THE GARS FOR ALL SUBJECTS

	%	Items
1)	15.4	Pattern of related lines
2)	45.2	Pattern of related shapes
3)	38.	Contrasting pattern of lines
4)	63.6	Contrasting pattern of shapes
5)	44.7	A definite mood established by either line,shape,or color
6)	60.8	Shapes that overlap each other
7)	61.5	Use of background (negative) space as an integral part of the work
8)	24.	Outline defining a shape
9)	-2.2	Outline as independent from a shape(free flowing calligraphic line)
10)	33.1	Rhythm and movement
11)	15.5	Lines that show variation of pressure(from thick to thin etc.)
12)	56.5	Attention to light and dark areas
13)	36.9	Texture(2 or 3 dimensional additions to the surface quality)
14)	31.8	A definite visual structure(spiral, radial, grid, modular,dendritic)
15)	47.9	Complexity and intricacy of surface detail
16)	29.6	Balance(either symmetrical or assymetrical)
17)	45.5	A variety of transformations of a single basic shape
18)	52.3	Symbols(number, letters, words) that function as part of the design
19)	31.1	Variations in color hue(color itself) and value(light to dark)
20)	8.5	Transparency(one form seen through another)

amount of improvement after GMVR treatment with the only loss occuring in the item dealing with calligraphic line.

The three GARS clusters were analyzed for a comparison of post-test scores on the ITPA and the amount of gain in each cluster. This was done in order to determine the level of achievement after GMVR training that might relate to psycholinguistic ability. This analysis was also concerned with the particular channel in which the GARS cluster items were learned. It became necessary to consider a) high and low scorers and b) high and low gainers. One considered existing ability at an established point in time (post-test), and the other considered the percent of change over time. Scores in the top quartile and bottom quartile were used in this fractional analysis, in each case N=5.

High and Low Scorers

Figure 2 presents a comparison of improvement on the GARS Cluster 1: Line, for children who scored high (top quartile) on the ITPA post-tests and those who scored low (bottom quartile). Children who scored highest in visual association on the post-test made the greatest gains in the cluster of items dealing with line. Figure 3 continues this analysis on Cluster II: Shape. Once again, children who scored high in visual association also made the greatest gains on the GARS Shape item s in this channel. The children who scored low in the ITPA post-tests learned shape items from several channels. Figure 4 shows that children who scored high in visual closure made the most striking gains in Mood related items, while those who scored low in the post-tests had a more even distribution of gains. These Figures(2,3 and 4)indicate that a) children who scored high in the visual association channel of

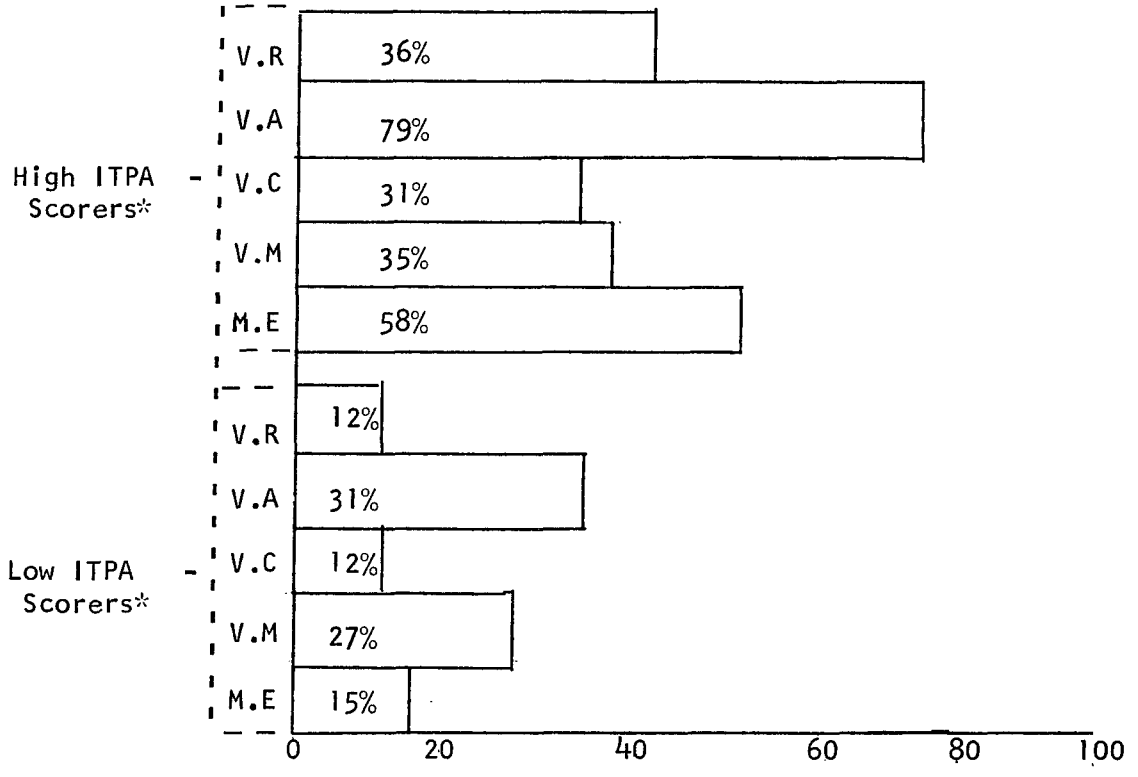

Figure 2. A COMPARISON OF IMPROVEMENT ON THE GARS CLUSTER I: LINE FOR HIGH AND LOW ITPA POST-TEST SCORERS

*N = 5
*N = 5

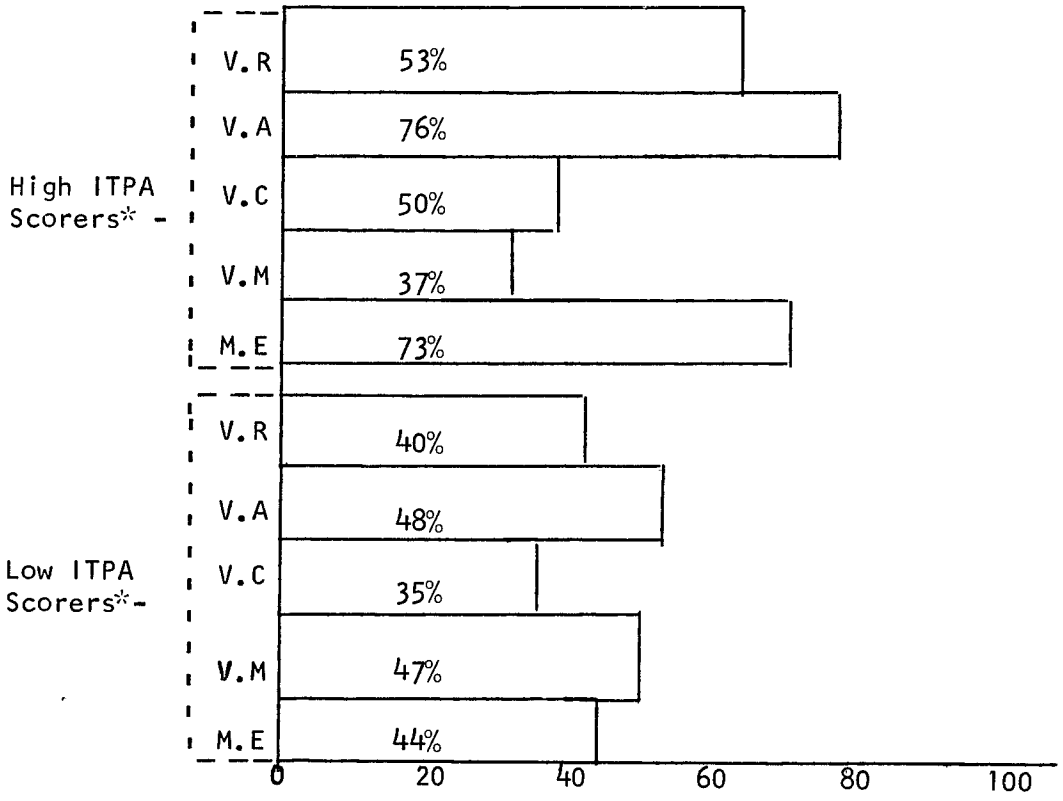

Figure 3. A COMPARISON OF IMPROVEMENT ON THE GARS CLUSTER II: SHAPE FOR HIGH AND LOW ITPA POST-TEST SCORERS

*N = 5
*N = 5

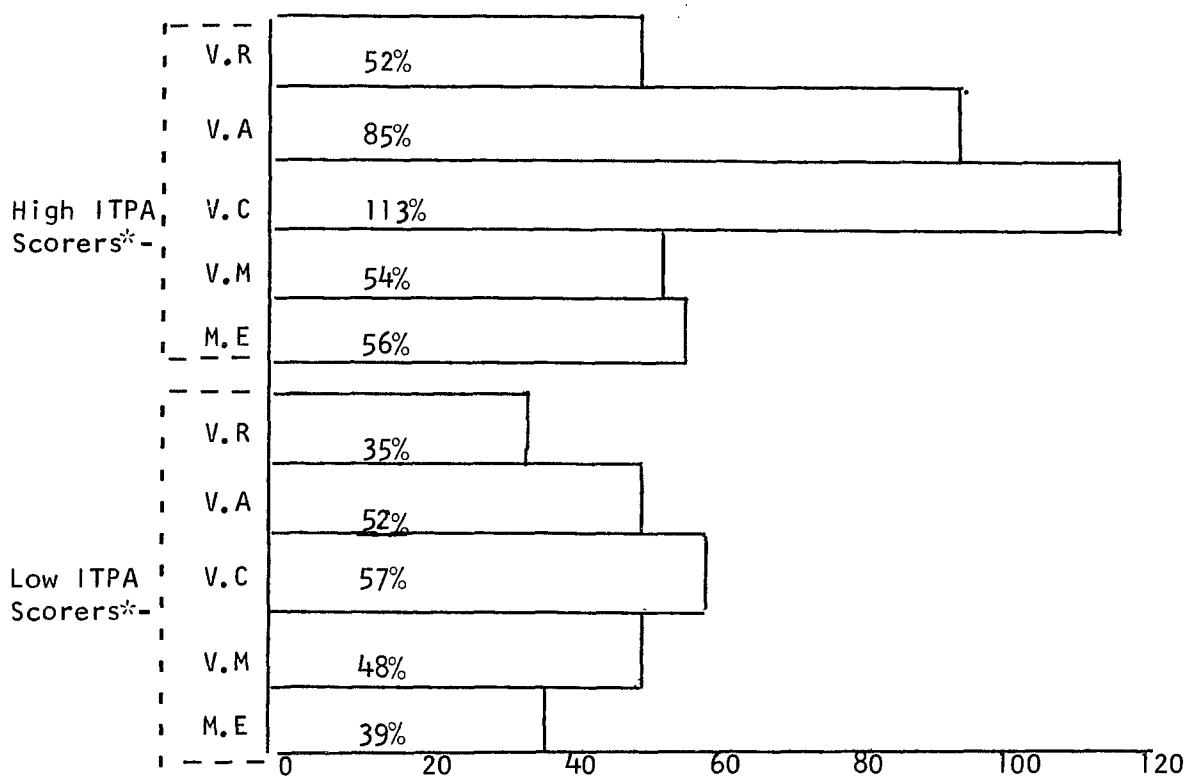

Figure 4. A COMPARISON OF IMPROVEMENT ON THE GARS CLUSTER III: MOOD FOR HIGH AND LOW ITPA POST-TEST SCORERS

*N = 5
*N = 5

psycholinguistic ability on the ITPA post-test, seemed to use this channel most effectively when learning new receptive-expressive tasks concerning line, shape and mood, as measured by the GARS. b) Children who scored lowest on the ITPA post-tests seemed to utilize the Automatic level of psycholinguistic ability in which to achieve new learning about line, shape and mood, as measured by the GARS.

High and Low Gainers

Figure 5 shows that children who gained most in the GARS Line cluster were the ones who used the visual association channel. Children who made the least gains on the Automatic level (visual closure, visual memory) were still able to make significant gains in the GARS Line items through these channels. Figure 6 indicates that the high Representational level gainers were also able to learn shape related information on this level. Whereas, those who made the least gains on the Automatic level of the ITPA subtests, were able to achieve strong GARS gains in these channels. Figure 7 shows that the highest gainers in visual closure improved most in the Mood cluster while once again those deficient in Automatic level gains on the ITPA, were able to achieve on the GARS by way of visual memory. These Figures (5, 6 and 7) indicate that, a) children who made the greatest gains on the Representational level of development as measured over time by the ITPA pre- and post subtests, also made the highest receptive-expressive gains in line, shape and mood as measured by the GARS. b) Children who made the least gains on the Automatic level of ability as measured by the ITPA were able to make

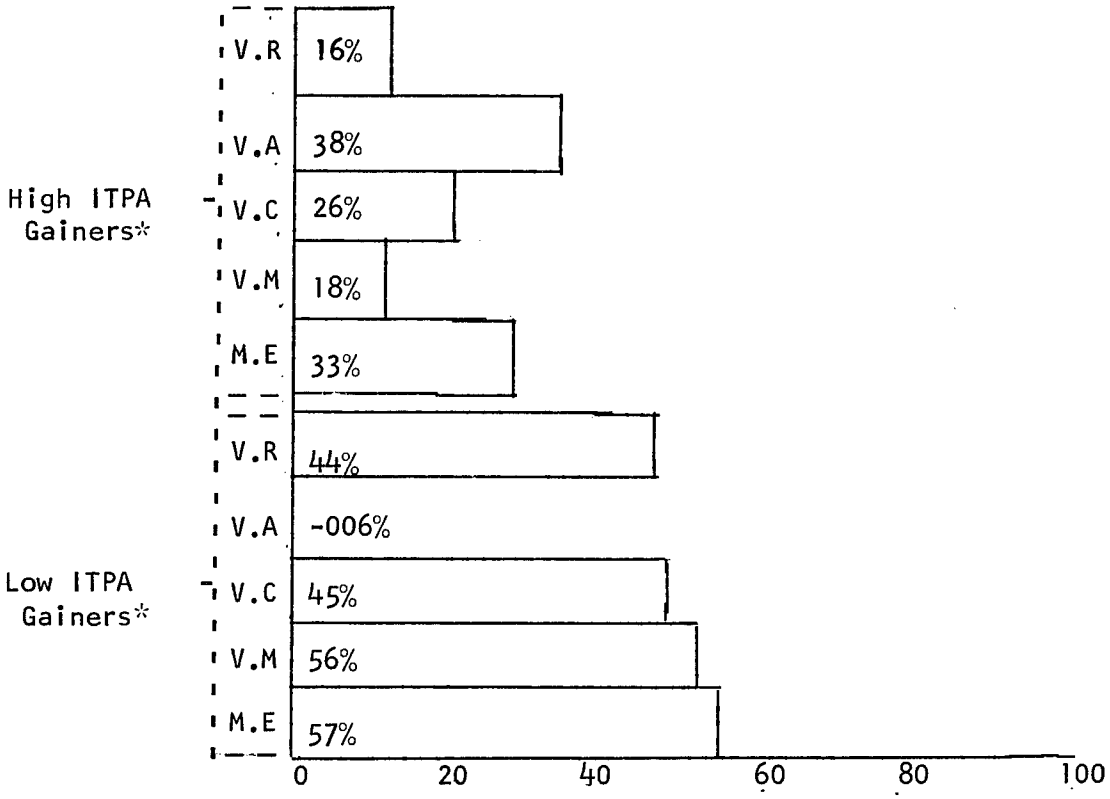

Figure 5. A COMPARISON OF IMPROVEMENT ON THE GARS CLUSTER I: LINE FOR HIGH AND LOW ITPA GAINERS (PRE - AND POST-TEST)

*N = 5
*N = 5

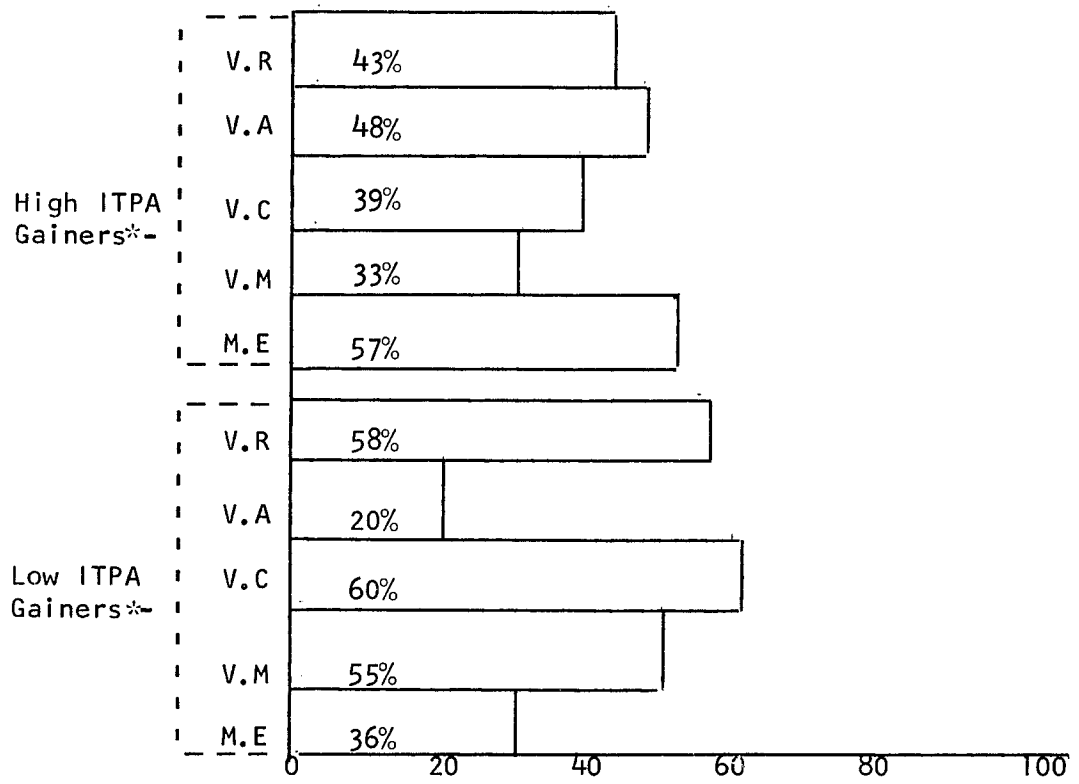

Figure 6. A COMPARISON OF IMPROVEMENT ON THE GARS CLUSTER II: SHAPE FOR HIGH AND LOW ITPA GAINERS (PRE— AND POST-TEST)

*N = 5
*N = 5

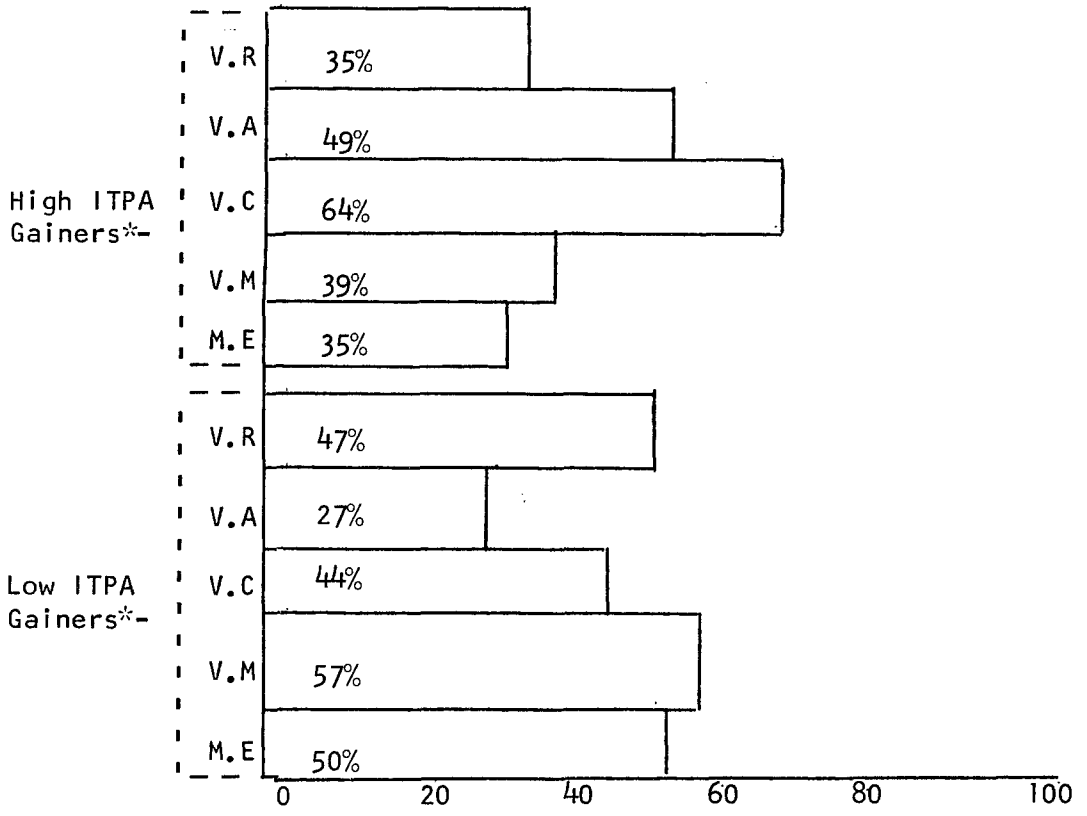

Figure 7. A COMPARISON OF IMPROVEMENT ON THE GARS CLUSTER III: MOOD FOR HIGH AND LOW ITPA GAINERS (PRE— AND POST-TEST)

*N = 5
*N = 5

the greatest gains in line, shape and mood, as measured by the GARS.

