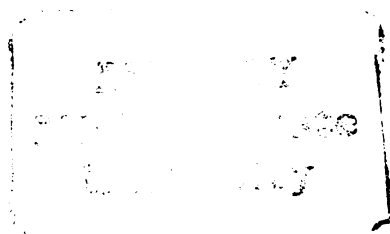


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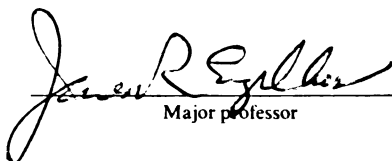
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**Block Design Training With Stroke Patients:
a Study on the Effects of Cognitive Retraining
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Block Design Training With Stroke Patients:
a Study on the Effects of Cognitive Retraining
on Improving Certain Activities of Daily Living Skills

By

Wilbur B. Leer

A Dissertation

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Doctor of Philosophy

Department of Counseling, Educational Psychology
and Special Education

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ABSTRACT

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On Improving Certain Activities of Daily Living Skills

By

Wilbur B. Leer

The purpose of the study was to explore the effect of using a standard block design test for remediation of cognitive deficit for visual perception in stroke patients suffering right sided cerebral hemisphere damage. Another purpose was to relate any improvement in visual perception to improvement in various activities of daily living. A total of forty adult stroke patients took part in this study. All of the patients were inpatients in a physical rehabilitation facility and had recently suffered their stroke. Patients were assigned randomly to an experimental and control group. Each group had an equal number of men and women.

The design was a two by two factorial design. The independent variables were sex and type of training (traditional rehabilitation and traditional rehabilitation plus cognitive retraining). The dependent measures were the raw scores on the performance portion of the Wechsler Adult Intelligence Scale - Revised, the Hooper Visual Organizational Test and the Raven Progressive Matrices.

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Another dependent variable was the level of performance scores on the Unilateral Skills Activities of Daily Living Evaluation Form, specific to the areas of feeding, hygiene, dressing, homemaking and community ADL/vocational skills.

Each subject in the experimental group underwent a three week program of visual perceptual retraining using a modified form of the Goldstein - Scheerer Cube Test and Ben-Yishay's method of "saturational cueing." The experimental treatment involved each patient individually receiving block design training four times per week with each training session lasting approximately three quarters of an hour.

A major hypothesis concerned both men and women in the experimental group demonstrating increased visual perceptual skills over the control group after receiving block design training. It was also hypothesized that those in the experimental group would show an improvement over the control group in their ability to perform various activities of daily living. In an analysis of the data, all of the hypotheses were supported except for feeding.

The results strongly support the use of cognitive retraining techniques for stroke patients in a rehabilitation setting. Results were discussed in terms of their implications for carrying out further research in cognitive retraining with other population groups.

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Chapter I

PROBLEM

Introduction and Need

One of the primary tasks of any physical rehabilitation facility is to improve several of the functional skills of the patient going through the rehabilitation program. Most of these skills had been lost due to a sudden traumatic injury which resulted in severe physical and cognitive deficits.

Traditional rehabilitation that has been carried out in most rehabilitation facilities attempts to restore the patient to an optimum level of independence in physical functioning. Little has been done until recently to complement traditional occupational therapy, physical therapy and speech therapy with cognitive remediation tasks. The purpose of such a cognitive approach would be to maximize the relearning process of certain areas of the brain and restore more fully the lost functioning that was caused by the brain damage.

A. R. Luria can be given the most credit for seeing the need for rehabilitation programs to more than just diagnose the physical and cognitive deficits. Such efforts usually included only routine muscle reeducation and other occupational therapy, physical therapy and speech and language therapy. He

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felt that more could be done to stimulate or restructure the damaged areas of the brain (Luria, 1969).

Luria proposed perhaps the most comprehensive theory on restoring lost functions due to brain damage. However, he did not go much beyond theory development and identifying the need for rehabilitation professionals to start applying systematic cognitive techniques to maximize return of the deficient area. He discussed rather in more generalized terms cognitive retraining procedures that could prove helpful. He defined cognitive remedial tasks as "those which help restore, optimize or significantly ameliorate deficiencies in a patient's logical reasoning and problem solving abilities" (Luria, 1973).

A few years passed between the time Luria's concepts and model of cognitive remediation was published in the late 1950's and early 1960's, and when rehabilitation practitioners started developing specifically related techniques in the rehabilitation setting. Acknowledged pioneers in the area were Leonard Diller and Ben-Yishay from the New York University Rehabilitation Services Institute. During the decade of the 1970's, extensive research and programatic development occurred in the area of cognitive remediation following along the lines of Luria's theory and model. Early research and development of techniques focused on the stroke patient, with later emphasis by Ben-Yishay being given to the brain injured population (Ben-Yishay and Diller, 1970, a,b,c; and Diller, 1974, 1976, 1980).

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The most recent experience with remediation and management of the brain injured population derived from a special clinical research study that began in 1975 and is now entering its ninth year of operation near Tel Aviv, Israel. The project was conceived, designed and organized by Leonard Diller and Ben-Yishay in collaboration with the Israeli Ministry of Defense, Department of Rehabilitation. This project served as a pilot for the current series of studies and the highly successful program now being carried out by Ben-Yishay at the Institute of Rehabilitation Medicine, New York University Medical Center.

Even though the diagnostic and remedial potential of the prototype versions of cognitive retraining was developed at this institute on the stroke population, a similar philosophy and method of treatment approach was adapted to the brain injured population with systematic research and program development being continued to this time. Thus, at the present time, two parallel lines of cognitive retraining and research are being carried out by Leonard Diller and his staff.

Using similar assumptions of cognitive remediation proposed by Luria and developed further by Dr. Diller and Dr. Ben-Yishay, research is continuing on the stroke patient using specific techniques aimed at improving or restoring deficits that are often unique to this population. Other researchers have begun to publish studies on cognitive remediation (Siev and Freistrat [1976] on perceptual

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dysfunction; Weinberg [1977, 1979] on visual scanning and spatial organization; Gianutsos [1980] on memory dysfunction; Kaplan and Hier [1982] on visuospatial deficits).

From the above discussion, Ben-Yishay and Diller (1974) described cognitive remediation as "those interventions or training programs which are designed to correct some deficiencies anywhere along the entire range comprising the brain injured patient's basic arousal, psychomotor, perceptual, cognitive-verbal and cognitive-emotive functioning." Gianutsos (1980) discussed a similar definition on what she terms "cognitive rehabilitation." She states that cognitive rehabilitation is "a service designed to remediate disorders of perception, memory and language in a brain injured person." The descriptions of these two terms are basically the same in concept and approach, and for all practical purposes have the same meaning or definition for this study.

The research in cognitive remediation has been demonstrated to be effective in applying standardized techniques to improve various cognitive functions of the stroke patient. Due to the recency of the studies and establishing reliable techniques, very little research to date has been done on any one of the various cognitive functions per se. More study needs to be done in specific areas of cognition to determine the effectiveness of cognitive remediation in optimally restoring certain functions in the stroke patient. One such area is visual perception.

Research can be found on describing the various processes of visual perception and in demonstrating the reliability of certain diagnostic procedures to identify visual perceptual problems (Goldstein, 1941; Bender, 1946; Ayers, 1962; Frostig, 1964; Benton, 1969; and Dee, 1970). Numerous research articles report that impairments in right cerebral vascular accident (CVA) patients often show deficits on most tests of visual perception. Such deficits are not as prevalent with left CVA's. The conclusion drawn by most of these authors is that the right hemisphere plays a significant role in visual perception (Warrington and James, 1967; Taylor, 1968; Ben-Yishay and Diller, 1974; and Kaplan and Hier, 1982).

Even though much has been written on where the function of visual perception is located in the brain, little research has been carried out in the area of cognitive remediation as it relates to visual perception. Ben-Yishay, Diller and others have published studies showing that right hemisphere CVA patients do experience visual perceptual deficits and that successful treatment programs can be carried out to enhance recovery of perceptual organizational skills following a brain injury (Reisenwebber, 1953; Ben-Yishay, 1974, 1981). These studies point out that cognitive remediation can be effective in restoring lost cognitive functioning in visual perception and visual problem solving.

Implicit then is the notion that improved visual perception for the stroke patient can improve physical independence and increase certain skills in some areas of daily living, such as dressing and feeding. Research has

been limited to only a few studies which focused on the aspect of certain training programs improving some functions of the stroke patient in the area of activities of daily living (Lorenze and Cancro, 1962; Ben-Yishay, 1970, 1974; Taylor, 1971; and Diller, 1976). However, while some of these studies are well done, the main focus was on developing the training technique itself, rather than the secondary benefit of generalization and improving a functional skill. This secondary focus was thus given weak support for consideration in some of the studies and was more like an interesting side note. However, when one considers the cost effectiveness of improving functional skills in rehabilitation patients and the length of stay sometimes required to maximize a patient's benefits in a rehabilitation facility, more importance should be given to this area.

Purpose

The purpose of the present study was to explore the feasibility of using a standard block design test, the Goldstein - Scheerer Cube Test, to cognitively retrain or remediate deficient visual perceptual skills in stroke patients suffering right cerebral hemisphere brain damage. Patients who experienced a right hemisphere CVA were tested for the extent of cognitive problems in the area of visual perception. Those patients found suitable for block design training were divided into an experimental and control group. The experimental group was given specific

training on the Goldstein-Scheerer Cube Test using a modified form of the saturation cueing approach described by Ben-Yishay in his classic series of studies (1970, 1971, 1974) and a modification of the standard directions given on the Goldstein-Scheerer Cube Test. The control group was provided the same traditional rehabilitation program as the experimental group, but was not given the additional block design training.

The questions to be answered were: are there learning differences or an increase in cognitive skills in the area of visual perception from similarly matched groups of right hemisphere CVA patients after receiving specific cognitive retraining in block designs? A related question was: will there be a carryover effect in those patients who have demonstrated improvement in block design skills in the area of functional skills, such as being better able to perform various activities of daily living? A third question was: are there differences between men and women CVA patients in their recovery pattern from their stroke?

Definition of Terms

Cognitive Remediation or Retraining. Interventions or training programs designed to correct some deficiency among the brain injured person's basic arousal, psychomotor, perceptual, cognitive-verbal and cognitive-emotive functions.

CVA Patient. A person who has suffered a cerebral vascular accident (stroke) as a result of either intracerebral hemorrhage, thrombosis, embolism or vascular insufficiency, and who has been rendered hemiparetic or hemiplegic.

Hemiparesis. Muscular weakness affecting one side of the body.

Hemiplegia. Paralysis of one side of the body.

Saturational Cueing. Providing a series of graded cues ranging from minimal to maximal explicitness until a subject is able to pass all items presented or shows complete failure to benefit from cues occurring.

Visual Perception. The ability to integrate, organize and interpret all the visual sensory messages from the external environment.

Overview

The following chapters present, in detail, a description of the project as outlined in this chapter. Chapter II incorporates a review of the relevant literature pertaining to remedial procedures used in visual perceptual dysfunction

and methods for improving ADL functional skills of stroke patients. The methods used to conduct the study are detailed in Chapter III, including development of the instrumentation, sample selection, presentation of the design, research questions in testable form, and a statistical model used for data analysis. Chapter IV will consist of the analysis of the data and interpretation of results. A discussion of the results, recommendations for future studies and conclusions are contained in Chapter V.