The following tables present a brief summation of the actual item distribution of the GARS data according to the five psycholingustic channels of decoding and encoding. Tables XI and XII show the distribution that occurred in all GARS clusters for children who scored highest and lowest on the five ITPA post-tests.

Table XI describes the pattern of learning channels for children who scored high after GMVR training. It is observed that almost all learning of GARS items took place in the visual association channel. Among this group, only structure (item 14) and Balance (item 16) were learned in the manual expression channel, related shapes were learned through visual closure and constrasting shapes were remembered through visual memory. Table XII demonstrates the opposite of this. Visual memory was the major learning channel of children who had the lowest ITPA post-test scores. Therefore, the children whose scores showed that they were not able to perform well on tests such as the ITPA, could achieve significantly on the GARS, through their Automatic level responses. As Table XII shows, most of the art-based behaviors taught by the GMVR were learned through the Automatic channel of visual memory.

Table XIII and XIV shows the item distribution in GARS clusters for children who gained the most between pre and post ITPA subtests, and those who gained the least. Table XIII describes the pattern of learning channels for children who made the greatest gains. The level on which these children achieved their learning behaviors was the

TABLE XI

ITEM DISTRIBUTION IN GARS CLUSTERS
AMONG HIGH ITPA SCORERS*
AFTER GMVR TREATMENT

Vis.Rec.	Vis.Assoc.	Vis.Closr.	Vis.Mem.	Man.Expr.
	Rel.Line(1)* Con.Line(3) Calligr.(9) Rhythm (10) LineVar.(11) Texture(13) ShapTrans(17) Color (19) Mood (5) Lt.andDk.(12) Detail (15) Symbols (18)	Rel.Shap(2)	Con.Shap(4)	Structr (14) Balance (16)

*Top quartile N=5
*All numbers in parenthesis refer to specific GARS items

TABLE XII

ITEM DISTRIBUTION IN GARS CLUSTERS
AMONG LOW ITPA SCORERS*
AFTER GMVR TREATMENT

Vis.Rec.	Vis.Assoc.	Vis.Closr.	Vis.Mem.	Man.Expr.
Calligr.(9)	Con.Line(3) Rhythm (10) Balance(16)	Ltand Dk(12) Symbols(18)	Rel.Line(1) LineVar(11) Texture(13) RelShap(2) Structr(14) ShapTrans(17) Color (19) Mood (5) Detail (15)	Cont.Shap(4)

* Bottom quartile N=5

TABLE XIII

ITEM DISTRIBUTION IN GARS CLUSTERS
AMONG HIGH ITPA GAINERS*
AFTER GMVR TREATMENT

Vis.Rec.	Vis.Assoc.	Vis.Closr.	Vis.Mem.	Man.Expr.
Rel.Shape(2)*	Rel.line(1)	LineVar.(11)		Calligrpy (9)
Mood (5)	Con.line(3)	Texture (13)		Con.Shape (4)
Lt.andDk.(12)	Rhythm (10)	Symbols (18)		Strctr. (14)
	Detail (15)			Balance (16)
	Color (19)			Shp.Trans.(17)

*Top quartile N=5
*All numbers in parenthesis refer to specific GARS items

TABLE XIV

ITEM DISTRIBUTION IN GARS CLUSTERS
AMONG LOW ITPA GAINERS*
AFTER GMVR TREATMENT

Vis.Rec.	Vis.Assoc.	Vis.Closr.	Vis.Mem.	Man.Expr.
Con.Line(3)		Rel.Shap(2)	Calligr.(9)	Rel.Line(1)
Con.Shap(4)		Shap.Trans(17)	Rhythm (10)	LineVar(11)
Color (19)		Mood (5)	Structr.(14)	Texture(13)
			Balance (16)	
			Lt.and Dk(12)	
			Detail (15)	
			Symbols (18)	

*Bottom quartile N=5

Representational, with visual association and manual expression being the major channels. The children who gained the least in psycholinguistic ability, as measured by the ITPA pre- and post-tests, achieved GARS gains in the Automatic level channels of visual closure and visual memory.

Summary

The analysis of the data indicate that there was a large and significant improvement made between pre- and post-tests in all catagories. T-tests and fractional improvements bear this out for all ITPA subtests as well as for the GARS, which also showed significant differences between all pre- and post-test scores per item. High positive intercorrelations were found between most of the ITPA subtests. The Gair Art Rating Scale correlated consistantly negative with all ITPA subtests except for the motor encoding test of Manual Expression where a low positive correlation was found with the GARS. An item analysis of the GARS revealed that clusters were formed concerning the properties of Line, Shape and Mood, and that the items within each cluster correlated highly with each other. In a comparison of achievement as measured by the GARS after GMVR training, the following data could be observed: 1) The top quartile of ITPA post-test scorers made significant gains in GARS scores in the Representational level of psycholinguistic ability. 2) The bottom quartile of ITPA post-test scorers made significant gains in GARS scores in the Automatic level of psycholinguistic ability. 3) The top quartile of ITPA pre- and post-test gainers made significant gains in GARS scores in the Representational level of psycholinguistic ability. 4) The bottom quartile of ITPA pre- and post-test gainers made significant gains in GARS scores in the Automatic level of psycholinguistic ability.

This chapter has presented data that provide answers to the six hypotheses posed by the initial problem.

Hypothesis I. This hypothesis stated that as result of an art-based visual perception program, the visual reception scores of learning disabled children, as measured by the ITPA, will be significantly changed. The data presented in the analysis indicate that the GMVR program has significantly effected the visual reception of the twenty learning disabled children as measured by the Visual Reception subtest of the ITPA.

Hypothesis II. This hypothesis stated that as a result of an art-based visual perception program, the visual association scores of learning disabled children, as measured by the ITPA, will be significantly changed. The data presented in the analysis indicate that the GMVR program has significantly effected the visual association of the twenty learning disabled children as measured by the Visual Association subtest of the ITPA.

Hypothesis III. This hypothesis stated that as a result of an art-based visual perception program, the visual closure scores of learning disabled children, as measured by the ITPA, will be significantly changed. The data presented in the analysis indicate that the GMVR program has significantly effected the visual closure of the twenty learning disabled children as measured by the Visual Closure subtest of the ITPA.

Hypothesis IV. This hypothesis stated that as a result of an art-based visual perception program, the visual sequential memory scores of learning disabled children, as measured by the ITPA, will be significantly changed. The data presented in the analysis indicate that the GMVR program has significantly effected the visual sequential memory of the twenty learning disabled children as measured by the Visual Memory subtest of the ITPA.

Hypothesis V. This hypothesis stated that as a result of an art-based visual perception program, the manual expression scores of learning disabled children, as measured by the ITPA, will be significantly changed. The data presented in the analysis indicate that the GMVR program has significantly effected the manual expression of the twenty learning disabled children as measured by the Manual Expression subtest of the ITPA.

Hypothesis VI. This hypothesis stated that as a result of an art-based visual perception program, the receptive-expressive performance of learning disabled children, as measured by the Gair Art Test and Gair Art Rating Scale will be significantly changed. The data presented in the analysis indicate that the GMVR program has significantly effected the receptive-expressive performance of the twenty learning disabled children as measured by the Gair Art Test and Gair Art Rating Scale.

CHAPTER VI.

SUMMARY, DISCUSSION AND CONCLUSIONS

The final chapter summarizes and discusses the study, presenting conclusions and interpretations that are based on the findings. Implications for the field of education are discussed as well as some suggestions and recommendations for future research.

Summary

The Problem. The problem undertaken in this study has been concerned with the effects of an art-based visual perception program on selected psycholinguistic abilities of learning disabled children, as measured by the ITPA. It is also concerned with the effects of this program on the receptive-expressive performance of these children, as measured by the Gair Art Test and Rating Scale (GARS). This study attempted to investigate the concept of a visual expression channel of psycholinguistic ability. It used the Gair Method of Visual Remediation (GMVR) to develop this channel and thereby effect a change in the scores of the twenty children studied.

The Study

The GMVR program, and its evaluative instruments the Gair Art Test and Rating Scale (GARS) took four years to develop. It grew out of the need for a synthesis of the psychology of perception and art education, on the elementary school level. The information processing

model of psycholinguistic abilities, as developed by Kirk and McCarthy, provided the rational base for this synthesis. Within the framework of the ITPA model, the entire process of receiving, organizing and expressing visual and auditory information was observed, on a continuum from ability to disability. Art education had been concerned with some of these problems for many years (McFee, Salome, Wilson, McWhinnie), however, no comprehensive program of art-based visual perception learning was developed that centered around the psycholinguistic channels of ability.

The GMVR defined the perceptual needs of children and integrated them with art-learning behaviors. It considered what was termed, the "visual expression channel" of psycholinguistic ability, functioning on both the Automatic and Representational response levels. For example, the need to recognize differences and similarities in form was defined in terms of visual patterns. The need to differentiate a figure from a complicated ground was learned through manipulation of form in space. The need to scan and focus was learned through aesthetic identification, and the need to deal with part-whole relationship was developed through structure. These synthesization procedures led to the concepts that became the foundation for the GMVR. Each concept involved the child in looking, speaking, perceiving and doing that resulted in a series of finished task products. The Gair Art Test was administered immediately before and after the program along with the five visual sub-tests of the ITPA. The Gair Art Rating Scale was used to measure, numerically, the task products of the Gair Art Test, and evaluate how much each child had learned during the GMVR program. The twenty item

scale stated the visual expressive criteria in simple sentences (see Appendix B) and the rater identified these behaviors in the product at hand. At the conclusion of the program three noted experts in the field of art education (see methodology) each judged the 80 task products.

The ITPA was used to evaluate the impact of the GMVR on the visual psycholinguistic abilities of the twenty children, and the GARS evaluated their receptive-expressive performance. The data indicate that the GMVR was able to raise both the ITPA and GARS scores. Within the seven weeks of teaching, visual reception, visual association, visual closure, visual memory and manual expression scores had been measureably effected along with the receptive-expressive performance level of the children.

In the course of this study, several precautions were taken in order to prevent bias. The teacher who administered the GMVR was briefed so as to familiarize herself with the materials, methods and procedures of the program. She was provided with a "Teacher's Manual" that outlined the program and included rational, sequences, vocabularies, materials and summaries of each developmental task. However, after this initial training period, no further instructions were given. Once the program had begun, no attempt was made to interfere with the teacher's presentation. Another precautionary measure that was taken concerned the pre and post Gair Art Test products. Upon completion of the program, these products were coded and subsequently re-coded by an impartial aide. Neither the three judges using the GARS, nor the researcher, had any knowledge of which products represented the pre- or post-tests.

In order to evaluate the program, all pre- and post-test data were submitted to statistical analysis. This included t-tests for each of the ITPA subtests, the total means and the GARS. The t-test for significant difference was performed on all twenty GARS items as well. The results of these tests, plus the Wilcox on Matched-Pairs Signed Rank test, indicated a significant change in all scores after GMVR training. The two correlations performed on the data were the Pearson Product Moment and Kendall-Rank Coefficent. These correlations determined that as the ITPA post-test scores rose after training, so did the GARS. However, the GARS consistantly showed negative correlations with the ITPA, indicating that one was measuring a set of abilities that the other was not. It was this observation that led to the in-depth study of the inter-correlations of the GARS items.

An item analysis was completed on the GARS data, which indicated that certain items with high inter-correlations fell into specific patterns, or clusters. These clusters were concerned with Line, Shape and Mood, and contained items that correlated highly within the cluster, but not with items outside of it. This analysis led to the final phase of the study involving a comparison of GARS gains in high and low ITPA post-test scorers, and high and low ITPA gainers. This fractional study was performed in order to discover which psycholinguistic channel the children used in learning about line, shape and mood (the three cluster areas). It was noted that the children scoring highest on the ITPA were not necessarily those who made the greatest gains and this was reflected in the GARS comparisons. The children scoring highest in visual

association on the ITPA, made the greatest GARS gains through this psycholinguistic channel. The children scoring lowest on the automatic level of the ITPA, made the greatest GARS gains through these learning channels. When considering the amount of gain between ITPA pre- and post-tests, a similar pattern of learning behaviors was evidenced. Children who gained most on the Representational level, (e.g. visual association) as measured by the ITPA, used these channels to best advantage when learning GARS cluster items. Conversely, children who gained least on the automatic level (e.g. visual memory and visual closure), as measured by the ITPA, were able to make the greatest receptive-expressive gains, as measured by the GARS.

This analysis seems to indicate that the GARS is sensitive to areas of learning that the ITPA is not measuring. Receptive-expressive learning, as measured by GARS, appears to take place on both Representational and Automatic levels, in children who are evidencing strength on one level and deficiency on the other. The GMVR has effected perceptual behaviors in channels where the child has shown psycholinguistic ability, however, it can also effect learning in a channel where psycholinguistic ability is not measured (e.g. by tests such as ITPA). This learning channel could be called "visual expression."

The preceding data has attempted to answer the questions posed by the initial problem. The results of this study have provided insights into the effects of a multi-dimensional program on certain aspects of the

learning process. The GMVR has measurably effected specific psycholinguistic abilities and receptive-expressive performance levels. Learning and achievement gains have been allowed in the twenty learning disabled children who received the program. What appears to be most critical to this study is 1) the program provided a channel for learning and achieving, and 2) it was able to remediate learning disabilities.

Discussion and Conclusions

This study has served to evaluate the effects of an art-based visual perception program called the GMVR (Gair Method of Visual Remediation). Significant gains were made on ITPA and GARS tests that measured specific psycholinguistic abilities and receptive-expressive performance of twenty learning disabled children. Analysis of the data indicate that the GMVR dealt with a complex repetoire of behaviors. It helped children to process information through a "visual expression" channel, that functioned on both Automatic and Representational levels of learning. The ITPA scores showed that the GMVR was able to increase functioning in visual reception, visual association, visual closure, visual memory and manual expression through this type of learning. The fact that children who were highest in visual association gained GMVR behaviors best in this channel, and children lowest in visual memory gained GMVR behaviors best in this channel, indicated that the program was reaching children on both Representational and Automatic levels of psycholinguistic ability. Since the GMVR was not confounded by any other training of this type during the intervention period, and pre- and post-testing was performed immediately before and after the program, we can assume that the GMVR had a significant effect on the scores of the children.

The changes in GARS correlation patterns before and after training indicated that the twenty GARS items acted as good predictors and were not stable under treatment. Since the GARS was designed to test for the effects of a teaching program, correlation changes are expected if teaching is successful. This raised the question regarding what abilities the GARS was actually measuring. The cluster analysis was performed for this purpose. It reflected the subtle relationships between perceptual and art behaviors that the GMVR had taught and the GARS had measured. The items fell into Line, Shape, and Mood clusters, based on high correlations within each cluster. It should be noted that the development of the GARS as a viable instrument rests on 1) a former study of perceptual criteria, where the scale was used to rate children's creative products, and 2) the expertise of the teacher's and judge's who used the scale over this experimental period.

This study has shown that children who are having problems with learning on one, or several levels, can make significant improvements through a program of art-based visual perception training. All data led to the conclusion that the program was not effected by the children's age, IQ or regression to the mean. However, the possibility of a "Hawthorn effect," the effect of recency and a "washout effect," must be considered in a study of this type. Even though extensive testing over time was impossible, given the nature of the children and the type of school setting, the GMVR program attempted to teach children in ways that would

last. The significant gains in ITPA and GARS scores showed that the GMVR was a process-oriented, developmental program, that taught more than compensatory techniques. As the ITPA Manual has stated..."it is the hypothesis of remediation that the rate of development of psycholinguistic abilities can be changed by intervention." The GMVR has been able to change the rate of development of learning disabled children as measured by two different types of instruments. The ITPA dealth with change in psycholinguistic visual abilities, the GARS dealt with change in receptive-expressive performance. In both cases, the GMVR intervened and also remediated.

It is the conclusion of this study that the GMVR served as a developmental educational activity that explored a channel of psycholinguistic ability called visual expression. This area of communication has not been researched by the ITPA studies, nor has it been considered as a prime learning channel. The GMVR utilized this channel through the technique of synthesizing the learned behaviors inherent in the psychology of perception and art education. The concept behind this process was perceptual integration, where the visual-verbal and visual-motor channels were linked together and focused through a performance-based visual expression program. It was to build a developmental program of perceptual integration that the seven basic concepts of the GMVR were defined. It is possible to conclude, as a result of this study, that the reason the GMVR was able to change the rate of development and remediate specific learning disabilities, was because the need for perceptual integration had been met.

Recommendations for Further Study

Studies in the combined fields of psycholinguistics, psychology and art education are very new. There has been no concentrated research in the area of perceptual integration through art, as a possible approach to teaching and learning. This study has provided some insights into the potential role of a visual expression channel as part of the total communication process. Much more research is needed, if this concept is to become a viable part of the psycholinguistic learning model.

The work on the GARS clusters pointed to a beginning in the exploration of art-based behaviors and perceptual training in line, shape and mood. The concerns of education regarding the pre-cursors of reading and writing could be explored within these discrete criteria. Perceptual learning, within an art context, has been shown to be trainable and measureable on both Representational and Automatic learning levels. This should be studied in much greater depth.

The GMVR data indicate the potential that art-based learning has in reaching children on the non-cognitive, pre-formal level, as well as the logical-conceptual level. Future research must strive to discover exactly what the visual expression channel consists of, that enables it to deal so well with both of these learning levels. The present study suggests that perceptual integration provides a major clue to this question. It futher suggests, that if educators recognize the importance of developing this ability, research must begin to remove the barriers between the disciplines. Remediation procedures cannot separate motor

learning from tactile discrimination, and visual from verbal learning, without teaching re-integration of these abilities. This is as true for the so-called "normal" child as it is for the learning disabled. Education must become integrative so that it can be internalized in this way.

It is recommended that this study be attempted again in other circumstances and with many different groups. Both higher and lower levels of the program are now being developed so as to provide children with more than a sporadic program of intensified training. A component for teacher taining is being explored, whereby the visual expression channel will be used by teachers, in preparation for the classroom experience.

It is further recommended that a study be conducted in order to identify which element of the GMVR program was able to effect the greatest learning. The slides, tapes, vocabularies, developmental tasks, or perhaps a combination of these things tended to foster perceptual integration. Additional research in these areas is necessary if the GMVR program is to become a useful educational tool.