Chapter II

REVIEW OF THE LITERATURE

A review of the literature on cognitive retraining reveals a rather diverse body of literature on the two main areas of concern in the present study, block design and remediation of visual perception problems of the stroke patient. Research applying these two concepts together, however, is quite limited and focused mainly on the works of Ben-Yishay, Diller and Weinberg at the Institute of Rehabilitation Medicine, New York University Medical Center. Several authors have reported statistically significant differences in scores on performance tasks of a perceptual-motor type between subjects with lesions on the right side of the brain and those with lesions on the left side of the brain. Subjects with lesions on the right hemisphere scored consistently below those whose left hemisphere was affected. A review of the literature was undertaken in these related areas: the localization of visual perception, remediation of visual perceptual problems, block design training, and restoration of functional activities of daily living.

Localization of Visual Perception

The problem of visual perceptual difficulties with the stroke patient emphasized the importance of this cognitive deficit for rehabilitation activities such as driving,

reading and other activities of daily living skills. It has been widely reported that deficiencies in visual/spatial perception often result from trauma to the brain. The dysfunction has been associated more frequently with lesions of the nondominant (usually right) than of the dominant hemisphere.

Warrington and James (1967) gave three tests of visual recognition, a test of immediate visual retention, and the Wechsler Adult Intelligence Scale to sixty-five patients with unilateral cortical lesions. Thirty-six patients had right hemisphere lesions, and twenty-nine had left hemisphere lesions. The main findings were that the right hemisphere group scored significantly worse on the performance scale of the Wechsler Adult Intelligence Scale and the right parietal group specifically were significantly worse than the left parietal group on the performance scale of this intelligence test. Test stimuli, which were both verbal and familiar, were graded in difficulty on a perceptual dimension and discriminated between right and left hemisphere lesions. Evidence for some degree of differentiation of function within the right hemisphere was demonstrated. The authors pointed out there is differentiation of function between the hemispheres within the total perceptual recognition process. The right hemisphere is critical for the processing of visual sensory data, and the left hemisphere for recording information in terms of linkages with verbal symbols.

Taylor (1968) administered a battery of sensory-percept-concept-motor function tests to two hundred ten non-handicapped adults to establish a basis for comparing test results of thirty-five left hemiplegics secondary to stroke. The comparison revealed trends of deficits among the patients, and the validity of this observation was estimated by means of a rank-order correlation study between the patients' test scores and their performance ratings in activities of daily living. The results were examined by other statistical methods, including analysis of variance. The findings demonstrated that the test battery has value for revealing deficits in perceptual-motor functions in left hemiplegia resulting from a stroke. Test results showed differences of a statistical significance between groups, with deficits in visual perception being a major problem in the right side CVA group.

Benton, Hannay and Varney (1975) assessed the accuracy of identifying the slope of briefly exposed lines in twenty-two patients with lesions on the right and left hemisphere, and twenty-one controls who had no evidence of brain disease. The frequency of impaired performance was remarkably high in patients with right hemisphere lesions. In contrast, the patients with left hemisphere lesions did not perform differently than the control group. The authors concluded that the right hemisphere plays a significant role in mediating the appreciation of spatial relations in right handed individuals.

Benton, Hannay and Varney (1976) in a related study assessed the accuracy of localization of briefly exposed single dots and pairs of dots in patients with lesions of the left and right hemispheres and in a group of patients without evidence of brain disease. A remarkably high frequency of impaired performance was found in the patients with right hemisphere lesions. The performance of the patients with left hemisphere lesions was comparable to that of the control patients. The distribution of correct responses to the dot localization tasks using the Mann-Whitney U Statistic verified similar performance by the control group and left hemisphere group, whereas the right hemisphere group made significantly fewer correct responses. The findings suggested that patients with right hemisphere lesions performed poorly in visual-perceptual functions.

Remediation of Visual Perceptual Problems

From some of the earlier research cited above, finely developed techniques of perceptual retraining have evolved. Ellen Siev and Brenda Freishtat, in 1976, published a book entitled, Perceptual Dysfunction in the Adult Stroke patient. This is a well documented and logically presented account of techniques to use with stroke patients experiencing visual perception problems. The book did not present empirically based studies to support the perceptual retraining techniques discussed. However, the authors discussed several systematic

and structural approaches to use. They had intended this book to be a resource book to meet the occupational therapists' clinical needs in identifying and rehabilitating patients with these specific deficits.

Siev and Freishtat gave proper precautions in using this manual and made suggestions on how some of the nonstandardized test results were to be applied in the clinical setting. The authors went on to say that "several selective evaluation tools and treatment techniques are listed under each deficit (perceptual). It behooves the therapists to experiment with various methods in order to find the one that best suits the needs of both the therapist and patient" (Siev and Freishtat, 1976, page VIII).

Success in the rehabilitation of stroke patients may be influenced by the type of communication that is used in the retraining program. Research studies show that damage to the left hemisphere, as in patients with right hemiplegia, tends to be associated with difficulties handling "symbolic" processes, such as language tasks and numerical calculations. In contrast, damage to the right hemisphere, as in patients with left hemiplegia, tends to be associated with deficits in perceptual tasks (Bruell, 1975; Reitan, 1959; Breuger, 1968; and Taylor, 1968).

In attempting to teach stroke patients who have either "symbolic" or "perceptual" deficits, the problem arises as to how much the deficits would interfere in receiving instructions, as well as in producing responses and reaction

to instruction. Fordyce and Jones (1966) compared patients having either left or right hemiplegia on the basis of their performance on manual tasks when instructions were varied between oral and pantomime. Right hemiplegic patients were found to score significantly higher when instructed by pantomime than when instructed orally for the same tasks, whereas left hemiplegic patients scored significantly higher under oral instructions for the same tasks. These findings were consistent in two previous studies carried out in 1964 and 1965, even when different examiners were used. These authors did suggest a note of caution in interpreting their findings because of the difficulties in carrying out precise measurement and controlling irrelevant variables in their study.

Miller and Rohr (1980) discussed the concept of verbal mediation for perceptual deficit and increased learning. They stated that the verbal mediation process of establishing a chain of connections between a stimulus and response can be used as an intervening variable in acting as a source for self-stimulation which allows the patient greater efficiency in behavior responses and correct responses in perceptual retraining. Thus, these authors present the argument that perceptual training will be most effective when the patient is taught the process of giving verbal instructions to himself or herself, or is given verbal guidance in completing the visual perceptual tasks.

Busse and Lighthall, as far back as 1966, began to echo Luria's concern that few research articles had been published and few treatment techniques developed to deal with the problems of retraining or reeducating brain damaged persons. These authors presented a method for conceptually retraining brain damaged adults. Their method involved teaching the brain damaged person to use increasingly complex schemes, a concept developed by Piaget. Their study included fourteen left hemiplegic adults, seven of whom were used as controls. The experimental group underwent a twelve-lesson retraining program, with each lesson lasting approximately fifteen minutes. The lessons themselves consisted of ten to twenty problems, each of which was presented to the subjects individually. A branching approach similar to that employed in programmed learning was used. Each successive step in the branching attempted to provide the subject with a little more of the required answer. The training sessions were given three times a week for four weeks. The retraining of concept began with the simple concepts of shape and color and progressed to more complex concepts. The study yielded positive results. The experimental patients were able to use concepts they had been taught, as well as build new concepts significantly better than patients in the control group. Relative youth and greater education, together with treatment, seemed to have been effective in producing a greater conceptual adaptability among members of the experimental group.

Taylor, Schaeffer and Grisell (1971) investigated the reliability and validity of percept-concept-motor function (PCMF) measures and the effect of multidiscipline treatment directed to PCMF deficits among forty-seven right CVA patients. Twenty-one patients were in the control group and twenty-six were in the experimental group. The two groups were compared on fifty-six crucial variables at the outset of the rehabilitation program and remained so after twenty treatment days. For each patient in the project, the complete research program required twenty treatment days usually over a period of one month. No less than three consecutive days could be lost to acute medical problems. Each treatment day included an hour of specific training working on remediating perceptual deficits. Significant improvement was achieved in all fourteen of the activities of daily living ratings, and eleven of the twenty-four reliable PCMF measures. Experimental treatment did not affect more functional improvement than did standard treatment. Factor analysis showed that PCMF and activities of daily living variables measure separate functions. Thus, the validity of PCMF measures was not determined.

Weinberg, Diller and Gordon (1977) presented a method of analyzing and remediating the visual perceptual deficits often found in persons with acquired right brain injury due to a stroke. A total of fifty-seven patients were randomly assigned to experimental (N=25) or control (N=32)

groups. All patients were administered the same test battery prior to assignment. The experimentals received a specific training program of visual scanning which involved receiving twenty hours of treatment, one hour each day, for four weeks in reading, writing and calculation. The controls received standard rehabilitation. Both groups were retested after a period of one month. Analysis revealed superior performance by the experimental group. The authors suggested these results indicated that academic disorders found in right brain damaged persons could be treated as secondary to a primary disturbance in visual scanning behavior.

The same authors (Weinberg, Diller and Gordon) in 1979 published another article building on their earlier methodology to improve scanning and academic skills performance behavior in persons with acquired right brain damage due to a stroke. Their more recent study presented two additional treatment methods: training in sensory awareness and spatial organization. The fifty-three patients studied were divided into two groups, experimental (N=30) and control (N=23). All patients in the experimental group received twenty hours of treatment in perceptual retraining. Each training session lasted one hour each day of the week and continued for four weeks. The experimental group received a treatment program incorporating the two methods, as well as a condensed version of the original program (1977).

The controls received standard rehabilitation. Both groups were retested after one month. Analysis revealed that the performance of those in the experimental group exceeded that of the control. Those patients in the experimental group with severe impairments improved more than those with mild impairments, and a combined multitreatment approach produced greater generalization than the original single treatment program. These authors suggested that the specific training programs for treating perceptual problems could be developed and were useful in the rehabilitation setting.

Carter, Howard and O'Neil (1983) carried out a study to determine whether a cognitive skills remediation program could help stroke patients who were one week post stroke to regain important thinking skills. Thirty-three patients in a community hospital were pretested in visual scanning, visual-spatial orientation and time judgment, and randomly assigned to a treatment (N=16) or control (N=17) group. The treatment group received cognitive retraining on a one-to-one basis for thirty minutes per day, three days a week for three weeks. The retraining involved the use of paper and pencil tasks, simple cueing procedures, positive reinforcement and immediate feedback. Although the control group did not receive this treatment, conventional therapies continued for both groups. Patients in the treatment group had overall and separate skill improvement scores in visual scanning, visual-spatial

orientation and time judgments that were significantly higher than those for the control patients. The authors concluded that a cognitive skills remediation program was effective in improving thinking skills for acute stroke patients.

Block Design Training

Block design performance is known to be sensitive to visual-perceptual and visual-constructive disturbances. The block design test was originated by Kohs (1923), who offered it first as a comprehensive measure of nonverbal intelligence. It has since been adapted for use in the Wechsler Intelligence Scale (1958), in a modified form as one of the performance subtests, where it is used to assess visual perception and visual organization skills. Studies in block design performance have been used to reflect differences between normals in brain damaged individuals (Reitan, 1958), demonstrate deficits in abstract thinking (Goldstein and Scheerer, 1941), and test various hypotheses concerning perceptual anomalies in brain damaged persons (Shapiro, 1953; Satz, 1966).