BIBLIOGRAPHY

BIBLIOGRAPHY

Allen, W.H. "Audio-Visual Communication", Encyclopedia of Educational Research, 3rd Edition, New York: Macmillan Co., 1960.

Arnheim, Rudolph. "The Study of Visual Factors in Concept Formation", U.S. Office of Education Final Report, E.E.C. 1-6-061741-1196, 1968.

Barrett, Gerald V. et al. "Relation of Perceptual Style to Measures Of Visual Functioning", Perceptual and Motor Skills, Vo. 25, 1967.

Barrett, Thomas C. "The Relationship between Selected Reading Readiness Measures of Visual Discrimination and First Grade Reading Achievement". Unpublished Doctoral Dissertation, University of Minnesota, 1965.

Bjorkman, M. "Predictive behavior: Aspects based on an ecological orientation". Scandinavian Journal of Psychology, Vo. 7, 1966.

Brown, L.F. and Rice, J.A. "Psycholinguistic Differentation of Low IQ Child". Mental Retardation, 1967 5, 16-20.

Brouch, V.M. "An Experimental Study of the Effects of Synchronized Slide-Tape Learning Experience on Tempra Painting of 3rd and 4th Grade Children", N.A.E.A. Journal Vol. 12, No. 3, Spring, 1971.

Bruner, J.S., Miller, G.A. and Zimmerman, C. "Discriminative Skill and Matching in Perceptual Recognition", Journal Experimental Psychology, Vol. 49, 1955.

_____., and Postman, L. "Emotional Sectivity in Perception and Reaction," Journal of Personality, Vol. 16, 1947.

Bruning, J.L. and Kintz, B.L. Computational Handbook of Statistics. New York: Scott, Foresman & Co., 1968.

Brunswik, E. Perception and the Representative design of Psychological Experiments. Berkeley, California: University of California Press, 1965.

_____. "Representative Design and Probabilistic Theory in a Functional Psychology." Psychological Review, Vol. 62, 1955.

Bryant, A.P. and Schwan, L.B. "Art and the Mentally Retarded Child". Studies in Art Education, Vo. 12 (3), 1971.

Carter, J.S. "Creative Art for Minimally Brain-Injured Children." Academic Therapy, Report 8, 1971.

Cripe, A.G. Auditory and Visual Learning Related to ITPA Sensory Channels Ph.D. Purdue University, 1966. D.A.: 27: 635B

Downie, N.M. and Heath, R.W. Basic Statistical Methods 3rd edition. New York: Harper and Row, 1970.

Efland, Arthur D. "An Examination of Perception-Delineation Theory". N.A.E.A. Journal, Vol. 8, No. 2, Spring 1967.

Eisner, E.W. "The Drawings of the Disadvantaged: A Comparative Study", Studies in Art Education, Vol. 2 (1), 1969.

Gaitskell, D. and Gaitskell, M.R. "Art Education for Slow Learners. Peoria, Illinois: Bennet & Co., 1953.

Gibson, Eleanor J. Principles of Perceptual Learning and Development. New York: Appleton-Century-Crofts 1969, Chapters 1-6.

Gibson, J.J. "Ecological Optics", Vision Research, Vol 1, 1961.

_____. and Gibson, E.J. "Perceptual Learning: Differential or Enrichment"? Psychological Review, 1955.

Gliner, C.R., Pick, A.D., Pick, H.L. and Hales, J.J. "A developmental investigation of visual and haptic preferences for shape and texture". Monographs of the Society for Research in Child Development, 1969. Vol. 34, No. 130.

Golden, N.E. and Steiner, S.R. Auditory and Visual Functions in Good and Poor Readers. Journal of Learning Disabilities, 1969, 2, pp.46-51.

Grossman, Marvin. "Perceptual Style, Creativity and Various Drawing Abilities". N.A.E.A. Journal, Vol 11, No. 2, Winter 1970.

Guilford, J.P. Fundamental Statistics in Psychology and Education. New York: McGraw Hill Co. 4th edition, 1965.

Hirshoren, A. "A Comparison of the Predictive Validity of the Revised Stanford-Binet Intelligence Scale and the Illinois Test of Psycholinguistic Abilities." Exceptional Children, 1969, 35, pp. 517-521. a._____., Response to Ten Brink's Critigue, Exceptional Children, 1969, 35, pp. 354-356.

Ittleson, W.H. The Ames Demonstrations in Perception. Princeton, New Jersey: Princeton University Press, 1952.

Kannegieter, R.B. "The Effects of a Learning Program upon the visual perception of Shape", N.A.E.A. Journal, Vol. 12, No. 2 Winter 1971

Kass, C.E. "Psycholinguistic Disabilities of Children with Reading Problems." Exceptional Children, 1966, 32, 533-539.

Kirk, S.A., McCarthy, James J. and Kirk, W.D. Examiners Manuel ITPA, Revised Edition, Urbana, Illinois, 1968.

_____., McCarthy, J.J., and Kirk, W.D. The Illinois Test of Psycholinguistic Abilities: Revised edition (Urbana, Illinois: University of Illinois Press, 1968.

Koffka, K. Principles of Gestalt Psychology. New York: Harcourt, Brace, 1935.

Kohler, W. Gestalt Psychology. New York: Liveright, 1929.

Lombardi, T.P. "Psycholinguistic Abilities of Pagago Indian School Children". Exceptional Children, 36, 1970, 485-494.

Lovano, Jessie J. "The Relation of Conceptural Style and Mode of Perception to Graphic Expression". Studies in Art Education, Vol. 11, No. 3, Spring 1970.

Lovano-Kerr, J., and Savage, S. "Incremental Art Curriculum for the Mentally Retarded," Exceptional Children, Vol. 39, No. 3, 1972.

Lowenfield, Viktor, Creative and Mental Growth, New York: Macmillan Co., 1957.

_____. "Test for Visual and Haptical Attitude," American Journal of Psychology, No. 58. 1945.

McCarthy, J.J. and Kirk, S.A. "The Illinois Test of Psycholinguistic Abilities. Examiner's manual. Urbana: University of Illinois Press, 1968. (2nd Edition)

McFee, June King, Preparation for Art, Belmont, California: Wadsworth, 1961.

_____. "Perception-Delineation Theory", unpublished doctoral dissertation, Stanford University, California, 1957.

McWhinnie, Harold J. "The Effects of a Learning Experience Upon the Preference for Complexity-Assymetry in Children's Drawing" unpublished Doctoral Dissertation, Stanford University, 1965.

Mickish, V.L. "The Relationship of Art Viewing Skills and Artistic Visual Perception", unpublished Doctoral Dissertation, Arizona State University, Tempe, Arizona, 1970.

Northman, John E. and Black, K.N. "Ontogeny of Visual and Haptic-tactual information processing", Purdue University, 1971.

O'Grady, D.J. Psycholinguistic Abilities in Primary School Age Children with Learning Disabilities. Ph.D., 1968, University of Cincinnati. D.A.: 29-1848B.

Oltman, Philip K. and Capobianco, F. "Field Independence and Eye Movement", Perceptual and Motor Skills, Vol. 25, 1967.

Paraskevopoulos, John N. and Kirk, S.A. The Development and Psychometric Characteristics of the Revised Illinois Test of Psycholinguistic Abilities (Urbana, Illinois: University of Illinois Press, 1969)

Piaget, Jean. and Inhelder, B. The Child's Conception of Space. London: Routledge and Kegan Paul, 1956.

Pillsbury, Judson A. "E.G.G. correlates of Perceptual Style: Field Orientation", Psychomatic Medicine, Vol. 29, No. 5, 1967.

Rosen, Carl L. "Study of Visual Perception Capabilities of First Grade Pupils and the Relationship Between Visual Perception Training and Reading Achievement", unpublished Doctoral Dissertation, University of Minnesota, 1965.

Rouse, Mary J. "A New Look at an Old Theory", N.A.E.A. Journal, Vol. 7, No. 1. Autumn 1965.

Rudin, S.A. "Figure-ground Differentiation Under Differing Perceptual Sets," Perceptual and Motor Skills, Vol. 27, 1968.

Ryckman, D.B. and Wiegerink, R. "The Factors of the Illinois Test of Psycholinguistic Abilities: A Comparison of 18 Factor Analyses." Exceptional Children, 1969, 36.

Salome, Richard A. "Perceptual Training in Reading Readiness and Implication for Art Education", Studies in Art Education, Vol. 10, No. 1, Fall 1968.

_____. "The Effects of Perceptual Training Upon the Two-Dimensional Drawings of Children", Studies in Art Education, Vol. 7, No. 1, Autumn 1965.

Schachtel, E. Metamorphasis. New York: Basic Books, 1959.

Smith, D.M. and Bolyard, A.J. "Interaction of Words and Non Wordal Stimuli in Programmed Sequences of Concept Formation Tasks", A.V. Communication Review, Vol. 14, Winter 1966.

Solley, C.M. and Murphy, G. Development of the Perceptual World. New York: Basic Books, 1960.

Swearenger, M.B.M. The Psycholinguistic Abilities of Beginning First-Grade Children and their Relationship to Reading Achievement. Ed.D., 1966, The University of New Mexico. D.A.: 27-1808A.

Ten Brink, T.D. "Critique of Hirshoren's ITPA Validity Study," Exceptional Children, 35, 1969, 351-354.

Vernon, M.D. "Cognitive Inference in Perceptual Activity." British Journal of Psychology, Vol. 48, 1957.

_____. "The Functions of Schemata in Perceiving", Psychological Review, Vol. 62, 1955.

Werner, H. Comparative Psychology of Mental Development, New York: Science Editions, 1961 (revised edition).

Wiggin, R.G. "Art Activities for Mentally Handicapped Children," Studies in Art Education, 1961, Vol. 2, (1).

Wilson, B.G. "Experimental Study to Alter Students Perception of Paintings", N.A.E.A. Journal, Vol 8, Autumn, 1966.

Wisland, M. and Many, W.A. "A Factorial Study of the Illinois Test of Psycholinguistic Abilities with Children Having Above Average Intelligence." Editional and Psychological Measurement, 29, 1969, 367-376.

Witkin, H.A., Dyke, R.B. et al. Psychological Differentiation, New York: John Wiley and Sons, 1961.

_____., Lewis, H.B. et al. Personality Through Perception New York: Harper and Row, 1954.

_____. and Oltman, P. "Cognitive Style", International Journal of Neurology, Vol. 2, 1967.

APPENDICES

APPENDIX A

TABULATIONS OF DATA

The following tables and figures included raw data, scaled scores, detailed descriptive tabulations and data supporting references from the text.

TABLE 1.

DATA MATRIX AND TALLY FOR ITPA SUBTEST SCORES, SUBTEST MEANS AND GARS

S's	V.R.		V.A.		V.C.		V.M.		M.E.		GARS		MEANS	
1.	20,	36,	28,	36,	42,	55,	28,	32,	36,	40,	222,	250,	33.2,	39.4
2.	33,	33,	32,	33,	30,	37,	30,	40,	26,	33,	217,	305,	30.2,	36.2
3.	34,	41,	36,	40,	35,	42,	42,	60,	33,	38,	224,	259,	36.0,	44.2
4.	19,	24,	25,	33,	26,	24,	25,	20,	24,	29,	193,	231,	23.8,	28.8
5.	41,	46,	34,	34,	40,	51,	35,	44,	33,	39,	230,	249,	36.6,	42.8
6.	18,	23,	24,	27,	19,	25,	22,	28,	20,	32,	202,	335,	20.6,	27.0
7.	19,	38,	35,	37,	27,	30,	35,	41,	31,	31,	161,	191,	29.4,	33.6
8.	32,	40,	31,	43,	35,	46,	39,	45,	38,	39,	206,	346,	33.0,	42.6
9.	27,	41,	28,	30,	20,	28,	19,	27,	34,	38,	253,	300,	25.6,	32.8
10.	43,	50,	34,	34,	40,	44,	32,	49,	20,	40,	172,	190,	38.8,	43.4
11.	37,	41,	36,	40,	34,	41,	34,	34,	34,	41,	139,	217,	35.0,	39.4
12.	27,	27,	25,	40,	28,	32,	31,	36,	24,	29,	202,	267,	27.0,	32.8
13.	34,	37,	34,	37,	32,	45,	32,	32,	33,	39,	165,	243,	33.0,	38.0
14.	40,	45,	25,	47,	54,	56,	27,	27,	48,	51,	149,	320,	38.6,	41.2
15.	32,	32,	28,	34,	34,	39,	24,	24,	34,	34,	221,	277,	28.4,	32.6
16.	40,	43,	43,	43,	46,	55,	56,	64,	27,	41,	152,	204,	42.4,	50.2
17.	37,	40,	32,	43,	32,	37,	36,	46,	36,	41,	146,	247,	34.6,	42.4
18.	35,	41,	24,	30,	27,	32,	16,	30,	30,	38,	222,	320,	29.2,	31.4
19.	38,	42,	33,	42,	49,	54,	26,	35,	36,	41,	141,	273,	37.4,	42.8
20.	34,	40,	27,	29,	39,	50,	33,	33,	27,	38,	176,	269,	32.2,	38.0

	MEAN	MAXIMUM	MINIMUM	RANGE
1. Vis.Rec,pre	32.000	43.000	18.000	25.000
2. Vis.Rec.post	33.100	50.000	23.000	27.000
3. Vis.Assoc.pre	30.150	43.000	20.000	23.000
4. Vis Assoc.post	37.100	48.000	27.000	21.000
5. Vis.Clo.pre	34.450	54.000	19.000	35.000
6. Vis.Clo.post	41.150	56.000	24.000	32.000
7. Vis.Mem. pre	31.100	56.000	16.000	40.000
8. Vis.Mem.post	37.300	64.000	24.000	40.000
9. Man.Exp.pre	30.950	48.000	20.000	28.000
10. Man.Exp.post	37.600	51.000	29.000	22.000
11. GARS pre	192.150	253.000	141.000	112.000
12. GARS post	263.150	346.000	190.000	156.000
13. Means pre	32.000	42.400	20.600	21.800
14. Means post	37.950	50.200	27.000	23.200

VARIANCE	STD. DEV.	STD. ERROR	MAD
61.368	7.834	1.752	6.200
56.200	7.497	1.676	5.780
39.292	6.268	1.402	5.335
34.305	5.857	1.310	4.710
82.631	9.093	2.033	6.995
107.924	10.389	2.323	8.650
77.252	8.789	1.965	6.300
118.434	10.885	2.434	8.660
42.366	6.509	1.455	4.960
26.358	5.134	1.148	3.760
1072.238	32.745	7.322	27.835
2265.396	47.596	10.643	33.050
28.130	5.304	1.186	4.180
35.381	5.948	1.330	4.864

TABLE 2

DATA MATRIX FOR PRE AND POST TEST SCORES
FOR ALL SUBJECTS ON ALL 20 ITEMS

	Reline	Rel.Shape	Con.Line	Con.Shape	Mood	Shape	Neg.Space	Outline	Calligr.	Rhythm	Line Var.	Lt.Dk.	Textr.	Structr.	Detail	Balance	Transfm.	Symbls.	Color	Transpr.
1.	19,13	09,22	11,03	07,11	14,14	06,08	10,09	08,16	19,11	20,19	09,10	06,03	06,09	13,15	10,13	16,19	11,12	06,13	11,16	06,06
2.	09,09	17,23	06,09	11,24	12,17	06,10	11,20	11,19	07,10	14,22	07,11	12,14	09,09	16,20	11,14	18,22	09,17	07,09	18,19	06,06
3.	09,11	16,15	03,03	09,15	13,14	07,11	10,16	14,19	10,07	14,17	10,03	08,12	13,12	12,13	12,14	16,21	12,12	12,10	14,19	07,07
4.	03,11	09,16	11,09	03,09	08,08	07,07	09,09	10,14	12,03	14,13	03,07	06,10	03,10	10,14	10,03	14,12	10,13	09,06	13,12	09,07
5.	15,11	20,22	08,06	10,15	10,14	07,14	09,13	14,14	10,03	17,17	08,07	09,12	06,03	16,16	09,11	21,17	13,17	08,09	09,11	06,10
6.	14,10	06,22	13,13	03,13	11,15	07,14	12,13	07,14	11,03	16,22	11,17	06,17	03,16	09,20	11,21	13,22	07,21	10,14	15,15	07,09
7.	07,07	10,19	06,06	13,12	03,10	06,03	03,07	11,14	06,06	07,03	07,06	07,07	07,07	09,15	07,03	15,19	06,11	06,06	07,09	03,06
8.	16,17	17,21	06,16	06,23	11,19	06,11	11,16	15,15	06,14	14,19	07,13	06,15	06,16	16,17	03,23	20,21	14,14	06,23	09,23	06,10
9.	11,14	22,19	03,11	13,17	12,19	11,11	12,21	21,20	12,06	19,20	10,03	07,17	03,11	20,13	13,16	20,24	13,14	06,17	07,11	03,06
10.	13,09	03,11	06,03	07,10	03,12	07,06	03,07	11,11	07,06	13,11	07,06	06,06	07,07	13,09	03,13	12,16	09,14	07,16	09,11	06,06
11.	13,09	13,13	11,06	10,16	11,11	061_	15,11	11,09	06,06	13,14	07,06	07,13	06,09	10,12	10,10	15,16	11,09	06,09	06,10	06,06
12.	17,15	15,17	06,11	06,17	07,15	06,09	10,16	13,15	09,03	15,17	03,07	06,16	06,10	19,16	07,14	19,13	13,16	06,14	03,10	06,06
13.	03,15	12,16	06,14	13,16	03,11	06,09	03,14	13,17	07,12	10,15	06,07	06,06	07,03	09,17	03,10	10,20	07,15	06,09	08,08	06,06
14.	03,16	06,13	06,13	10,15	06,21	06,10	03,17	10,15	09,14	10,19	06,14	07,15	06,17	09,10	06,21	10,24	06,17	07,10	07,11	06,13
15.	13,15	16,22	03,06	10,16	13,14	06,15	07,15	15,10	11,03	15,22	07,10	14,13	07,12	14,17	09,15	10,10	10,16	10,07	12,17	06,08
16.	06,16	11,16	06,03	06,11	06,08	06,11	03,12	11,12	06,06	09,13	03,07	06,03	06,06	09,13	06,07	14,17	09,13	06,07	07,07	06,06
17.	06,13	09,16	07,15	03,14	06,11	06,12	06,12	03,15	03,13	07,17	06,11	06,06	06,07	06,14	11,11	10,17	07,12	03,11	08,10	06,07
18.	13,20	17,13	07,17	11,16	11,18	06,07	09,17	14,14	12,09	15,22	08,09	06,14	10,07	14,19	15,20	15,22	11,15	12,23	14,21	07,07
19.	06,17	06,13	06,10	09,14	06.14	06,13	06,14	12,17	07,09	10,20	07,07	06,09	06,12	06,20	09,15	03,20	07,17	06,12	06,09	06,06
20.	11,17	09,16	12,19	12,17	07,13	06,03	06,13	13,20	09,16	11,22	03,03	06,06	06,10	07,13	03,14	12,19	09,13	10,06	03,03	06,06

TABLE 3.