One of the earliest studies found in attempting to enhance recovery of perceptual organizational skills following brain injury was done by Reisenwebber (1953). Until this time, block design performance was used as a diagnostic aid in recognizing some disturbances in visual perceptual skills. Reisenwebber described a thoroughly detailed study and

complex project involving modified block design materials and methods as an aid in evaluating and training disturbances in the visual perception of form, size, space and organization with fifty patients who had suffered traumatic head injury or stroke. Modifications in the block consisted of substituting sixteen one-inch wooden blocks finished in black and white enamel for the standard cubes of red, white, blue and yellow found in the original Kohs blocks. Standard design cards were changed to black and white and expanded to include more than fifty designs of varied designs and difficulty. The levels of difficulty of these designs were comparable in terms of the physical form to the Kohs series (1923). The author used order of presentation and training in ascending order of difficulty, depending upon the perceived seriousness of the visual perception disorder of the patient. This could include starting with an actual block representation for which the patient is to copy all the way down to a presentation of a design on a card with no lines distinguishing how the blocks were arranged in the design. No specific criterion measures for other test data were reported in this author's study. Most of the study consisted of the specific techniques used and the modifications developed which the author felt would be helpful in improving visual perception and organizational skills in patients experiencing these deficits. The author reported that her approach to block design training on fifty patients over a three year period had led to improvement in these patients in the areas of visual perception and organization.

In 1970 Ben-Yishay, Diller and Gordon began reporting on a series of studies out of the Institute of Rehabilitation Medicine in New York. They had been carrying out research with block designs aimed at quantifying and systematizing the diagnostic, prognostic and remedial possibilities inherent in the block design tasks.

One of the first studies (1970b) focused on the relationship between competence and ability to profit from cues. The effects of premorbid education on current test performance, and whether the ability to profit from cues is uniform across tasks in brain damaged persons, were examined. Sixty-two left hemiplegics were tested consecutively on the Wechsler Adult Intelligence Scale block design and similarities subtest under standard and specifically designed cueing conditions. The authors reordered the item difficulty of the Wechsler block design test according to the percent of normals who passed each design. A systematic scaled method for cueing subjects to pass previously failed designs was developed. The subjects underwent one hour block design training sessions for ten consecutive weekdays or until the subjects reached full competence on the entire scale of the ten designs. For each of the ten Wechsler block designs, three alternative forms were developed and validated. A reliable and objective scoring system for recording and analyzing performance was developed. Results indicated that the ability to profit from cues is a linear function of competence levels in both tasks. In a block design test,

premorbid education was unrelated to either competence or cues gained. In the similarities subtest, education correlated with current competence but not with cues. No relationship was found between ability to gain from cues across tasks.

In a replication study (1970c), Ben-Yishay and Diller, using the same procedure as in their previous study (1970b), tested forty normals, fifty-six left hemiplegics, and forty-nine right hemiplegics. They had them perform the Wechsler Adult Intelligence Scale block design tasks on the standard and special cueing conditions as outlined in their previous publication. Their results upheld the previous findings, which suggested that improvement in block design and performance of the left hemiplegic is a function of cueing, is lawful and quantifiable, and can be generalized to normals and right hemiplegics as well.

In a subsequent study, Ben-Yishay, Diller and Gordon (1971) attempted to find out whether two types of patients with brain damage differed from normal controls and from one another in terms of competence levels, style of performance, constructional deviation, and various rates of activity while attempting to solve block designs. An objective scoring system was developed and the microanalysis of the Wechsler block design performances was conducted on forty normals, fifty-six right hemiplegics and forty-nine left hemiplegics. Results indicated that brain injured patients did not differ from normals in style of poor performance and in partial competence; right hemiplegic patients differed

from left hemiplegic patients on all parameters and performance except the competence level, showing an overall better performance.

In a followup study, Ben-Yishay, Diller and Gordon (1974) focused solely on the sequential aspects of cell matching behavior during block design performances. The following questions were posed: Do normal and brain injured people differ in matching persistence during block design performances? Do patients with right and left hemiplegia differ from one another with regard to matching persistence? A reanalysis of the data from a previous publication on the topic by Ben-Yishay and Diller (1971) was conducted. In addition, thirty right handed patients who suffered cerebral vascular accidents, fifteen right hemiplegic and fifteen left hemiplegic patients were included in this study. Performance of these brain injured subjects was compared on the same variable in this study with that of the normals (N=40) from the previous study cited. Prior to the application of the specific experimental procedures, all of the subjects underwent a baseline evaluation on an extensive battery of psychometric measures, as was done in the previous studies. Following this, two groups of hemiplegic patients received systematic training for ten consecutive days on a series of experimentally validated alternate forms of the Wechsler block design tasks. Training continued until all reached either full competence on the entire scale of ten designs, or plateaued at a given level above initial

competence. Upon reaching criterion, patients were retested on the standard Wechsler block design scale to determine post training gain. Then, for each patient, a weighted matching persistence index was calculated for the last passed and first failed designs before and after training. The results replicated the findings from the previous study by the same authors (1971) in all respects. It was found that saturational cueing activity raised post training block design competence of all of the right and left hemiplegic patients. With regard to differences between right and left hemiplegic groups when passing designs, right hemiplegics obtained uniformly greater scores than left hemiplegics. However, the differences were not statistically significant. The findings demonstrated the efficacy of saturational cueing on the parallel block design forms and the power in generalization of systematic retraining. The results of the present study also demonstrated that brain injured persons approached the task of constructing block designs in a less persistent style than normals.

Restoration of Functional Activities of Daily Living

Systematic retraining on block design tasks has been shown to carry over to certain functional activities of daily living in the rehabilitation setting. Lorenze and Cancro (1962) studied a group of forty-one hemiplegic patients for success and failure in activities of daily living. In all cases, the hemiplegia was due to a cerebral vascular accident.

Sixteen patients were right hemiplegic and twenty-five were left hemiplegic. Upon admission, each patient was examined for functional status by the Occupational Therapy Department in activities of daily living. Status was checked periodically during the course of the patient's rehabilitation stay. Specific activities evaluated were dressing activities for upper parts of the body, grooming, and self feeding. The Wechsler Adult Intelligence Scale was used to test each patient during the first three weeks following admission. For the purposes of the study, perception was measured through the use of the block design and object assembly subtests of the Wechsler scale. This study investigated the relationship between failure to acquire adequate skills and activities of daily living and degree of dysfunction in visual perception. From the obtained correlations, it appeared that patients who did poorly on the block design and object assembly subtest of the Wechsler Adult Intelligence Scale could be expected to fail at dressing, grooming and ambulation.

In a previous study, the same authors (1961) studied one hundred nineteen hemiplegic patients, thirty-five of whom were studied for severity of disturbances of visual perception. Standardized tests of intelligence, in conjunction with specific subtests of the Goldstein Scheerer Test of abstract behavior, were used to determine the presence and severity of difficulty in visual perception. The incidence was high; only three of the thirty-five patients

showed no deficits in this respect. The most striking observations in the seven cases of severe disturbances of visual perception were that patients failed particularly in activities of daily living and that hemiplegia was on the left side in such cases. Since the sample of thirty-five patients was small, no specific conclusions were drawn statistically as to the relationship between problems of visual perception and the functional status of the patient in terms of activities of daily living and ambulation. However, the authors did suggest the possibility of the correlation between disturbance in visual perception and failure in activities of daily living.

Ben-Yishay, Gerstman, Diller and Haas (1970a) studied the proposition that an intake, multivariate battery of forty-two psychometric predictors can predict duration of stay in a rehabilitation hospital and confidence in ambulation and self care. Multiple regression equations were computed for fifty-four patients with left hemiplegia and retrospective outcome scores were highly accurate in their prediction. A compact battery of twenty-seven variables was thus obtained and a program repeated, with resulting multiple correlations and predictive accuracy being only slightly less than those arrived at with the full battery of forty-two psychometric predictors. A cross validation study on fifteen new patients yielded essentially identical results. It was concluded, therefore, that the prediction of outcomes from psychometric measures taken at the initiation of the rehabilitation program

is highly feasible in predicting how long a patient will remain in the program, as well as predicting their functional competence for ambulation and self care at the time of discharge. Self care in the study was described as the extent that a patient was independent in grooming, dressing, feeding and transfer. The authors suggested that implications of their findings indicated that a more useful clinical tool is available in predicting functional outcomes at the end of a patient's rehabilitation stay, and made more explicit the clinician's judgment as to whether a patient had reached the "maximum benefit" in the rehabilitation program.

In a study previously cited, Leonard Diller and Ben-Yishay (1971) reported on improvements in activities of daily living skills in patients involving both left and right hemiplegia. In addition to routine rehabilitation therapies, the experimental group received ten one-hour training sessions in copying block designs adapted from the block design test found in the Wechsler Adult Intelligence Scale. Diller used a hierarchy of cues, systematically decreasing the level of the cue, until the subject could do the design unaided. The control group received standard rehabilitation therapies. Not only did the experimental group do better on a block design test in post testing, but they significantly improved in five areas of occupational therapy, as judged from occupational therapy progress notes by nonpartisan judges. The five areas were: patient attitude and mood; consistency in attention; degree of assistance required in self care activities; proficiency in eye/hand coordination; and special

problems, e.g., compensation for unilateral neglect.

Ben-Yishay and Diller (1974) in a later study used essentially the same procedures from the previous study in 1971 to train fourteen experimental patients and obtained baseline and retest measures on another fourteen control patients. The medical chart of each patient was examined and the weekly routine reports of occupational therapists were consulted. From these reports, the therapists' verbatim descriptions of each patient's status in five critical areas were recorded. The areas included patient's attitude or mood; consistency in attention; degree of assistance required in self care activities; proficiency in eye/hand coordination tasks; and special problems, such as compensation for unilateral neglect. Each subject received a baseline and retest evaluation on the five occupational therapy parameters described. Obtained protocols were then coded, randomized and presented to eight independent judges who had no knowledge of the purpose of the experiment. The results of this study indicated that a deliberate programmed intervention of eye/hand task behavior, such as block design training, may result in a noticeable improvement in related functional behaviors in the rehabilitation setting, including some self care activities. Both right and left hemiplegics showed evidence of a generalization of block design training to the area of eating. After training, left hemiplegics showed a greater improvement than right hemiplegics, specifically with respect to eating utensil proficiency.

Kaplan and Hier (1982) investigated the influence of visual spatial deficits on functional status in thirty-four patients who had suffered right hemisphere stroke. Correlation coefficients were computed between visual spatial deficits, age, sex, educational level, length of stay on the rehabilitation unit, and hemiparesis. Little correlation was found between the severity of the hemiparesis and the visual spatial deficits, yet both motor and visual spatial deficits proved to be important predictors of functional status at the time of discharge from the stroke rehabilitation unit. The authors concluded that visual spatial deficits are an important independent factor governing functional outcomes, including activities of daily living. They also concluded that visual spatial deficits should be given as much attention as the degree of hemiparesis still present during rehabilitation, and that rehabilitation planning for the right cerebral hemisphere stroke patient should take these factors into consideration.

Summary

In this section, the body of literature on visual perceptual retraining and, more specifically, block design retraining, were reviewed. In addition, a review was made of the kinds of cognitive retraining activities that have been carried out with the intent of improving functional skills in the area of activities of daily living. There has been little research done in the area of cognitive

retraining as it relates to improving a person's functional skills.

The research that has been done has mainly come from Ben-Yishay and Diller's studies at the Rehabilitation Institute in New York. They have attempted to take the block design training task as it relates to the Wechsler Adult Intelligence Scale, and with some adaptations and revisions introduce a particular training approach (saturational cueing) to determine if the systematic retraining will improve visual perception which in turn will carry over to an increase in activities of daily living skills. Their research has produced success in this area and has demonstrated that a deliberate program of intervention with block design training may result in a noticeable improvement in related functional behaviors.