TALLY FOR GARS PRE AND POST TEST SCORES ON ALL 20 ITEMS

	TOTAL	MEAN	MAXIMUM	MINIMUM	RANGE
1. Rel.Line -	222.000	11.100	17.000	5.000	13.000
	284.000	14.200	20.000	7.000	13.000
2. Rel.Shape-	244.000	12.200	22.000	6.000	16.000
	360.000	18.000	23.000	11.000	12.000
3. Con.Line -	153.000	7.650	13.000	6.000	7.000
	218.000	10.900	19.000	6.000	13.000
4. Con.Shape-	137.000	6.850	13.000	6.000	7.000
	306.000	15.300	24.000	9.000	15.000
5. Mood -	144.000	7.200	14.000	6.000	8.000
	274.000	13.700	21.000	8.000	13.000
6. Shape -	130.000	6.500	11.000	6.000	5.000
	209.000	10.450	15.000	6.000	9.000
7. Neg.Sp. -	179.000	8.950	12.000	6.000	6.000
	289.000	14.450	21.000	7.000	14.000

VARIANCE	STD. DEV.	STD. ERROR	MAD
15.358	3.919	0.876	3.310
14.500	3.807	0.860	3.260
23.305	4.828	1.079	4.140
10.737	3.277	0.733	2.600
5.563	2.360	0.528	1.890
18.305	4.278	0.957	3.590
5.503	2.346	0.525	1.950
14.326	3.785	0.846	2.700
7.200	2.683	1.600	2.400
12.737	3.597	0.804	2.720
1.316	1.147	0.256	0.700
7.524	2.743	0.613	2.250
3.629	1.905	0.426	1.555
16.642	4.044	0.913	3.305

	TOTAL	MEAN	MAXIMUM	MINIMUM	RANGE
8. Outline -	242.000	12.100	21.000	7.000	14.000
	300.000	15.000	20.000	9.000	11.000
9. Calligr.-	134.000	6.200	19.000	6.000	13.000
	177.000	8.850	16.000	3.000	13.000
10. Rhythm -	263.000	13.150	20.000	7.000	13.000
	349.000	17.450	22.000	8.000	14.000
11. LineVar.-	155.000	7.750	11.000	6.000	5.000
	179.000	8.950	17.000	6.000	11.000
12. Lt.Dk. -	143.000	7.150	14.000	6.000	8.000
	224.000	11.200	17.000	6.000	11.000
13. Textr. -	141.000	7.050	10.000	6.000	4.000
	203.000	10.150	17.000	6.000	11.000
14. Structr.-	242.000	12.100	20.000	6.000	14.000
	319.000	15.950	20.000	9.000	11.000

VARIANCE	STD. DEV.	STD. ERROR	MAD
9.674	3.110	0.695	2.310
9.579	3.095	0.692	2.300
9.953	3.156	0.706	2.340
10.661	3.265	0.730	2.535
12.371	3.518	0.302	2.335
16.471	4.058	0.907	3.250
1.832	1.372	0.307	1.050
8.892	2.932	0.667	2.340
4.766	2.183	0.488	1.440
15.537	3.942	0.881	3.430
1.839	1.356	0.303	1.070
10.345	3.216	0.719	2.495
18.726	4.327	0.968	3.710
10.366	3.220	0.720	2.560

	TOTAL	MEAN	MAXIMUM	MINIMUM	RANGE
15. Detail -	188.000	9.400	15.000	6.000	9.000
	273.000	13.900	23.000	7.000	16.000
16. Balance -	297.000	14.850	21.000	8.000	13.000
	335.000	19.250	24.000	12.000	12.000
17. Transgm.-	198.000	9.900	18.000	6.000	12.000
	288.000	14.400	21.000	9.000	12.000
18. Symbls. -	153.000	7.650	12.000	6.000	6.000
	233.000	11.650	28.000	6.000	22.000
19. Color -	196.000	9.800	18.000	6.000	12.000
	257.000	12.850	23.000	7.000	16.000
20. Transp. -	130.000	6.500	9.000	6.000	3.000
	141.000	7.050	10.000	6.000	4.000

VARIANCE	STD. DEV.	STD. ERROR	MAD
5.411	2.326	0.520	1.440
20.726	4.553	1.018	3.410
14.555	3.815	0.853	3.065
8.724	2.954	0.660	2.275
9.353	3.059	0.684	2.300
7.411	2.722	0.609	2.140
4.134	2.033	0.455	1.640
33.157	5.761	1.288	4.245
11.642	3.412	0.763	2.540
22.458	4.738	1.059	4.035
0.739	0.859	0.192	0.701
2.261	1.504	0.336	1.175

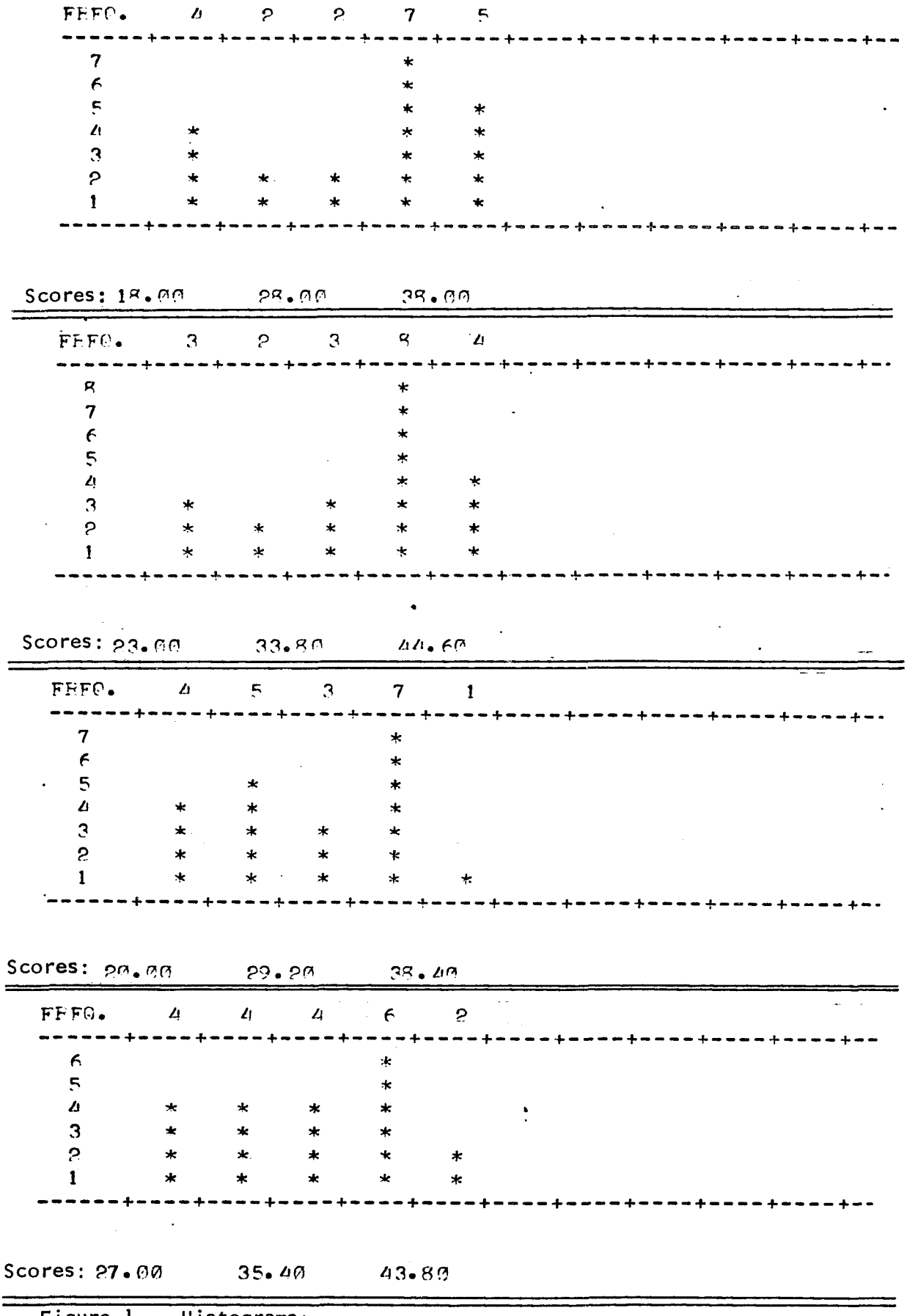

Figure 1. - Histograms:
a) Pre-test of ITPA, Visual Reception
b) Post-test of ITPA, Visual Reception
c) Pre-test of ITPA, Visual Association
d) Post-test of ITPA, Visual Association

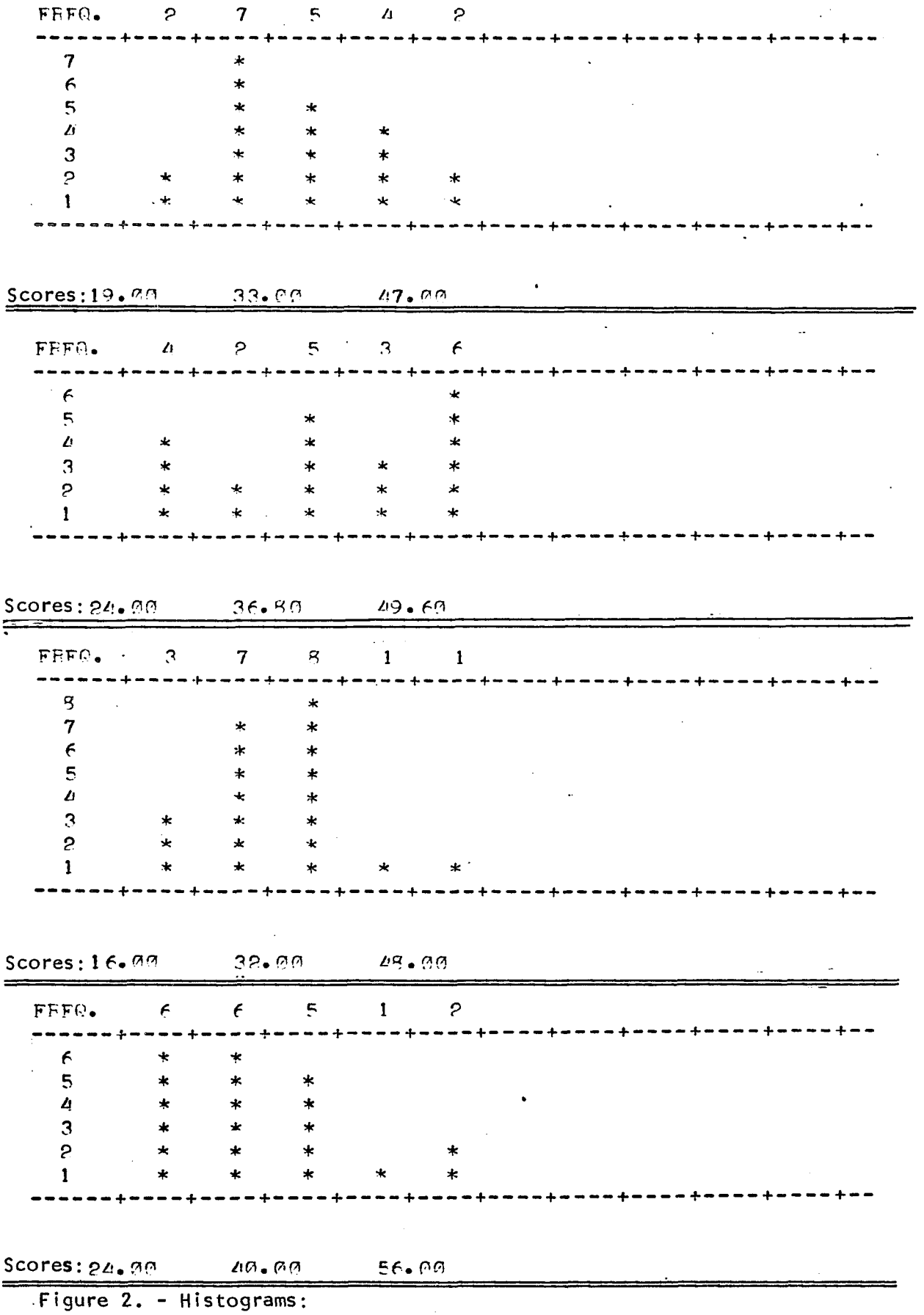

Figure 2. - Histograms:
a) Pre-test of ITPA, Visual Closure
b) Post-test of ITPA, Visual Closure
c) Pre-test of ITPA, Visual Memory
d) Post-test of ITPA, Visual Memory

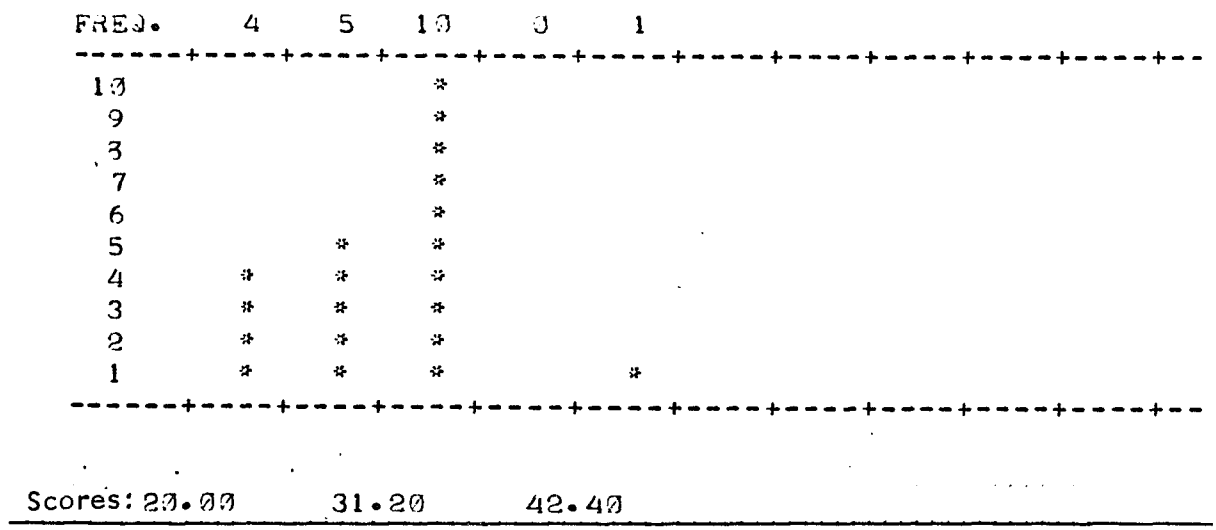

Figure 3. - Histograms:
a) Pre-test of ITPA, Manual Expression
b) Post-test of ITPA, Manual Expression

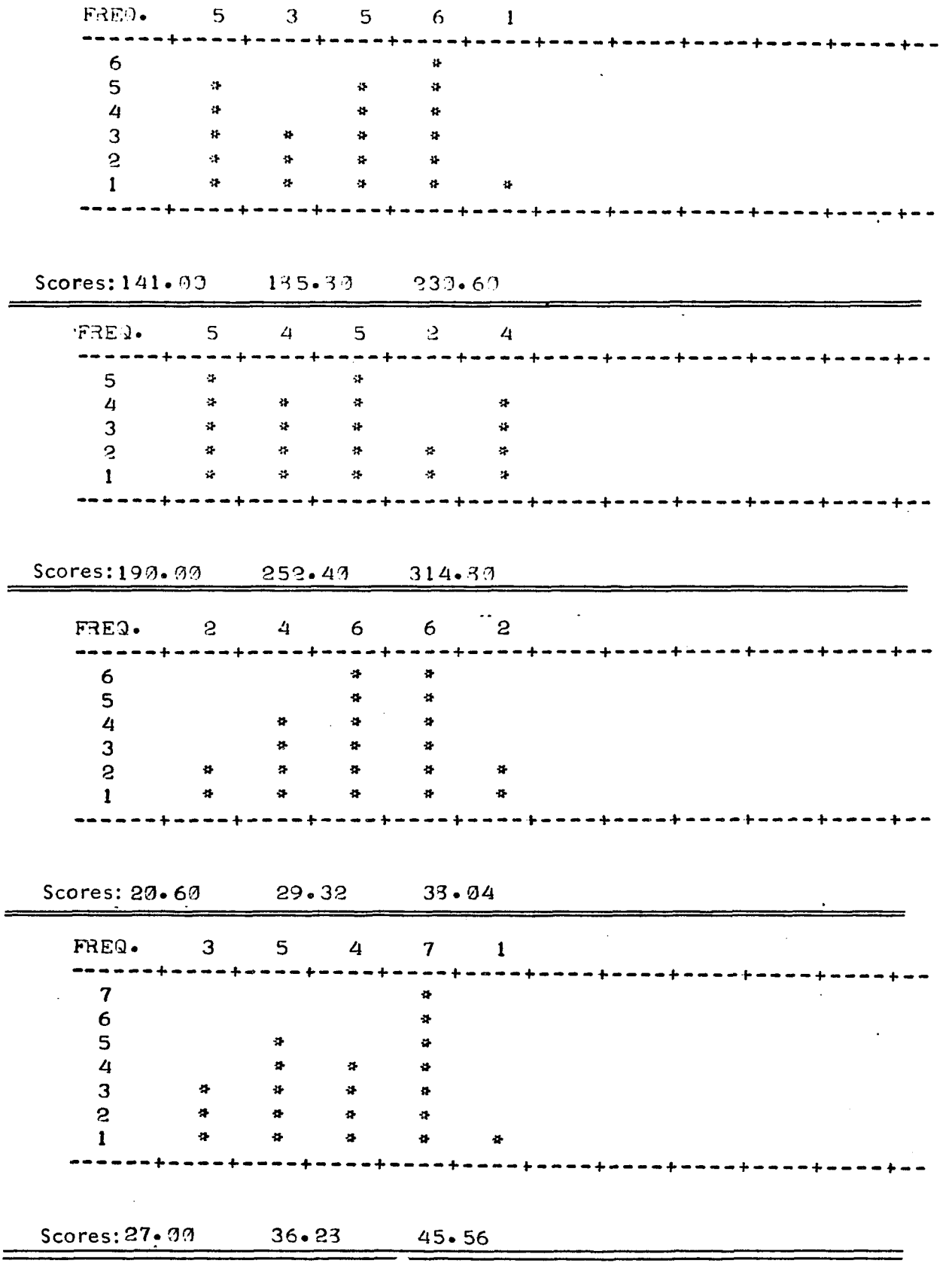

Figure 4. - Histograms:
a) Pre-test of GARS
b) Post-test of GARS
c) Pre-test of ITPA Means on all five subtests
d) Post-test of ITPA Means on all five subtests.

TABLE 4.

CORRELATION MATRIX FOR PRE-TEST ITEMS 1-10 ON GARS (PEARSON)

- - - - - - - - - - - - PEARSON CORRELATION COEFFICIENTS - - - - - - - - - - - -

	VAR001	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010
VAR001	1.0000 (0) S=0.001	0.3094 (20) S=0.092	0.3255 (20) S=0.081	-0.3246 (20) S=0.081	0.5566 (20) S=0.005	0.0351 (20) S=0.442	0.4942 (20) S=0.013	0.0189 (20) S=0.468	0.4920 (20) S=0.014	0.7700 (20) S=0.001
VAR002	0.3094 (20) S=0.092	1.0000 (0) S=0.001	-0.2134 (20) S=0.183	0.2426 (20) S=0.151	0.5436 (20) S=0.007	0.4277 (20) S=0.030	0.4544 (20) S=0.022	0.5987 (20) S=0.003	0.0567 (20) S=0.406	0.4947 (20) S=0.013
VAR003	0.3255 (20) S=0.081	-0.2134 (20) S=0.183	1.0000 (0) S=0.001	0.0067 (20) S=0.489	0.3308 (20) S=0.077	0.1361 (20) S=0.284	0.2447 (20) S=0.149	-0.2539 (20) S=0.140	0.5117 (20) S=0.011	0.4060 (20) S=0.038
VAR004	-0.3246 (20) S=0.081	0.2426 (20) S=0.151	0.0067 (20) S=0.489	1.0000 (0) S=0.001	0.1020 (20) S=0.334	0.2641 (20) S=0.130	-0.0901 (20) S=0.353	0.3146 (20) S=0.088	-0.0668 (20) S=0.390	-0.1191 (20) S=0.308
VAR005	0.5566 (20) S=0.005	0.5436 (20) S=0.007	0.3308 (20) S=0.077	0.1020 (20) S=0.334	1.0000 (0) S=0.001	0.2736 (20) S=0.122	0.6322 (20) S=0.001	0.0414 (20) S=0.431	0.5246 (20) S=0.009	0.7589 (20) S=0.001
VAR006	0.0351 (20) S=0.442	0.4277 (20) S=0.030	0.1361 (20) S=0.284	0.2641 (20) S=0.130	0.2736 (20) S=0.122	1.0000 (0) S=0.001	0.4456 (20) S=0.024	0.6057 (20) S=0.002	0.2617 (20) S=0.132	0.4796 (20) S=0.016
VAR007	0.4942 (20) S=0.013	0.4544 (20) S=0.022	0.2447 (20) S=0.149	-0.0901 (20) S=0.353	0.6322 (20) S=0.001	0.4456 (20) S=0.024	1.0000 (0) S=0.001	0.3209 (20) S=0.084	0.2206 (20) S=0.175	0.6634 (20) S=0.001
VAR008	0.0189 (20) S=0.468	0.5987 (20) S=0.003	-0.2539 (20) S=0.140	0.3146 (20) S=0.088	0.0414 (20) S=0.431	0.6057 (20) S=0.002	0.3209 (20) S=0.084	1.0000 (0) S=0.001	-0.1243 (20) S=0.301	0.2117 (20) S=0.185
VAR009	0.4920 (20) S=0.014	0.0567 (20) S=0.406	0.5117 (20) S=0.011	-0.0668 (20) S=0.390	0.5246 (20) S=0.009	0.2617 (20) S=0.132	0.2206 (20) S=0.175	-0.1243 (20) S=0.301	1.0000 (0) S=0.001	0.7178 (20) S=0.001
VAR010	0.7700 (20) S=0.001	0.4947 (20) S=0.013	0.4060 (20) S=0.038	-0.1191 (20) S=0.308	0.7589 (20) S=0.001	0.4796 (20) S=0.016	0.6634 (20) S=0.001	0.2117 (20) S=0.185	0.7178 (20) S=0.001	1.0000 (0) S=0.001
VAR011	0.3476 (20) S=0.067	0.1908 (20) S=0.210	0.5610 (20) S=0.005	-0.1022 (20) S=0.334	0.5005 (20) S=0.012	0.5519 (20) S=0.006	0.5791 (20) S=0.004	0.2139 (20) S=0.183	0.5350 (20) S=0.008	0.6390 (20) S=0.001

	VAR001	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010
VAR012	0.0289 (20) S=0.452	0.4385 (20) S=0.027	-0.1093 (20) S=0.323	0.2564 (20) S=0.138	0.4744 (20) S=0.017	-0.0315 (20) S=0.448	0.0272 (20) S=0.455	-0.2673 (20) S=0.127	0.0107 (20) S=0.482	0.1986 (20) S=0.201
VAR013	-0.1099 (20) S=0.322	0.3424 (20) S=0.070	0.0345 (20) S=0.443	0.2920 (20) S=0.106	0.4859 (20) S=0.015	0.2876 (20) S=0.109	0.3677 (20) S=0.055	0.1981 (20) S=0.201	0.2066 (20) S=0.191	0.2688 (20) S=0.126
VAR014	0.7008 (20) S=0.001	0.7210 (20) S=0.001	-0.1072 (20) S=0.326	-0.1125 (20) S=0.318	0.6174 (20) S=0.002	0.4135 (20) S=0.035	0.6263 (20) S=0.002	0.3917 (20) S=0.044	0.4301 (20) S=0.029	0.8024 (20) S=0.001
VAR015	0.0863 (20) S=0.359	0.1926 (20) S=0.208	0.5282 (20) S=0.008	0.3880 (20) S=0.045	0.2939 (20) S=0.104	0.2456 (20) S=0.148	0.0176 (20) S=0.471	0.2541 (20) S=0.140	0.3314 (20) S=0.077	0.2616 (20) S=0.133
VAR016	0.5889 (20) S=0.003	0.8350 (20) S=0.001	0.0041 (20) S=0.493	-0.0526 (20) S=0.413	0.6334 (20) S=0.001	0.3307 (20) S=0.077	0.5927 (20) S=0.003	0.3229 (20) S=0.082	0.2212 (20) S=0.174	0.6554 (20) S=0.001
VAR017	0.6111 (20) S=0.002	0.7513 (20) S=0.001	0.0642 (20) S=0.394	-0.1929 (20) S=0.208	0.4283 (20) S=0.030	0.3300 (20) S=0.078	0.4507 (20) S=0.023	0.5209 (20) S=0.009	0.2366 (20) S=0.158	0.6584 (20) S=0.001
VAR018	-0.0020 (20) S=0.497	0.1223 (20) S=0.304	0.3214 (20) S=0.084	0.1264 (20) S=0.298	0.2778 (20) S=0.118	-0.0338 (20) S=0.444	-0.1270 (20) S=0.297	-0.1200 (20) S=0.307	0.2986 (20) S=0.100	0.1374 (20) S=0.282
VAR019	0.1708 (20) S=0.236	0.1840 (20) S=0.219	0.2392 (20) S=0.155	-0.0434 (20) S=0.428	0.5726 (20) S=0.004	-0.0403 (20) S=0.433	0.3790 (20) S=0.050	-0.2516 (20) S=0.142	0.3559 (20) S=0.062	0.4110 (20) S=0.036
VAR020	-0.2267 (20) S=0.168	0.0736 (20) S=0.379	0.2510 (20) S=0.143	0.2651 (20) S=0.129	0.1104 (20) S=0.322	0.5164 (20) S=0.010	0.2643 (20) S=0.130	0.2259 (20) S=0.169	0.2440 (20) S=0.150	0.1238 (20) S=0.301

TABLE 5.

CORRELATION MATRIX FOR PRE-TEST ITEMS 11-20 ON GARS (PEARSON)

PEARSON CORRELATION COEFFICIENTS

	VAR011	VAR012	VAR013	VAR014	VAR015	VAR016	VAR017	VAR018	VAR019	VAR020
VAR001	0.3476 (20) S=0.067	0.0289 (20) S=0.452	-0.1099 (20) S=0.322	0.7008 (20) S=0.001	0.0863 (20) S=0.359	0.5889 (20) S=0.003	0.6111 (20) S=0.002	-0.0020 (20) S=0.497	0.1708 (20) S=0.236	-0.2267 (20) S=0.168
VAR002	0.1908 (20) S=0.210	0.4385 (20) S=0.027	0.3424 (20) S=0.070	0.7210 (20) S=0.001	0.1926 (20) S=0.208	0.8350 (20) S=0.001	0.7513 (20) S=0.001	0.1223 (20) S=0.304	0.1840 (20) S=0.219	0.0736 (20) S=0.379
VAR003	0.5610 (20) S=0.005	-0.1093 (20) S=0.323	0.0345 (20) S=0.443	-0.1072 (20) S=0.326	0.5282 (20) S=0.008	0.0041 (20) S=0.493	0.0642 (20) S=0.394	0.3214 (20) S=0.084	0.2392 (20) S=0.155	0.2510 (20) S=0.143
VAR004	-0.1022 (20) S=0.334	0.2564 (20) S=0.138	0.2920 (20) S=0.106	-0.1125 (20) S=0.318	0.3880 (20) S=0.045	-0.0526 (20) S=0.413	-0.1929 (20) S=0.208	0.1264 (20) S=0.298	-0.0434 (20) S=0.428	0.2651 (20) S=0.129
VAR005	0.5005 (20) S=0.012	0.4744 (20) S=0.017	0.4859 (20) S=0.015	0.6174 (20) S=0.002	0.2939 (20) S=0.104	0.6334 (20) S=0.001	0.4283 (20) S=0.030	0.2778 (20) S=0.118	0.5726 (20) S=0.004	0.1104 (20) S=0.322
VAR006	0.5519 (20) S=0.006	-0.0315 (20) S=0.448	0.2876 (20) S=0.109	0.4135 (20) S=0.035	0.2456 (20) S=0.148	0.3307 (20) S=0.077	0.3300 (20) S=0.078	-0.0338 (20) S=0.444	-0.0403 (20) S=0.433	0.5164 (20) S=0.010
VAR007	0.5791 (20) S=0.004	0.0272 (20) S=0.455	0.3677 (20) S=0.055	0.6263 (20) S=0.002	0.0176 (20) S=0.471	0.5927 (20) S=0.003	0.4507 (20) S=0.023	-0.1270 (20) S=0.297	0.3790 (20) S=0.050	0.2643 (20) S=0.130
VAR008	0.2139 (20) S=0.183	-0.2673 (20) S=0.127	0.1981 (20) S=0.201	0.3917 (20) S=0.044	0.2541 (20) S=0.140	0.3229 (20) S=0.082	0.5209 (20) S=0.009	-0.1200 (20) S=0.307	-0.2516 (20) S=0.142	0.2259 (20) S=0.169
VAR009	0.5350 (20) S=0.008	0.0107 (20) S=0.482	0.2066 (20) S=0.191	0.4301 (20) S=0.029	0.3314 (20) S=0.077	0.2212 (20) S=0.174	0.2366 (20) S=0.158	0.2986 (20) S=0.100	0.3559 (20) S=0.062	0.2440 (20) S=0.150
VAR010	0.6390 (20) S=0.001	0.1986 (20) S=0.201	0.2688 (20) S=0.126	0.8024 (20) S=0.001	0.2616 (20) S=0.133	0.6554 (20) S=0.001	0.6584 (20) S=0.001	0.1374 (20) S=0.282	0.4110 (20) S=0.036	0.1238 (20) S=0.301
VAR011	1.0000 (0) S=0.001	-0.1098 (20) S=0.322	0.4314 (20) S=0.029	0.3325 (20) S=0.076	0.3915 (20) S=0.044	0.3445 (20) S=0.068	0.3324 (20) S=0.076	0.3255 (20) S=0.081	0.3823 (20) S=0.048	0.4102 (20) S=0.036

	VAR011	VAR012	VAR013	VAR014	VAR015	VAR016	VAR017	VAR018	VAR019	VAR020
VAR012	-0.1098 (20) S=0.322	1.0000 (0) S=0.001	0.2284 (20) S=0.166	0.2769 (20) S=0.119	-0.0218 (20) S=0.464	0.4642 (20) S=0.020	0.0969 (20) S=0.342	0.2259 (20) S=0.169	0.4282 (20) S=0.030	-0.1492 (20) S=0.265
VAR013	0.4314 (20) S=0.029	0.2284 (20) S=0.166	1.0000 (0) S=0.001	0.1874 (20) S=0.214	0.4297 (20) S=0.029	0.1643 (20) S=0.244	0.0266 (20) S=0.456	0.6365 (20) S=0.001	0.7529 (20) S=0.001	0.5023 (20) S=0.012
VAR014	0.3325 (20) S=0.076	0.2769 (20) S=0.119	0.1874 (20) S=0.214	1.0000 (0) S=0.001	-0.0114 (20) S=0.481	0.8394 (20) S=0.001	0.7085 (20) S=0.001	-0.1214 (20) S=0.305	0.2474 (20) S=0.147	0.0274 (20) S=0.454
VAR015	0.3915 (20) S=0.044	-0.0218 (20) S=0.464	0.4297 (20) S=0.029	-0.0114 (20) S=0.481	1.0000 (0) S=0.001	0.0171 (20) S=0.472	0.1255 (20) S=0.299	0.6174 (20) S=0.002	0.3282 (20) S=0.079	0.1783 (20) S=0.226
VAR016	0.3445 (20) S=0.068	0.4642 (20) S=0.020	0.1643 (20) S=0.244	0.8394 (20) S=0.001	0.0171 (20) S=0.472	1.0000 (0) S=0.001	0.7878 (20) S=0.001	0.0200 (20) S=0.467	0.2604 (20) S=0.134	0.1164 (20) S=0.312
VAR017	0.3324 (20) S=0.076	0.0969 (20) S=0.342	0.0266 (20) S=0.456	0.7085 (20) S=0.001	0.1255 (20) S=0.299	0.7878 (20) S=0.001	1.0000 (0) S=0.001	0.0702 (20) S=0.384	0.0535 (20) S=0.411	-0.0194 (20) S=0.468
VAR018	0.3255 (20) S=0.081	0.2259 (20) S=0.169	0.6365 (20) S=0.001	-0.1214 (20) S=0.305	0.6174 (20) S=0.002	0.0200 (20) S=0.467	0.0702 (20) S=0.384	1.0000 (0) S=0.001	0.5811 (20) S=0.004	0.2185 (20) S=0.177
VAR019	0.3823 (20) S=0.048	0.4282 (20) S=0.030	0.7529 (20) S=0.001	0.2474 (20) S=0.147	0.3282 (20) S=0.079	0.2604 (20) S=0.134	0.0535 (20) S=0.411	0.5811 (20) S=0.004	1.0000 (0) S=0.001	0.2083 (20) S=0.189
VAR020	0.4102 (20) S=0.036	-0.1492 (20) S=0.265	0.5023 (20) S=0.012	0.0274 (20) S=0.454	0.1783 (20) S=0.226	0.1164 (20) S=0.312	-0.0194 (20) S=0.468	0.2185 (20) S=0.177	0.2083 (20) S=0.189	1.0000 (0) S=0.001

TABLE 6.

CORRELATION MATRIX FOR POST-TEST ITEMS 1-10 ON GARS (PEARSON)

- - - - - - - - - - - - PEARSON CORRELATION COEFFICIENTS - - - - - - - - - - - -

	VAR101	VAR102	VAR103	VAR104	VAR105	VAR106	VAR107	VAR108	VAR109	VAR110
VAR101	1.0000 (0) S=0.001	0.2463 (20) S=0.146	0.6632 (20) S=0.001	0.1330 (20) S=0.288	0.3248 (20) S=0.081	0.0708 (20) S=0.383	0.1581 (20) S=0.253	0.1591 (20) S=0.251	0.5095 (20) S=0.011	0.6243 (20) S=0.002
VAR102	0.2463 (20) S=0.146	1.0000 (0) S=0.001	-0.0338 (20) S=0.444	0.4753 (20) S=0.017	0.4510 (20) S=0.023	0.3104 (20) S=0.091	0.3657 (20) S=0.056	0.2076 (20) S=0.190	0.2411 (20) S=0.153	0.5541 (20) S=0.006
VAR103	0.6632 (20) S=0.001	-0.0338 (20) S=0.444	1.0000 (0) S=0.001	0.3465 (20) S=0.067	0.4645 (20) S=0.020	-0.2695 (20) S=0.125	0.1985 (20) S=0.201	0.4014 (20) S=0.040	0.7336 (20) S=0.001	0.4635 (20) S=0.020
VAR104	0.1330 (20) S=0.288	0.4753 (20) S=0.017	0.3465 (20) S=0.067	1.0000 (0) S=0.001	0.6325 (20) S=0.001	0.3158 (20) S=0.087	0.7466 (20) S=0.001	0.3504 (20) S=0.065	0.4893 (20) S=0.014	0.6177 (20) S=0.002
VAR105	0.3248 (20) S=0.081	0.4510 (20) S=0.023	0.4645 (20) S=0.020	0.6325 (20) S=0.001	1.0000 (0) S=0.001	0.0742 (20) S=0.378	0.6517 (20) S=0.001	0.3546 (20) S=0.063	0.4827 (20) S=0.016	0.6703 (20) S=0.001
VAR106	0.0708 (20) S=0.383	0.3104 (20) S=0.091	-0.2695 (20) S=0.125	0.3158 (20) S=0.087	0.0742 (20) S=0.378	1.0000 (0) S=0.001	0.5447 (20) S=0.007	-0.2542 (20) S=0.140	-0.0685 (20) S=0.387	0.2976 (20) S=0.101
VAR107	0.1581 (20) S=0.253	0.3657 (20) S=0.056	0.1985 (20) S=0.201	0.7466 (20) S=0.001	0.6517 (20) S=0.001	0.5447 (20) S=0.007	1.0000 (0) S=0.001	0.2623 (20) S=0.132	0.1711 (20) S=0.235	0.6444 (20) S=0.001
VAR108	0.1591 (20) S=0.251	0.2076 (20) S=0.190	0.4014 (20) S=0.040	0.3504 (20) S=0.065	0.3546 (20) S=0.063	-0.2542 (20) S=0.140	0.2623 (20) S=0.132	1.0000 (0) S=0.001	0.4115 (20) S=0.036	0.4022 (20) S=0.039
VAR109	0.5095 (20) S=0.011	0.2411 (20) S=0.153	0.7336 (20) S=0.001	0.4893 (20) S=0.014	0.4827 (20) S=0.016	-0.0685 (20) S=0.387	0.1711 (20) S=0.235	0.4115 (20) S=0.036	1.0000 (0) S=0.001	0.5177 (20) S=0.010
VAR110	0.6243 (20) S=0.002	0.5541 (20) S=0.006	0.4635 (20) S=0.020	0.6177 (20) S=0.002	0.6703 (20) S=0.001	0.2976 (20) S=0.101	0.6444 (20) S=0.001	0.4022 (20) S=0.039	0.5177 (20) S=0.010	1.0000 (0) S=0.001
VAR111	0.5239 (20) S=0.009	0.5440 (20) S=0.007	0.4822 (20) S=0.016	0.4770 (20) S=0.017	0.5589 (20) S=0.005	0.2603 (20) S=0.134	0.3606 (20) S=0.059	0.0969 (20) S=0.342	0.4479 (20) S=0.024	0.5891 (20) S=0.003

	VAR101	VAR102	VAR103	VAR104	VAR105	VAR106	VAR107	VAR108	VAR109	VAR110
VAR112	0.1222 (20) S=0.304	0.4401 (20) S=0.026	0.0824 (20) S=0.365	0.5778 (20) S=0.004	0.7031 (20) S=0.001	0.3709 (20) S=0.054	0.7885 (20) S=0.001	0.0259 (20) S=0.457	-0.0630 (20) S=0.396	0.4975 (20) S=0.013
VAR113	0.3037 (20) S=0.096	0.3446 (20) S=0.068	0.3568 (20) S=0.061	0.4284 (20) S=0.030	0.6156 (20) S=0.002	0.3320 (20) S=0.076	0.4113 (20) S=0.036	0.1586 (20) S=0.252	0.3681 (20) S=0.055	0.4824 (20) S=0.016
VAR114	0.4895 (20) S=0.014	0.6735 (20) S=0.001	0.4810 (20) S=0.016	0.5584 (20) S=0.005	0.5677 (20) S=0.005	0.1636 (20) S=0.245	0.5061 (20) S=0.011	0.3856 (20) S=0.047	0.4749 (20) S=0.017	0.7067 (20) S=0.001
VAR115	0.5301 (20) S=0.008	0.3740 (20) S=0.052	0.5885 (20) S=0.003	0.5791 (20) S=0.004	0.8736 (20) S=0.001	0.1049 (20) S=0.330	0.5007 (20) S=0.012	0.1830 (20) S=0.220	0.5017 (20) S=0.012	0.6891 (20) S=0.001
VAR116	0.3474 (20) S=0.067	0.4495 (20) S=0.026	0.4394 (20) S=0.026	0.5906 (20) S=0.003	0.8199 (20) S=0.001	0.1088 (20) S=0.324	0.5966 (20) S=0.003	0.5067 (20) S=0.011	0.4735 (20) S=0.017	0.5960 (20) S=0.003
VAR117	0.3488 (20) S=0.066	0.5251 (20) S=0.009	0.2341 (20) S=0.160	0.3708 (20) S=0.054	0.4666 (20) S=0.019	0.2284 (20) S=0.166	0.4327 (20) S=0.028	0.1312 (20) S=0.291	0.1907 (20) S=0.210	0.5498 (20) S=0.006
VAR118	0.4165 (20) S=0.034	0.0592 (20) S=0.417	0.4213 (20) S=0.032	0.3356 (20) S=0.074	0.5926 (20) S=0.003	-0.1694 (20) S=0.238	0.3023 (20) S=0.098	0.0177 (20) S=0.470	0.1230 (20) S=0.303	0.3177 (20) S=0.086
VAR119	0.1605 (20) S=0.249	0.4610 (20) S=0.020	0.0953 (20) S=0.345	0.5045 (20) S=0.012	0.5395 (20) S=0.007	0.0136 (20) S=0.477	0.3110 (20) S=0.091	0.0682 (20) S=0.388	0.1448 (20) S=0.271	0.4799 (20) S=0.016
VAR120	0.2257 (20) S=0.169	0.4380 (20) S=0.027	0.2545 (20) S=0.139	0.2839 (20) S=0.113	0.4681 (20) S=0.019	0.3771 (20) S=0.051	0.3304 (20) S=0.077	-0.1697 (20) S=0.237	0.2911 (20) S=0.107	0.2808 (20) S=0.115

TABLE 7.