The concern remains that the elaborate modifications as proposed by both Reisenwebber (1953) and Ben-Yishay and Diller (1974) on the Wechsler block design task is too much trouble for a clinician in a rehabilitation setting to go through in order to effect a good cognitive retraining program. Even though the research has shown that such procedures, when carried out in a systematic manner, can definitely benefit the patient in improving such activity of daily living skills as feeding and dressing, it is unlikely that the typical staff person in a rehabilitation setting will have the time or inclination to develop the cognitive retraining tools as outlined by both Reisenwebber

and Ben-Yishay and Diller. The question remains whether there is a more simplified way to provide cognitive retraining in the area of visual perception which will generalize to the area of activities of daily living. A related question is whether a standardized test currently available used in the manner described by Ben-Yishay with his "saturational cueing" method can accomplish the same successful results that the more elaborate training materials have been able to do.

The purpose of this study is to use the standardized version of the Goldstein Scheerer Cube Test and, along with modified techniques of "saturational cueing" (Ben-Yishay, 1974), carry out a cognitive retraining program that will improve visual perception and demonstrate carryover effects in the practical and functional areas of daily living activities. There is evidence that this more simplified method of cognitive retraining will be able to accomplish the same task and provide impetus for more practical use of cognitive retraining for the everyday practitioner in the rehabilitation setting.

Chapter III

METHODOLOGY

This chapter contains the methodology used in the present study. Included are sample selection procedures, sample characteristics, instrumentation, procedures, design, hypotheses studied, and the method by which those hypotheses were tested. Rationale for selection procedures, instrumentation and statistical methods employed are presented by section.

Selection of the Sample

All of the subjects participating in this study were inpatients in the rehabilitation program at Mary Free Bed Hospital and Rehabilitation Center in Grand Rapids, Michigan. This eighty-bed rehabilitation hospital's main purpose is the restoration of a patient's physical, cognitive and vocational potential to the maximum extent possible following a functional loss due to an accident or birth defect. The mission of the hospital is essentially the same as other physical rehabilitation centers throughout the United States. Physical disabilities treated include stroke, head injury, spinal cord injury, amputee, arthritis, and other neurologically impaired individuals.

Subjects

Included in this study were patients who became hemiplegic or hemiparetic following a cerebral vascular accident (CVA), or stroke. Both the experimental and control groups consisted of twenty patients who had experienced a right sided CVA. Each patient selected for the experimental group was explained the purpose of the training sessions (Appendix A). This explanation was given to all patients in the study by the occupational therapist research technician prior to receiving the pre test unilateral skills activities of daily living evaluation. An Informed Consent Form was obtained from each patient to obtain permission to use the study test results prior to the block design training program (Appendix B).

Permission was secured from the Hospital Board and Executive Director to use Mary Free Bed Hospital and Rehabilitation Center as the site of the study and an administrative agreement was established (Appendix C).

The population of interest included all patients who:

1. Had experienced a right sided CVA within the past two months.
2. Had no history of having had a previous CVA.
3. Had no history of psychiatric problems.
4. Had no history of alcoholism or drug abuse.
5. Were in the age group between thirty-five and eighty-five.

Multiple criteria were used to select subjects for this study. A primary selection criteria was that the patients must have a Wechsler Adult Intelligence Scale - Revised (WAIS-R) verbal intelligence quotient score of ninety or above. This would ensure that the verbal reasoning and comprehension of a patient was good enough to benefit from the cueing offered as part of their training. Another criterion for selection was that the block design subtest on the performance portion of the WAIS-R be at least at a scaled score of seven or below. This particular subtest measures visual perception, and a scaled score of seven or below indicated that the patient had at least moderate impairment in this area. A scaled score above seven would not warrant the need for a patient to undergo visual perceptual training.

A third selection criterion was that a patient have no worse than a mild visual field cut of less than seventy-five degrees. This would ensure that visual perception, rather than poor visual scanning or visual alertness, was involved in causing a patient's poor performance in various activities of daily living. If a field cut did exist, the patient had to demonstrate good compensatory skills to show that this deficit was not interfering with performance.

A related selection criterion was that the patient not demonstrate poor constructional apraxia or motor planning skills. This dysfunction would interfere with the block design training and any generalization into the areas of activities of daily living.

Characteristics of the Sample

The forty patients in the study included twenty men and twenty women, all of whom had suffered a right sided CVA. Ages ranged from thirty-six to eighty-three ($\bar{x}$ = average age of 63). The average educational level of the sample was eleventh grade. The Full Scale IQ Score of these patients on the Wechsler Adult Intelligence Scale ranged from eighty-one to one hundred and three, with the average Full Scale IQ Score being ninety-one. This is within the normal range of intellectual functioning. The group consisted of sixteen high school graduates, two college graduates, four persons who had completed the eighth grade, ten who had some high school but did not graduate, and eight who had one to two years of college but did not graduate.

The average length of time between onset of the stroke and when the patient started block design training was 4.8 weeks. All patients in the study were medically stable, a condition all patients must achieve before entering Mary Free Bed Hospital. "Medically stable condition" generally refers to a patient having strong vital signs, not in need of tube feeding, not dependent on a respirator for breathing, and having satisfactory bowel and bladder functioning.

According to Fordyce (1971), the right sided CVA patient is quite unique, both cognitively and behaviorally.

Most strokes usually cause focal brain damage. Right sided CVA's cause some degree of muscular weakness or paralysis on the left side of the body, particularly the left arm and leg. The more subtle deficits caused by a stroke in this area of the brain include certain cognitive and behavioral problems. It should be noted that these deficits will exist in varying degrees in different patients, causing more dysfunction in one person than another.