CORRELATION MATRIX FOR POST-TEST ITEMS 11-20 ON GARS (PEARSON)

PEARSON CORRELATION COEFFICIENTS

	VAR111	VAR112	VAR113	VAR114	VAR115	VAR116	VAR117	VAR118	VAR119	VAR120
VAR101	0.5239 (20) S=0.009	0.1222 (20) S=0.304	0.3037 (20) S=0.096	0.4895 (20) S=0.014	0.5301 (20) S=0.008	0.3474 (20) S=0.067	0.3488 (20) S=0.066	0.4165 (20) S=0.034	0.1605 (20) S=0.249	0.2257 (20) S=0.169
VAR102	0.5440 (20) S=0.007	0.4401 (20) S=0.026	0.3446 (20) S=0.068	0.6735 (20) S=0.001	0.3740 (20) S=0.052	0.4405 (20) S=0.026	0.5251 (20) S=0.009	0.0502 (20) S=0.417	0.4610 (20) S=0.020	0.4380 (20) S=0.027
VAR103	0.4822 (20) S=0.016	0.0824 (20) S=0.365	0.3568 (20) S=0.061	0.4810 (20) S=0.016	0.5885 (20) S=0.003	0.4394 (20) S=0.026	0.2341 (20) S=0.160	0.4213 (20) S=0.032	0.0953 (20) S=0.345	0.2545 (20) S=0.139
VAR104	0.4770 (20) S=0.017	0.5778 (20) S=0.004	0.4284 (20) S=0.030	0.5584 (20) S=0.005	0.5791 (20) S=0.004	0.5908 (20) S=0.003	0.3708 (20) S=0.054	0.3358 (20) S=0.074	0.5045 (20) S=0.012	0.2839 (20) S=0.113
VAR105	0.5589 (20) S=0.005	0.7031 (20) S=0.001	0.6156 (20) S=0.002	0.5677 (20) S=0.005	0.8736 (20) S=0.001	0.8199 (20) S=0.001	0.4666 (20) S=0.019	0.5926 (20) S=0.003	0.5395 (20) S=0.007	0.4681 (20) S=0.019
VAR106	0.2603 (20) S=0.134	0.3709 (20) S=0.054	0.3320 (20) S=0.076	0.1636 (20) S=0.245	0.1049 (20) S=0.330	0.1088 (20) S=0.324	0.2284 (20) S=0.166	-0.1694 (20) S=0.238	0.0136 (20) S=0.477	0.3771 (20) S=0.051
VAR107	0.3606 (20) S=0.059	0.7885 (20) S=0.001	0.4113 (20) S=0.036	0.5061 (20) S=0.011	0.5007 (20) S=0.012	0.5966 (20) S=0.003	0.4327 (20) S=0.028	0.3023 (20) S=0.098	0.3110 (20) S=0.091	0.3304 (20) S=0.077
VAR108	0.0969 (20) S=0.342	0.0259 (20) S=0.457	0.1586 (20) S=0.252	0.3856 (20) S=0.047	0.1830 (20) S=0.220	0.5067 (20) S=0.011	0.1312 (20) S=0.291	0.0177 (20) S=0.470	0.0682 (20) S=0.388	-0.1697 (20) S=0.237
VAR109	0.4479 (20) S=0.024	-0.0630 (20) S=0.396	0.3681 (20) S=0.055	0.4749 (20) S=0.017	0.5017 (20) S=0.012	0.4735 (20) S=0.017	0.1907 (20) S=0.210	0.1230 (20) S=0.303	0.1448 (20) S=0.271	0.2911 (20) S=0.107
VAR110	0.5891 (20) S=0.003	0.4975 (20) S=0.013	0.4824 (20) S=0.016	0.7067 (20) S=0.001	0.6891 (20) S=0.001	0.5960 (20) S=0.003	0.5498 (20) S=0.006	0.3177 (20) S=0.086	0.4799 (20) S=0.016	0.2808 (20) S=0.115
VAR111	1.0000 (0) S=0.001	0.4845 (20) S=0.015	0.7142 (20) S=0.001	0.5096 (20) S=0.011	0.7362 (20) S=0.001	0.5393 (20) S=0.007	0.5602 (20) S=0.005	0.2532 (20) S=0.141	0.4800 (20) S=0.016	0.6345 (20) S=0.001
VAR112	0.4845 (20) S=0.015	1.0000 (0) S=0.001	0.6078 (20) S=0.002	0.4197 (20) S=0.033	0.6435 (20) S=0.001	0.5108 (20) S=0.011	0.4679 (20) S=0.019	0.4367 (20) S=0.027	0.4920 (20) S=0.014	0.4600 (20) S=0.021
VAR113	0.7142 (20) S=0.001	0.6078 (20) S=0.002	1.0000 (0) S=0.001	0.4226 (20) S=0.032	0.7559 (20) S=0.001	0.5056 (20) S=0.011	0.4797 (20) S=0.016	0.1621 (20) S=0.247	0.3573 (20) S=0.061	0.6405 (20) S=0.001
VAR114	0.5096 (20) S=0.011	0.4197 (20) S=0.033	0.4226 (20) S=0.032	1.0000 (0) S=0.001	0.5383 (20) S=0.007	0.6102 (20) S=0.002	0.6690 (20) S=0.001	0.2033 (20) S=0.195	0.1582 (20) S=0.253	0.2615 (20) S=0.133
VAR115	0.7362 (20) S=0.001	0.6435 (20) S=0.001	0.7559 (20) S=0.001	0.5383 (20) S=0.007	1.0000 (0) S=0.001	0.7143 (20) S=0.001	0.5427 (20) S=0.007	0.6829 (20) S=0.001	0.6141 (20) S=0.002	0.5698 (20) S=0.004
VAR116	0.5393 (20) S=0.007	0.5108 (20) S=0.011	0.5056 (20) S=0.011	0.6102 (20) S=0.002	0.7143 (20) S=0.001	1.0000 (0) S=0.001	0.4320 (20) S=0.029	0.4075 (20) S=0.037	0.3714 (20) S=0.053	0.2341 (20) S=0.160
VAR117	0.5602 (20) S=0.005	0.4679 (20) S=0.019	0.4797 (20) S=0.016	0.6690 (20) S=0.001	0.5427 (20) S=0.007	0.4320 (20) S=0.029	1.0000 (0) S=0.001	0.2007 (20) S=0.198	0.1681 (20) S=0.239	0.4706 (20) S=0.018
VAR118	0.2532 (20) S=0.141	0.4367 (20) S=0.027	0.1621 (20) S=0.247	0.2033 (20) S=0.195	0.6829 (20) S=0.001	0.4075 (20) S=0.037	0.2007 (20) S=0.198	1.0000 (0) S=0.001	0.5552 (20) S=0.006	0.2087 (20) S=0.189
VAR119	0.4800 (20) S=0.016	0.4920 (20) S=0.014	0.3573 (20) S=0.061	0.1582 (20) S=0.253	0.6141 (20) S=0.002	0.3714 (20) S=0.053	0.1681 (20) S=0.239	0.5552 (20) S=0.006	1.0000 (0) S=0.001	0.3779 (20) S=0.050
VAR120	0.6345 (20) S=0.001	0.4600 (20) S=0.021	0.6405 (20) S=0.001	0.2615 (20) S=0.133	0.5698 (20) S=0.004	0.2341 (20) S=0.160	0.4706 (20) S=0.018	0.2087 (20) S=0.189	0.3779 (20) S=0.050	1.0000 (0) S=0.001

TABLE 8.

CORRELATION MATRIX FOR PRE-TEST ITEMS 1-6 ON GARS (KENDALL)

KENDALL CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR001	0.2323	VAR001	0.2638	VAR001	-0.2127	VAR001	0.4175	VAR001	0.1278	VAR001	0.4375
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR002	SIG .076	VAR003	SIG .052	VAR004	SIG .095	VAR005	SIG .005	VAR006	SIG .215	VAR007	SIG .004
VAR001	0.1264	VAR001	0.2659	VAR001	0.6591	VAR001	0.3200	VAR001	0.0208	VAR001	-0.0324
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR008	SIG .218	VAR009	SIG .051	VAR010	SIG .001	VAR011	SIG .024	VAR012	SIG .449	VAR013	SIG .421
VAR001	0.6000	VAR001	0.0795	VAR001	0.4676	VAR001	0.4755	VAR001	0.0249	VAR001	0.2806
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR014	SIG .001	VAR015	SIG .312	VAR016	SIG .002	VAR017	SIG .002	VAR018	SIG .439	VAR019	SIG .042
VAR001	-0.1237	VAR002	-0.0438	VAR002	0.1777	VAR002	0.3874	VAR002	0.0876	VAR002	0.3606
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR020	SIG .223	VAR003	SIG .393	VAR004	SIG .137	VAR005	SIG .008	VAR006	SIG .295	VAR007	SIG .013
VAR002	0.5158	VAR002	0.0749	VAR002	0.3796	VAR002	0.1657	VAR002	0.3806	VAR002	0.2070
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR008	SIG .001	VAR009	SIG .322	VAR010	SIG .010	VAR011	SIG .154	VAR012	SIG .009	VAR013	SIG .101
VAR002	0.5755	VAR002	0.1700	VAR002	0.6742	VAR002	0.5724	VAR002	0.0124	VAR002	0.1543
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR014	SIG .001	VAR015	SIG .147	VAR016	SIG .001	VAR017	SIG .001	VAR018	SIG .470	VAR019	SIG .171
VAR002	0.0848	VAR003	0.0572	VAR003	0.3333	VAR003	0.3357	VAR003	0.2064	VAR003	-0.1525
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR020	SIG .301	VAR004	SIG .362	VAR005	SIG .020	VAR006	SIG .019	VAR007	SIG .102	VAR008	SIG .174
VAR003	0.5049	VAR003	0.3643	VAR003	0.4831	VAR003	0.0307	VAR003	0.1076	VAR003	0.0
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR009	SIG .001	VAR010	SIG .012	VAR011	SIG .001	VAR012	SIG .425	VAR013	SIG .254	VAR014	SIG .500
VAR003	0.5339	VAR003	0.0747	VAR003	0.1603	VAR003	0.3849	VAR003	0.2408	VAR003	0.2821
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR015	SIG .001	VAR016	SIG .322	VAR017	SIG .162	VAR018	SIG .009	VAR019	SIG .069	VAR020	SIG .041
VAR004	0.1056	VAR004	-0.0162	VAR004	-0.0708	VAR004	0.1628	VAR004	0.0409	VAR004	-0.0690
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR005	SIG .258	VAR006	SIG .460	VAR007	SIG .331	VAR008	SIG .158	VAR009	SIG .400	VAR010	SIG .335
VAR004	-0.1121	VAR004	0.3720	VAR004	0.2953	VAR004	-0.0751	VAR004	0.2874	VAR004	-0.0399
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR011	SIG .245	VAR012	SIG .011	VAR013	SIG .034	VAR014	SIG .322	VAR015	SIG .038	VAR016	SIG .403
VAR004	-0.1994	VAR004	0.1258	VAR004	-0.0580	VAR004	0.2347	VAR005	0.2446	VAR005	0.5119
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR017	SIG .109	VAR018	SIG .219	VAR019	SIG .360	VAR020	SIG .074	VAR006	SIG .066	VAR007	SIG .001
VAR005	0.0997	VAR005	0.3304	VAR005	0.5798	VAR005	0.3329	VAR005	0.3895	VAR005	0.4436
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR008	SIG .269	VAR009	SIG .021	VAR010	SIG .001	VAR011	SIG .020	VAR012	SIG .008	VAR013	SIG .003
VAR005	0.5365	VAR005	0.3653	VAR005	0.5060	VAR005	0.3550	VAR005	0.1586	VAR005	0.4679
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR014	SIG .001	VAR015	SIG .012	VAR016	SIG .001	VAR017	SIG .014	VAR018	SIG .164	VAR019	SIG .002
VAR005	0.2052	VAR006	0.3445	VAR006	0.1616	VAR006	0.3902	VAR006	0.3995	VAR006	0.5020
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR020	SIG .103	VAR007	SIG .017	VAR008	SIG .160	VAR009	SIG .008	VAR010	SIG .007	VAR011	SIG .001
VAR006	0.1269	VAR006	0.4197	VAR006	0.2250	VAR006	0.2637	VAR006	0.1822	VAR006	0.2854
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)
VAR012	SIG .217	VAR013	SIG .005	VAR014	SIG .083	VAR015	SIG .052	VAR016	SIG .131	VAR017	SIG .039

TABLE 9.

CORRELATION MATRIX FOR PRE-TEST ITEMS 7-20 ON GARS (KENDALL)

KENDALL CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR006 WITH VAR018	0.2535 N(20) SIG .059	VAR006 WITH VAR019	0.2498 N(20) SIG .062	VAR006 WITH VAR020	0.5220 N(20) SIG .001	VAR007 WITH VAR008	0.2006 N(20) SIG .108	VAR007 WITH VAR009	0.1484 N(20) SIG .180	VAR007 WITH VAR010	0.4841 N(20) SIG .001
VAR007 WITH VAR011	0.4360 N(20) SIG .004	VAR007 WITH VAR012	0.1425 N(20) SIG .190	VAR007 WITH VAR013	0.2797 N(20) SIG .042	VAR007 WITH VAR014	0.5456 N(20) SIG .001	VAR007 WITH VAR015	0.1808 N(20) SIG .132	VAR007 WITH VAR016	0.4856 N(20) SIG .001
VAR007 WITH VAR017	0.4345 N(20) SIG .004	VAR007 WITH VAR018	-0.1149 N(20) SIG .239	VAR007 WITH VAR019	0.2824 N(20) SIG .041	VAR007 WITH VAR020	0.2779 N(20) SIG .043	VAR008 WITH VAR009	-0.0234 N(20) SIG .443	VAR008 WITH VAR010	0.1552 N(20) SIG .169
VAR008 WITH VAR011	0.1868 N(20) SIG .125	VAR008 WITH VAR012	0.0140 N(20) SIG .466	VAR008 WITH VAR013	0.0656 N(20) SIG .343	VAR008 WITH VAR014	0.2601 N(20) SIG .054	VAR008 WITH VAR015	0.1035 N(20) SIG .262	VAR008 WITH VAR016	0.2736 N(20) SIG .046
VAR008 WITH VAR017	0.4340 N(20) SIG .004	VAR008 WITH VAR018	-0.1446 N(20) SIG .186	VAR008 WITH VAR019	-0.0812 N(20) SIG .308	VAR008 WITH VAR020	0.1095 N(20) SIG .250	VAR009 WITH VAR010	0.5723 N(20) SIG .001	VAR009 WITH VAR011	0.4384 N(20) SIG .003
VAR009 WITH VAR012	0.0353 N(20) SIG .414	VAR009 WITH VAR013	0.2970 N(20) SIG .034	VAR009 WITH VAR014	0.2733 N(20) SIG .046	VAR009 WITH VAR015	0.3989 N(20) SIG .007	VAR009 WITH VAR016	0.1720 N(20) SIG .145	VAR009 WITH VAR017	0.2065 N(20) SIG .102
VAR009 WITH VAR018	0.4618 N(20) SIG .002	VAR009 WITH VAR019	0.3790 N(20) SIG .010	VAR009 WITH VAR020	0.3698 N(20) SIG .011	VAR010 WITH VAR011	0.5539 N(20) SIG .001	VAR010 WITH VAR012	0.1457 N(20) SIG .185	VAR010 WITH VAR013	0.2206 N(20) SIG .087
VAR010 WITH VAR014	0.6572 N(20) SIG .001	VAR010 WITH VAR015	0.2841 N(20) SIG .040	VAR010 WITH VAR016	0.5352 N(20) SIG .001	VAR010 WITH VAR017	0.5450 N(20) SIG .001	VAR010 WITH VAR018	0.1368 N(20) SIG .200	VAR010 WITH VAR019	0.3840 N(20) SIG .009
VAR010 WITH VAR020	0.1779 N(20) SIG .136	VAR011 WITH VAR012	-0.0526 N(20) SIG .373	VAR011 WITH VAR013	0.2530 N(20) SIG .059	VAR011 WITH VAR014	0.3219 N(20) SIG .024	VAR011 WITH VAR015	0.3447 N(20) SIG .017	VAR011 WITH VAR016	0.3173 N(20) SIG .025
VAR011 WITH VAR017	0.4397 N(20) SIG .003	VAR011 WITH VAR018	0.1818 N(20) SIG .131	VAR011 WITH VAR019	0.3042 N(20) SIG .030	VAR011 WITH VAR020	0.4272 N(20) SIG .004	VAR012 WITH VAR013	0.2139 N(20) SIG .094	VAR012 WITH VAR014	0.2582 N(20) SIG .056
VAR012 WITH VAR015	0.0208 N(20) SIG .449	VAR012 WITH VAR016	0.4197 N(20) SIG .005	VAR012 WITH VAR017	0.0850 N(20) SIG .300	VAR012 WITH VAR018	0.1519 N(20) SIG .175	VAR012 WITH VAR019	0.0490 N(20) SIG .381	VAR012 WITH VAR020	0.0378 N(20) SIG .408
VAR013 WITH VAR014	0.1762 N(20) SIG .139	VAR013 WITH VAR015	0.3957 N(20) SIG .007	VAR013 WITH VAR016	0.1222 N(20) SIG .226	VAR013 WITH VAR017	0.0265 N(20) SIG .435	VAR013 WITH VAR018	0.4046 N(20) SIG .006	VAR013 WITH VAR019	0.5169 N(20) SIG .001
VAR013 WITH VAR020	0.5916 N(20) SIG .001	VAR014 WITH VAR015	0.0571 N(20) SIG .362	VAR014 WITH VAR016	0.7253 N(20) SIG .001	VAR014 WITH VAR017	0.6065 N(20) SIG .001	VAR014 WITH VAR018	-0.1000 N(20) SIG .269	VAR014 WITH VAR019	0.2133 N(20) SIG .094
VAR014 WITH VAR020	0.0467 N(20) SIG .387	VAR015 WITH VAR016	0.0507 N(20) SIG .377	VAR015 WITH VAR017	0.1913 N(20) SIG .119	VAR015 WITH VAR018	0.4476 N(20) SIG .003	VAR015 WITH VAR019	0.3610 N(20) SIG .013	VAR015 WITH VAR020	0.2939 N(20) SIG .035
VAR016 WITH VAR017	0.6842 N(20) SIG .001	VAR016 WITH VAR018	-0.0123 N(20) SIG .470	VAR016 WITH VAR019	0.2103 N(20) SIG .037	VAR016 WITH VAR020	0.0997 N(20) SIG .269	VAR017 WITH VAR018	0.0317 N(20) SIG .422	VAR017 WITH VAR019	0.1755 N(20) SIG .140
VAR017 WITH VAR020	0.0316 N(20) SIG .423	VAR018 WITH VAR019	0.5142 N(20) SIG .001	VAR018 WITH VAR020	0.2369 N(20) SIG .072	VAR019 WITH VAR020	0.1950 N(20) SIG .115				

TABLE 10.

CORRELATION MATRIX FOR POST-TEST ITEMS 1-6 ON GARS (KENDALL)

KENDALL CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR101 WITH VAR102	0.1734 N(20) SIG .143	VAR101 WITH VAR103	0.5000 N(20) SIG .001	VAR101 WITH VAR104	0.1023 N(20) SIG .264	VAR101 WITH VAR105	0.2343 N(20) SIG .074	VAR101 WITH VAR106	0.0511 N(20) SIG .376	VAR101 WITH VAR107	-0.0282 N(20) SIG .431
VAR101 WITH VAR108	0.1038 N(20) SIG .261	VAR101 WITH VAR109	0.4208 N(20) SIG .005	VAR101 WITH VAR110	0.4523 N(20) SIG .003	VAR101 WITH VAR111	0.4900 N(20) SIG .001	VAR101 WITH VAR112	0.0508 N(20) SIG .377	VAR101 WITH VAR113	0.1719 N(20) SIG .145
VAR101 WITH VAR114	0.3380 N(20) SIG .019	VAR101 WITH VAR115	0.3503 N(20) SIG .015	VAR101 WITH VAR116	0.2343 N(20) SIG .074	VAR101 WITH VAR117	0.1547 N(20) SIG .170	VAR101 WITH VAR118	0.3125 N(20) SIG .027	VAR101 WITH VAR119	0.0678 N(20) SIG .338
VAR101 WITH VAR120	0.2283 N(20) SIG .080	VAR102 WITH VAR103	-0.0289 N(20) SIG .429	VAR102 WITH VAR104	0.3006 N(20) SIG .032	VAR102 WITH VAR105	0.3663 N(20) SIG .012	VAR102 WITH VAR106	0.2023 N(20) SIG .106	VAR102 WITH VAR107	0.3096 N(20) SIG .028
VAR102 WITH VAR108	0.0821 N(20) SIG .306	VAR102 WITH VAR109	0.1994 N(20) SIG .109	VAR102 WITH VAR110	0.4661 N(20) SIG .002	VAR102 WITH VAR111	0.4214 N(20) SIG .005	VAR102 WITH VAR112	0.3277 N(20) SIG .022	VAR102 WITH VAR113	0.2216 N(20) SIG .086
VAR102 WITH VAR114	0.4587 N(20) SIG .001	VAR102 WITH VAR115	0.3104 N(20) SIG .028	VAR102 WITH VAR116	0.3605 N(20) SIG .013	VAR102 WITH VAR117	0.4257 N(20) SIG .004	VAR102 WITH VAR118	0.0520 N(20) SIG .374	VAR102 WITH VAR119	0.3392 N(20) SIG .018
VAR102 WITH VAR120	0.2391 N(20) SIG .070	VAR103 WITH VAR104	0.2443 N(20) SIG .066	VAR103 WITH VAR105	0.3429 N(20) SIG .017	VAR103 WITH VAR106	-0.2045 N(20) SIG .104	VAR103 WITH VAR107	0.1239 N(20) SIG .222	VAR103 WITH VAR108	0.3574 N(20) SIG .014
VAR103 WITH VAR109	0.5073 N(20) SIG .001	VAR103 WITH VAR110	0.3537 N(20) SIG .015	VAR103 WITH VAR111	0.4200 N(20) SIG .005	VAR103 WITH VAR112	0.1017 N(20) SIG .265	VAR103 WITH VAR113	0.2235 N(20) SIG .084	VAR103 WITH VAR114	0.3549 N(20) SIG .014
VAR103 WITH VAR115	0.4237 N(20) SIG .004	VAR103 WITH VAR116	0.3600 N(20) SIG .013	VAR103 WITH VAR117	0.2178 N(20) SIG .090	VAR103 WITH VAR118	0.3295 N(20) SIG .021	VAR103 WITH VAR119	0.0113 N(20) SIG .472	VAR103 WITH VAR120	0.1544 N(20) SIG .171
VAR104 WITH VAR105	0.5029 N(20) SIG .001	VAR104 WITH VAR106	0.2330 N(20) SIG .075	VAR104 WITH VAR107	0.5803 N(20) SIG .001	VAR104 WITH VAR108	0.2652 N(20) SIG .051	VAR104 WITH VAR109	0.3170 N(20) SIG .025	VAR104 WITH VAR110	0.4929 N(20) SIG .001
VAR104 WITH VAR111	0.3500 N(20) SIG .015	VAR104 WITH VAR112	0.4802 N(20) SIG .002	VAR104 WITH VAR113	0.3324 N(20) SIG .020	VAR104 WITH VAR114	0.4676 N(20) SIG .002	VAR104 WITH VAR115	0.4520 N(20) SIG .003	VAR104 WITH VAR116	0.4572 N(20) SIG .002
VAR104 WITH VAR117	0.2579 N(20) SIG .056	VAR104 WITH VAR118	0.1818 N(20) SIG .131	VAR104 WITH VAR119	0.2203 N(20) SIG .087	VAR104 WITH VAR120	0.1074 N(20) SIG .254	VAR105 WITH VAR106	0.0857 N(20) SIG .299	VAR105 WITH VAR107	0.5496 N(20) SIG .001
VAR105 WITH VAR108	0.2609 N(20) SIG .054	VAR105 WITH VAR109	0.3536 N(20) SIG .015	VAR105 WITH VAR110	0.5190 N(20) SIG .001	VAR105 WITH VAR111	0.4928 N(20) SIG .001	VAR105 WITH VAR112	0.5796 N(20) SIG .001	VAR105 WITH VAR113	0.4842 N(20) SIG .001
VAR105 WITH VAR114	0.4590 N(20) SIG .002	VAR105 WITH VAR115	0.7955 N(20) SIG .001	VAR105 WITH VAR116	0.6494 N(20) SIG .001	VAR105 WITH VAR117	0.3977 N(20) SIG .007	VAR105 WITH VAR118	0.5200 N(20) SIG .001	VAR105 WITH VAR119	0.4716 N(20) SIG .002
VAR105 WITH VAR120	0.3107 N(20) SIG .028	VAR106 WITH VAR107	0.3887 N(20) SIG .008	VAR106 WITH VAR108	-0.1095 N(20) SIG .250	VAR106 WITH VAR109	-0.0519 N(20) SIG .375	VAR106 WITH VAR110	0.1797 N(20) SIG .134	VAR106 WITH VAR111	0.1575 N(20) SIG .166
VAR106 WITH VAR112	0.2429 N(20) SIG .067	VAR106 WITH VAR113	0.2694 N(20) SIG .048	VAR106 WITH VAR114	0.1127 N(20) SIG .244	VAR106 WITH VAR115	0.1356 N(20) SIG .202	VAR106 WITH VAR116	0.0343 N(20) SIG .416	VAR106 WITH VAR117	0.1547 N(20) SIG .170

TABLE 11.

CORRELATION MATRIX FOR POST-TEST ITEMS 7-20 ON GARS (KENDALL)

KENDALL CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR106 WITH VAR118	0.0170 N(20) SIG .458	VAR106 WITH VAR119	0.0113 N(20) SIG .472	VAR106 WITH VAR120	0.2417 N(20) SIG .068	VAR107 WITH VAR108	0.1200 N(20) SIG .230	VAR107 WITH VAR109	0.0457 N(20) SIG .389	VAR107 WITH VAR110	0.4197 N(20) SIG .005
VAR107 WITH VAR111	0.3008 N(20) SIG .032	VAR107 WITH VAR112	0.5994 N(20) SIG .001	VAR107 WITH VAR113	0.3239 N(20) SIG .023	VAR107 WITH VAR114	0.3743 N(20) SIG .011	VAR107 WITH VAR115	0.3922 N(20) SIG .008	VAR107 WITH VAR116	0.4873 N(20) SIG .001
VAR107 WITH VAR117	0.3578 N(20) SIG .007	VAR107 WITH VAR118	0.2592 N(20) SIG .055	VAR107 WITH VAR119	0.2633 N(20) SIG .052	VAR107 WITH VAR120	0.2464 N(20) SIG .064	VAR108 WITH VAR109	0.3860 N(20) SIG .009	VAR108 WITH VAR110	0.3235 N(20) SIG .023
VAR108 WITH VAR111	0.2190 N(20) SIG .089	VAR108 WITH VAR112	0.0229 N(20) SIG .444	VAR108 WITH VAR113	0.2267 N(20) SIG .081	VAR108 WITH VAR114	0.3258 N(20) SIG .022	VAR108 WITH VAR115	0.2235 N(20) SIG .084	VAR108 WITH VAR116	0.4348 N(20) SIG .004
VAR108 WITH VAR117	0.0581 N(20) SIG .360	VAR108 WITH VAR118	0.0461 N(20) SIG .398	VAR108 WITH VAR119	-0.0172 N(20) SIG .458	VAR108 WITH VAR120	-0.1703 N(20) SIG .147	VAR109 WITH VAR110	0.4177 N(20) SIG .005	VAR109 WITH VAR111	0.4793 N(20) SIG .002
VAR109 WITH VAR112	-0.0229 N(20) SIG .444	VAR109 WITH VAR113	0.2151 N(20) SIG .092	VAR109 WITH VAR114	0.3944 N(20) SIG .008	VAR109 WITH VAR115	0.3382 N(20) SIG .019	VAR109 WITH VAR116	0.3594 N(20) SIG .013	VAR109 WITH VAR117	0.2093 N(20) SIG .098
VAR109 WITH VAR118	0.0922 N(20) SIG .285	VAR109 WITH VAR119	0.0688 N(20) SIG .336	VAR109 WITH VAR120	0.1635 N(20) SIG .157	VAR110 WITH VAR111	0.5833 N(20) SIG .001	VAR110 WITH VAR112	0.3575 N(20) SIG .014	VAR110 WITH VAR113	0.3743 N(20) SIG .011
VAR110 WITH VAR114	0.6324 N(20) SIG .001	VAR110 WITH VAR115	0.6112 N(20) SIG .001	VAR110 WITH VAR116	0.5132 N(20) SIG .001	VAR110 WITH VAR117	0.4094 N(20) SIG .006	VAR110 WITH VAR118	0.2667 N(20) SIG .050	VAR110 WITH VAR119	0.3344 N(20) SIG .020
VAR110 WITH VAR120	0.1987 N(20) SIG .110	VAR111 WITH VAR112	0.3654 N(20) SIG .012	VAR111 WITH VAR113	0.4177 N(20) SIG .005	VAR111 WITH VAR114	0.4396 N(20) SIG .003	VAR111 WITH VAR115	0.5336 N(20) SIG .001	VAR111 WITH VAR116	0.4986 N(20) SIG .001
VAR111 WITH VAR117	0.2942 N(20) SIG .035	VAR111 WITH VAR118	0.2450 N(20) SIG .065	VAR111 WITH VAR119	0.4002 N(20) SIG .007	VAR111 WITH VAR120	0.4895 N(20) SIG .001	VAR112 WITH VAR113	0.4445 N(20) SIG .003	VAR112 WITH VAR114	0.3305 N(20) SIG .021
VAR112 WITH VAR115	0.4944 N(20) SIG .001	VAR112 WITH VAR116	0.4262 N(20) SIG .004	VAR112 WITH VAR117	0.3248 N(20) SIG .023	VAR112 WITH VAR118	0.3390 N(20) SIG .018	VAR112 WITH VAR119	0.3989 N(20) SIG .007	VAR112 WITH VAR120	0.3272 N(20) SIG .022
VAR113 WITH VAR114	0.3523 N(20) SIG .015	VAR113 WITH VAR115	0.5984 N(20) SIG .001	VAR113 WITH VAR116	0.3977 N(20) SIG .007	VAR113 WITH VAR117	0.3179 N(20) SIG .025	VAR113 WITH VAR118	0.1490 N(20) SIG .179	VAR113 WITH VAR119	0.2792 N(20) SIG .043
VAR113 WITH VAR120	0.3861 N(20) SIG .009	VAR114 WITH VAR115	0.4986 N(20) SIG .001	VAR114 WITH VAR116	0.5950 N(20) SIG .001	VAR114 WITH VAR117	0.5512 N(20) SIG .001	VAR114 WITH VAR118	0.1409 N(20) SIG .193	VAR114 WITH VAR119	0.1176 N(20) SIG .234
VAR114 WITH VAR120	0.1265 N(20) SIG .218	VAR115 WITH VAR116	0.5966 N(20) SIG .001	VAR115 WITH VAR117	0.4160 N(20) SIG .005	VAR115 WITH VAR118	0.5198 N(20) SIG .001	VAR115 WITH VAR119	0.4438 N(20) SIG .003	VAR115 WITH VAR120	0.3806 N(20) SIG .009
VAR116 WITH VAR117	0.3285 N(20) SIG .021	VAR116 WITH VAR118	0.3143 N(20) SIG .026	VAR116 WITH VAR119	0.2216 N(20) SIG .086	VAR116 WITH VAR120	0.1688 N(20) SIG .149	VAR117 WITH VAR118	0.2063 N(20) SIG .102	VAR117 WITH VAR119	0.1311 N(20) SIG .210
VAR117 WITH VAR120	0.2845 N(20) SIG .040	VAR118 WITH VAR119	0.3051 N(20) SIG .030	VAR118 WITH VAR120	0.1343 N(20) SIG .204	VAR119 WITH VAR120	0.4207 N(20) SIG .005				

TABLE 12.

CORRELATION MATRIX FOR PRE-TEST ITEM 1-6 ON GARS (SPEARMAN)

SPEARMAN CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR001 WITH VAR002	0.3209 N(20) SIG .084	VAR001 WITH VAR003	0.3389 N(20) SIG .072	VAR001 WITH VAR004	-0.2669 N(20) SIG .128	VAR001 WITH VAR005	0.5662 N(20) SIG .005	VAR001 WITH VAR006	0.1526 N(20) SIG .260	VAR001 WITH VAR007	0.555 N(20) SIG .00
VAR001 WITH VAR008	0.1425 N(20) SIG .274	VAR001 WITH VAR009	0.3582 N(20) SIG .060	VAR001 WITH VAR010	0.7969 N(20) SIG .001	VAR001 WITH VAR011	0.4145 N(20) SIG .035	VAR001 WITH VAR012	0.0090 N(20) SIG .485	VAR001 WITH VAR013	-0.057 N(20) SIG .40
VAR001 WITH VAR014	0.7176 N(20) SIG .001	VAR001 WITH VAR015	0.1167 N(20) SIG .312	VAR001 WITH VAR016	0.6209 N(20) SIG .002	VAR001 WITH VAR017	0.6502 N(20) SIG .001	VAR001 WITH VAR018	0.0390 N(20) SIG .435	VAR001 WITH VAR019	0.394 N(20) SIG .04
VAR001 WITH VAR020	-0.1358 N(20) SIG .284	VAR002 WITH VAR003	-0.0427 N(20) SIG .429	VAR002 WITH VAR004	0.2680 N(20) SIG .127	VAR002 WITH VAR005	0.5318 N(20) SIG .008	VAR002 WITH VAR006	0.1077 N(20) SIG .326	VAR002 WITH VAR007	0.444 N(20) SIG .02
VAR002 WITH VAR008	0.6224 N(20) SIG .002	VAR002 WITH VAR009	0.0797 N(20) SIG .369	VAR002 WITH VAR010	0.4437 N(20) SIG .025	VAR002 WITH VAR011	0.1938 N(20) SIG .206	VAR002 WITH VAR012	0.4861 N(20) SIG .015	VAR002 WITH VAR013	0.280 N(20) SIG .11
VAR002 WITH VAR014	0.6913 N(20) SIG .001	VAR002 WITH VAR015	0.2188 N(20) SIG .177	VAR002 WITH VAR016	0.8253 N(20) SIG .001	VAR002 WITH VAR017	0.7121 N(20) SIG .001	VAR002 WITH VAR018	0.0131 N(20) SIG .478	VAR002 WITH VAR019	0.209 N(20) SIG .18
VAR002 WITH VAR020	0.1030 N(20) SIG .333	VAR003 WITH VAR004	0.0873 N(20) SIG .357	VAR003 WITH VAR005	0.4253 N(20) SIG .031	VAR003 WITH VAR006	0.3843 N(20) SIG .047	VAR003 WITH VAR007	0.2466 N(20) SIG .147	VAR003 WITH VAR008	-0.213 N(20) SIG .18
VAR003 WITH VAR009	0.6102 N(20) SIG .002	VAR003 WITH VAR010	0.4931 N(20) SIG .014	VAR003 WITH VAR011	0.5896 N(20) SIG .003	VAR003 WITH VAR012	0.0463 N(20) SIG .423	VAR003 WITH VAR013	0.1335 N(20) SIG .287	VAR003 WITH VAR014	0.028 N(20) SIG .45
VAR003 WITH VAR015	0.6701 N(20) SIG .001	VAR003 WITH VAR016	0.1311 N(20) SIG .291	VAR003 WITH VAR017	0.2437 N(20) SIG .150	VAR003 WITH VAR018	0.4702 N(20) SIG .018	VAR003 WITH VAR019	0.2988 N(20) SIG .100	VAR003 WITH VAR020	0.313 N(20) SIG .08
VAR004 WITH VAR005	0.1553 N(20) SIG .257	VAR004 WITH VAR006	-0.0147 N(20) SIG .476	VAR004 WITH VAR007	-0.0970 N(20) SIG .342	VAR004 WITH VAR008	0.2334 N(20) SIG .161	VAR004 WITH VAR009	0.0687 N(20) SIG .387	VAR004 WITH VAR010	-0.084 N(20) SIG .36
VAR004 WITH VAR011	-0.1572 N(20) SIG .254	VAR004 WITH VAR012	0.4649 N(20) SIG .019	VAR004 WITH VAR013	0.3677 N(20) SIG .055	VAR004 WITH VAR014	-0.1097 N(20) SIG .323	VAR004 WITH VAR015	0.3397 N(20) SIG .071	VAR004 WITH VAR016	-0.030 N(20) SIG .44
VAR004 WITH VAR017	-0.2409 N(20) SIG .153	VAR004 WITH VAR018	0.1341 N(20) SIG .286	VAR004 WITH VAR019	-0.1261 N(20) SIG .298	VAR004 WITH VAR020	0.2769 N(20) SIG .119	VAR005 WITH VAR006	0.2778 N(20) SIG .118	VAR005 WITH VAR007	0.628 N(20) SIG .00
VAR005 WITH VAR008	0.0705 N(20) SIG .384	VAR005 WITH VAR009	0.4347 N(20) SIG .028	VAR005 WITH VAR010	0.7227 N(20) SIG .001	VAR005 WITH VAR011	0.4391 N(20) SIG .026	VAR005 WITH VAR012	0.4572 N(20) SIG .021	VAR005 WITH VAR013	0.518 N(20) SIG .01
VAR005 WITH VAR014	0.6600 N(20) SIG .001	VAR005 WITH VAR015	0.4477 N(20) SIG .024	VAR005 WITH VAR016	0.6607 N(20) SIG .001	VAR005 WITH VAR017	0.4848 N(20) SIG .015	VAR005 WITH VAR018	0.1918 N(20) SIG .209	VAR005 WITH VAR019	0.579 N(20) SIG .00
VAR005 WITH VAR020	0.2598 N(20) SIG .134	VAR006 WITH VAR007	0.3947 N(20) SIG .043	VAR006 WITH VAR008	0.1892 N(20) SIG .212	VAR006 WITH VAR009	0.4392 N(20) SIG .026	VAR006 WITH VAR010	0.4521 N(20) SIG .023	VAR006 WITH VAR011	0.564 N(20) SIG .00
VAR006 WITH VAR012	0.1468 N(20) SIG .268	VAR006 WITH VAR013	0.4644 N(20) SIG .020	VAR006 WITH VAR014	0.2610 N(20) SIG .133	VAR006 WITH VAR015	0.2936 N(20) SIG .104	VAR006 WITH VAR016	0.2243 N(20) SIG .171	VAR006 WITH VAR017	0.328 N(20) SIG .07

TABLE 13.

CORRELATION MATRIX FOR PRE-TEST ITEMS 7-20 ON GARS (SPEARMAN)

SPEARMAN CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR006	0.2861	VAR006	0.2898	VAR006	0.5513	VAR007	0.2453	VAR007	0.1994	VAR007	0.6
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(
VAR018	SIG .111	VAR019	SIG .108	VAR020	SIG .006	VAR008	SIG .149	VAR009	SIG .200	VAR010	SIG .
VAR007	0.5189	VAR007	0.1759	VAR007	0.3485	VAR007	0.6572	VAR007	0.2273	VAR007	0.6
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(
VAR011	SIG .010	VAR012	SIG .224	VAR013	SIG .066	VAR014	SIG .001	VAR015	SIG .168	VAR016	SIG .
VAR007	0.5559	VAR007	-0.1616	VAR007	0.3362	VAR007	0.3342	VAR008	-0.0977	VAR008	0.1
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(
VAR017	SIG .005	VAR018	SIG .246	VAR019	SIG .074	VAR020	SIG .075	VAR009	SIG .341	VAR010	SIG .
VAR008	0.2112	VAR008	0.0138	VAR008	0.0953	VAR008	0.3411	VAR008	0.1604	VAR008	0.3
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(
VAR011	SIG .186	VAR012	SIG .477	VAR013	SIG .345	VAR014	SIG .071	VAR015	SIG .250	VAR016	SIG .
VAR008	0.5914	VAR008	-0.1288	VAR008	-0.1321	VAR008	0.1199	VAR009	0.7280	VAR009	0.5
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(
VAR017	SIG .003	VAR018	SIG .294	VAR019	SIG .289	VAR020	SIG .307	VAR010	SIG .001	VAR011	SIG .
VAR009	0.0336	VAR009	0.3762	VAR009	0.3715	VAR009	0.5230	VAR009	0.2281	VAR009	0.28
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(2
VAR012	SIG .444	VAR013	SIG .051	VAR014	SIG .053	VAR015	SIG .009	VAR016	SIG .167	VAR017	SIG .1
VAR009	0.5120	VAR009	0.5015	VAR009	0.4137	VAR010	0.6780	VAR010	0.1822	VAR010	0.28
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(2
VAR018	SIG .011	VAR019	SIG .012	VAR020	SIG .035	VAR011	SIG .001	VAR012	SIG .221	VAR013	SIG .1
VAR010	0.7949	VAR010	0.3802	VAR010	0.6513	VAR010	0.6797	VAR010	0.1901	VAR010	0.53
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(2
VAR014	SIG .001	VAR015	SIG .049	VAR016	SIG .001	VAR017	SIG .001	VAR018	SIG .211	VAR019	SIG .0
VAR010	0.2042	VAR011	-0.0575	VAR011	0.3232	VAR011	0.3904	VAR011	0.4598	VAR011	0.42
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(2
VAR020	SIG .194	VAR012	SIG .405	VAR013	SIG .082	VAR014	SIG .044	VAR015	SIG .021	VAR016	SIG .0
VAR011	0.5160	VAR011	0.2377	VAR011	0.3674	VAR011	0.5043	VAR012	0.2526	VAR012	0.29
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(2
VAR017	SIG .010	VAR018	SIG .156	VAR019	SIG .056	VAR020	SIG .012	VAR013	SIG .141	VAR014	SIG .1
VAR012	0.0532	VAR012	0.4970	VAR012	0.1176	VAR012	0.1825	VAR012	0.0934	VAR012	0.053
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20
VAR015	SIG .412	VAR016	SIG .013	VAR017	SIG .311	VAR018	SIG .221	VAR019	SIG .348	VAR020	SIG .41
VAR013	0.2095	VAR013	0.4649	VAR013	0.1454	VAR013	0.0123	VAR013	0.4780	VAR013	0.628
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20
VAR014	SIG .188	VAR015	SIG .019	VAR016	SIG .270	VAR017	SIG .479	VAR018	SIG .017	VAR019	SIG .00
VAR013	0.7018	VAR014	0.0665	VAR014	0.8641	VAR014	0.7786	VAR014	-0.1247	VAR014	0.353
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20
VAR020	SIG .001	VAR015	SIG .390	VAR016	SIG .001	VAR017	SIG .001	VAR018	SIG .300	VAR019	SIG .06
VAR014	0.0639	VAR015	0.0921	VAR015	0.2406	VAR015	0.5606	VAR015	0.4235	VAR015	0.355
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20
VAR020	SIG .395	VAR016	SIG .350	VAR017	SIG .153	VAR018	SIG .005	VAR019	SIG .031	VAR020	SIG .06
VAR016	0.7921	VAR016	-0.0405	VAR016	0.3018	VAR016	0.1280	VAR017	0.0056	VAR017	0.225
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20
VAR017	SIG .001	VAR018	SIG .433	VAR019	SIG .098	VAR020	SIG .295	VAR018	SIG .491	VAR019	SIG .16
VAR017	0.0419	VAR018	0.6502	VAR018	0.2679	VAR019	0.2403				
WITH	N(20)	WITH	N(20)	WITH	N(20)	WITH	N(20)				
VAR020	SIG .430	VAR019	SIG .001	VAR020	SIG .127	VAR020	SIG .154				

TABLE 14.

CORRELATION MATRIX FOR POST-TEST ITEMS 1-6 ON GARS (SPEARMAN)

SPEARMAN CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR101 WITH VAR102	0.1929 N(20) SIG .208	VAR101 WITH VAR103	0.6450 N(20) SIG .001	VAR101 WITH VAR104	0.1545 N(20) SIG .258	VAR101 WITH VAR105	0.3101 N(20) SIG .092	VAR101 WITH VAR106	0.0610 N(20) SIG .399	VAR101 WITH VAR107	0.0030 N(20) SIG .49
VAR101 WITH VAR108	0.1717 N(20) SIG .235	VAR101 WITH VAR109	0.5734 N(20) SIG .004	VAR101 WITH VAR110	0.5480 N(20) SIG .006	VAR101 WITH VAR111	0.6150 N(20) SIG .002	VAR101 WITH VAR112	0.0990 N(20) SIG .339	VAR101 WITH VAR113	0.194 N(20 SIG .20
VAR101 WITH VAR114	0.4287 N(20) SIG .030	VAR101 WITH VAR115	0.4794 N(20) SIG .016	VAR101 WITH VAR116	0.3206 N(20) SIG .084	VAR101 WITH VAR117	0.2173 N(20) SIG .179	VAR101 WITH VAR118	0.4092 N(20) SIG .037	VAR101 WITH VAR119	0.105 N(20 SIG .32
VAR101 WITH VAR120	0.2848 N(20) SIG .112	VAR102 WITH VAR103	-0.0580 N(20) SIG .404	VAR102 WITH VAR104	0.3977 N(20) SIG .041	VAR102 WITH VAR105	0.5366 N(20) SIG .007	VAR102 WITH VAR106	0.2425 N(20) SIG .151	VAR102 WITH VAR107	0.3806 N(20) SIG .04
VAR102 WITH VAR108	0.1238 N(20) SIG .301	VAR102 WITH VAR109	0.2859 N(20) SIG .111	VAR102 WITH VAR110	0.5771 N(20) SIG .004	VAR102 WITH VAR111	0.5345 N(20) SIG .008	VAR102 WITH VAR112	0.4734 N(20) SIG .018	VAR102 WITH VAR113	0.2857 N(20 SIG .111
VAR102 WITH VAR114	0.6302 N(20) SIG .001	VAR102 WITH VAR115	0.4235 N(20) SIG .031	VAR102 WITH VAR116	0.4802 N(20) SIG .016	VAR102 WITH VAR117	0.5213 N(20) SIG .009	VAR102 WITH VAR118	0.0726 N(20) SIG .381	VAR102 WITH VAR119	0.4429 N(20 SIG .025
VAR102 WITH VAR120	0.3072 N(20) SIG .094	VAR103 WITH VAR104	0.4018 N(20) SIG .040	VAR103 WITH VAR105	0.4389 N(20) SIG .026	VAR103 WITH VAR106	-0.2661 N(20) SIG .128	VAR103 WITH VAR107	0.1467 N(20) SIG .269	VAR103 WITH VAR108	0.4960 N(20) SIG .013
VAR103 WITH VAR109	0.6580 N(20) SIG .001	VAR103 WITH VAR110	0.4466 N(20) SIG .024	VAR103 WITH VAR111	0.5396 N(20) SIG .007	VAR103 WITH VAR112	0.1537 N(20) SIG .259	VAR103 WITH VAR113	0.2827 N(20) SIG .114	VAR103 WITH VAR114	0.5326 N(20) SIG .008
VAR103 WITH VAR115	0.5355 N(20) SIG .007	VAR103 WITH VAR116	0.4958 N(20) SIG .013	VAR103 WITH VAR117	0.2686 N(20) SIG .126	VAR103 WITH VAR118	0.4034 N(20) SIG .039	VAR103 WITH VAR119	0.0168 N(20) SIG .472	VAR103 WITH VAR120	0.1829 N(20) SIG .22
VAR104 WITH VAR105	0.6349 N(20) SIG .001	VAR104 WITH VAR106	0.3018 N(20) SIG .098	VAR104 WITH VAR107	0.7400 N(20) SIG .001	VAR104 WITH VAR108	0.3479 N(20) SIG .066	VAR104 WITH VAR109	0.4150 N(20) SIG .034	VAR104 WITH VAR110	0.6571 N(20) SIG .001
VAR104 WITH VAR111	0.4702 N(20) SIG .018	VAR104 WITH VAR112	0.6170 N(20) SIG .002	VAR104 WITH VAR113	0.4369 N(20) SIG .027	VAR104 WITH VAR114	0.6110 N(20) SIG .002	VAR104 WITH VAR115	0.6075 N(20) SIG .002	VAR104 WITH VAR116	0.5810 N(20) SIG .004
VAR104 WITH VAR117	0.4151 N(20) SIG .034	VAR104 WITH VAR118	0.2870 N(20) SIG .110	VAR104 WITH VAR119	0.2852 N(20) SIG .111	VAR104 WITH VAR120	0.1277 N(20) SIG .296	VAR105 WITH VAR106	0.1140 N(20) SIG .316	VAR105 WITH VAR107	0.6847 N(20) SIG .001
VAR105 WITH VAR108	0.3635 N(20) SIG .058	VAR105 WITH VAR109	0.4396 N(20) SIG .026	VAR105 WITH VAR110	0.6916 N(20) SIG .001	VAR105 WITH VAR111	0.6434 N(20) SIG .001	VAR105 WITH VAR112	0.7711 N(20) SIG .001	VAR105 WITH VAR113	0.5918 N(20) SIG .003
VAR105 WITH VAR114	0.6492 N(20) SIG .001	VAR105 WITH VAR115	0.9037 N(20) SIG .001	VAR105 WITH VAR116	0.7890 N(20) SIG .001	VAR105 WITH VAR117	0.5837 N(20) SIG .003	VAR105 WITH VAR118	0.6548 N(20) SIG .001	VAR105 WITH VAR119	0.5898 N(20) SIG .003
VAR105 WITH VAR120	0.3795 N(20) SIG .049	VAR106 WITH VAR107	0.5057 N(20) SIG .011	VAR106 WITH VAR108	-0.1630 N(20) SIG .246	VAR106 WITH VAR109	-0.0353 N(20) SIG .441	VAR106 WITH VAR110	0.2342 N(20) SIG .160	VAR106 WITH VAR111	0.2099 N(20) SIG .187
VAR106 WITH VAR112	0.3276 N(20) SIG .079	VAR106 WITH VAR113	0.3458 N(20) SIG .068	VAR106 WITH VAR114	0.1233 N(20) SIG .302	VAR106 WITH VAR115	0.1730 N(20) SIG .233	VAR106 WITH VAR116	0.0622 N(20) SIG .397	VAR106 WITH VAR117	0.2136 N(20) SIG .183

TABLE 15.
CORRELATION MATRIX FOR POST-TEST ITEMS 7-20 ON GARS (SPEARMAN)

SPEARMAN CORRELATION COEFFICIENTS

VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR		VARIABLE PAIR	
VAR106 WITH VAR118	0.0031 N(20) SIG .495	VAR106 WITH VAR119	-0.0008 N(20) SIG .499	VAR106 WITH VAR120	0.3333 N(20) SIG .076	VAR107 WITH VAR108	0.1844 N(20) SIG .218	VAR107 WITH VAR109	0.1071 N(20) SIG .327	VAR107 WITH VAR110	0.5370 N(20) SIG .007
VAR107 WITH VAR111	0.3713 N(20) SIG .054	VAR107 WITH VAR112	0.7894 N(20) SIG .001	VAR107 WITH VAR113	0.4068 N(20) SIG .038	VAR107 WITH VAR114	0.5125 N(20) SIG .010	VAR107 WITH VAR115	0.5306 N(20) SIG .008	VAR107 WITH VAR116	0.5631 N(20) SIG .005
VAR107 WITH VAR117	0.4956 N(20) SIG .013	VAR107 WITH VAR118	0.3403 N(20) SIG .071	VAR107 WITH VAR119	0.3593 N(20) SIG .060	VAR107 WITH VAR120	0.2892 N(20) SIG .108	VAR108 WITH VAR109	0.5066 N(20) SIG .011	VAR108 WITH VAR110	0.3917 N(20) SIG .044
VAR108 WITH VAR111	0.3079 N(20) SIG .093	VAR108 WITH VAR112	0.0169 N(20) SIG .472	VAR108 WITH VAR113	0.3054 N(20) SIG .095	VAR108 WITH VAR114	0.4067 N(20) SIG .038	VAR108 WITH VAR115	0.2896 N(20) SIG .108	VAR108 WITH VAR116	0.5478 N(20) SIG .006
VAR108 WITH VAR117	0.0826 N(20) SIG .365	VAR108 WITH VAR118	0.1277 N(20) SIG .296	VAR108 WITH VAR119	-0.0111 N(20) SIG .481	VAR108 WITH VAR120	-0.2273 N(20) SIG .168	VAR109 WITH VAR110	0.5465 N(20) SIG .006	VAR109 WITH VAR111	0.6088 N(20) SIG .002
VAR109 WITH VAR112	-0.0444 N(20) SIG .426	VAR109 WITH VAR113	0.2739 N(20) SIG .121	VAR109 WITH VAR114	0.5352 N(20) SIG .008	VAR109 WITH VAR115	0.4627 N(20) SIG .020	VAR109 WITH VAR116	0.4461 N(20) SIG .024	VAR109 WITH VAR117	0.2977 N(20) SIG .101
VAR109 WITH VAR118	0.1523 N(20) SIG .261	VAR109 WITH VAR119	0.0943 N(20) SIG .346	VAR109 WITH VAR120	0.2038 N(20) SIG .194	VAR110 WITH VAR111	0.7158 N(20) SIG .001	VAR110 WITH VAR112	0.4682 N(20) SIG .019	VAR110 WITH VAR113	0.5000 N(20) SIG .012
VAR110 WITH VAR114	0.8055 N(20) SIG .001	VAR110 WITH VAR115	0.7707 N(20) SIG .001	VAR110 WITH VAR116	0.6637 N(20) SIG .001	VAR110 WITH VAR117	0.5381 N(20) SIG .007	VAR110 WITH VAR118	0.2807 N(20) SIG .115	VAR110 WITH VAR119	0.4327 N(20) SIG .028
VAR110 WITH VAR120	0.2423 N(20) SIG .152	VAR111 WITH VAR112	0.4490 N(20) SIG .024	VAR111 WITH VAR113	0.5207 N(20) SIG .009	VAR111 WITH VAR114	0.5485 N(20) SIG .006	VAR111 WITH VAR115	0.6945 N(20) SIG .001	VAR111 WITH VAR116	0.6371 N(20) SIG .001
VAR111 WITH VAR117	0.3767 N(20) SIG .051	VAR111 WITH VAR118	0.3152 N(20) SIG .088	VAR111 WITH VAR119	0.5620 N(20) SIG .005	VAR111 WITH VAR120	0.5696 N(20) SIG .004	VAR112 WITH VAR113	0.5989 N(20) SIG .003	VAR112 WITH VAR114	0.4694 N(20) SIG .018
VAR112 WITH VAR115	0.6697 N(20) SIG .001	VAR112 WITH VAR116	0.5584 N(20) SIG .005	VAR112 WITH VAR117	0.4847 N(20) SIG .015	VAR112 WITH VAR118	0.4646 N(20) SIG .020	VAR112 WITH VAR119	0.5306 N(20) SIG .008	VAR112 WITH VAR120	0.3896 N(20) SIG .045
VAR113 WITH VAR114	0.4567 N(20) SIG .021	VAR113 WITH VAR115	0.7160 N(20) SIG .001	VAR113 WITH VAR116	0.5103 N(20) SIG .011	VAR113 WITH VAR117	0.4016 N(20) SIG .040	VAR113 WITH VAR118	0.1976 N(20) SIG .202	VAR113 WITH VAR119	0.3719 N(20) SIG .053
VAR113 WITH VAR120	0.4447 N(20) SIG .025	VAR114 WITH VAR115	0.6765 N(20) SIG .001	VAR114 WITH VAR116	0.7432 N(20) SIG .001	VAR114 WITH VAR117	0.7381 N(20) SIG .001	VAR114 WITH VAR118	0.2276 N(20) SIG .167	VAR114 WITH VAR119	0.1662 N(20) SIG .242
VAR114 WITH VAR120	0.1652 N(20) SIG .243	VAR115 WITH VAR116	0.7597 N(20) SIG .001	VAR115 WITH VAR117	0.5630 N(20) SIG .005	VAR115 WITH VAR118	0.6536 N(20) SIG .001	VAR115 WITH VAR119	0.5577 N(20) SIG .005	VAR115 WITH VAR120	0.4496 N(20) SIG .023
VAR116 WITH VAR117	0.4575 N(20) SIG .021	VAR116 WITH VAR118	0.4236 N(20) SIG .031	VAR116 WITH VAR119	0.3869 N(20) SIG .046	VAR116 WITH VAR120	0.2092 N(20) SIG .188	VAR117 WITH VAR118	0.2901 N(20) SIG .107	VAR117 WITH VAR119	0.1974 N(20) SIG .202
VAR117 WITH VAR120	0.3531 N(20) SIG .063	VAR118 WITH VAR119	0.4159 N(20) SIG .034	VAR118 WITH VAR120	0.1719 N(20) SIG .234	VAR119 WITH VAR120	0.5431 N(20) SIG .007				

APPENDIX B

Gair Art Test (GAT)

Part I - Do-A-Design

Part II - Do A Picture of Yourself

Instruction for Part I. Do a design on the piece of paper in front of you (an 11" x 14" piece of tan manila art paper will be on each desk). You can use pencils, crayons, pens, paint, ink, paper, tissue, glue - any one, or all of these things. Do as good a design as you possibly can and do it the way that you like best. Be sure to finish your picture, you will be given plenty of time, so make your design look just like you think it should.

(time: open ended)

Instruction for Part II. Do a picture of yourself either inside or outside. Put as many things into the picture as you can think of. Remember things like what time of the day or whatseason of the year it will be in your picture. You can use anything that you want to in order to make this picture, but try to fill up the whole paper so that everything you put in will be easy to see.

GAIR ART RATING SCALE (GARS)

Rate this artwork on a scale of 1 (low) to 5 (high) based on the following criteria:

1) _____ Pattern of related lines

2) _____ Pattern of related shapes

3) _____ Contrasting pattern of lines

4) _____ Contrasting pattern of shapes

5) _____ A definite mood established by either line, shape, or color

6) _____ Shapes that overlap each other

7) _____ Use of background (negative) space as an integral part of the work

8) _____ Outline defining a shape

9) _____ Outline as independent from a shape (free flowing calligraphic line)

10) _____ Rhythm and movement

11) _____ Lines that show variation of pressure (from thick to thin etc.)

12) _____ Attention to light and dark areas

13) _____ Texture (2 or 3 dimensional additions to the surface quality)

14) _____ A definite visual structure (spiral, radial, grid, modular, dendritic etc.)

15) _____ Complexity and intricacy of surface detail

16) _____ Balance (either symmetrical or assymetrical)

17) _____ A variety of transformations of a single basic shape

18) _____ Symbols (number, letters, words) that function as part of the design

19) _____ Variations in color hue (the color itself) and value (color tone from light to dark

20) _____ Transparency (one form seen through another) due to special use of the media