Common cognitive problems of the right sided CVA patient include loss of visual perception, a left visual field cut, and cognitive denial. Visual perception has already been defined as the ability to integrate, organize and interpret all the visual sensory messages from the external environment. A left visual field cut means the person is unable to perceive visual stimuli on the left side and misses seeing most things to the left of midline in his or her field of vision. Cognitive denial is a term used to describe a lack of awareness regarding the extent of one's disability. Such people may not realize how physically dysfunctional or how poor their visual perception is. Thus, they are not able to self monitor or adequately evaluate their performance in the rehabilitation program.

Behavioral problems which may be present among the right sided CVA patients are impulsivity, flat affect and constructional apraxia. Impulsivity may be seen in a patient trying to do something before thinking through the steps

needed to be taken to accomplish the task in a safe and successful manner. For example, such a patient may want to stand up from the wheelchair and will lurch upward before thinking to lock the wheels or untie the safety strap. A right sided CVA patient with a flat affect will tend to appear stoic and lack natural appearance and voice inflection consistent with the situation, whether it be humorous or sad. Constructional apraxia, present in only some of the right sided CVA patients, is the inability to motor plan successfully. Patients with this dysfunction auditorially comprehend what is being asked of them, but cannot figure out or initiate the sequential steps motor wise to accomplish the task.

Instrumentation

Four instruments were used in the selection of the subjects for the study and subsequent pretest and post test measurement of cognitive changes before and after block design training. The Wechsler Adult Intelligence Scale - Revised (WAIS-R) was used as part of the selection criteria for the sample. The performance portion of the Wechsler was specifically used as a psychological measure for post testing. The Hooper Visual Organization Test and the Raven Progressive Matrices Test were also used as pre and post test measures to assess particularly the visual perceptual area. Traditionally, the Mary Free Bed Hospital unilateral skills

activities of daily living (ADL) form was developed and used to assess activities of daily living in several areas. This form was modified to meet the needs of this study. A further description of each of the measures follows.

Wechsler Adult Intelligence Scale - Revised

The WAIS-R is an individually administered composite test in battery format, consisting of eleven subtests which measure general intelligence. Classification of these subtests roughly coincides with the results of factor analytic studies. Six of the subtests are classified as "verbal" tests. The other five are termed "performance" tests. The performance portion of the WAIS-R, especially the block design subtest, was the main measure of interest on this test.

Construction. The WAIS-R, like other intelligence tests, uses sets of standardized questions and tasks for assessing an individual's potential for purposeful and useful behavior. It is composed of eleven tests, six verbal and five nonverbal. The verbal and nonverbal groups may be administered separately or together to yield respectively a Verbal, Performance and Full Scale Intelligence Quotient (IQ). This feature permits the use of the Performance section of the scale, along with subjects unable to comprehend or manage language. Likewise, the Verbal section alone can be used with subjects who are visually or motorically handicapped.

The WAIS-R test items were placed in the approximate order of difficulty as estimated from preliminary tryout data. Starting and stopping rules for the subtests involved were set generously in order to limit the number of items presented while allowing subjects to attempt all of the items they might be expected to pass. Final adjustments in the sequence of test items and the rules for discontinuing the test after a given number of consecutive failures were made using data from the standardization sample.

Administration. The WAIS-R is intended for use with individuals sixteen years of age and older. Norms are provided through age seventy-four, but many people who are older than seventy-four may be tested using the norms for ages seventy to seventy-four. WAIS-R examiners need to be thoroughly trained in the use of individually administered intelligence scales and need to adhere carefully to the specific directions given in the test manual for each subject.

For most of the tests, rules for discontinuing after a number of consecutive failures are presented in the directions for administration. These rules have been established to provide reasonable limits of testing when subjects have failed several items in succession. In this context, failure of an item means a score of zero. On several of the subtests, partial credit (1) and full credit (2) is given depending on the quality of the response.

During the course of a WAIS-R administration, an examiner may not be certain whether a particular item

should receive a score of zero. In such cases, the item in question should be considered provisionally, and additional items given until the criterion for discontinuing the subtest have clearly been met. A stopwatch is needed for timing the subject's responses to all of the performance subtests.

Scoring. The scaled scores for each of the eleven subtests in the battery were based on a reference group, which consisted of five hundred subjects used in the standardization sample between the ages of twenty and thirty-four. For each subtest, the distribution of raw scores of the reference group was converted to a scale of a mean of ten and a standard deviation of three. For every subject in the standardization sample, raw scores on the test were converted to scaled scores based on the reference group. Thus, using scaled scores the performance of a subject of any age on an individual test may be compared directly with a reference group.

Although scaled scores for the eleven subtests were obtained using a single table based on the reference group, an intelligence quotient (IQ) was derived separately for each of the nine age groups. It was predetermined, as for the other scales in the Wechsler series, that the IQ's would have a mean of one hundred and a standard deviation of fifteen at each age. To construct the IQ tables for the WAIS-R, three sums of scaled scores were calculated for each individual in the sample: the sum of scaled scores

for the six verbal subtests, the five performance subtests, and the sum of all eleven scaled scores.

Standardization. Test-retest reliability (r^{xx}) information for the WAIS-R was provided separately by age group. Different types of reliability computations were used to estimate the reliabilities of the WAIS-R test. When appropriate, a split-half procedure was employed. Reliability coefficients for the eleven tests and the Verbal, Performance and Full Scale IQ's for the nine age groups were computed based on the double testing studies of samples at four age levels ranging in size from forty to eighty individuals.

The reliabilities for the three IQ's are very high across all nine age groups, with the average coefficients of .97, .93 and .97 for Verbal, Performance and Full Scale IQ's, respectively. Reliability coefficients for the individual tests ranged from .52 for object assembly at ages sixteen-seventeen, to .96 for vocabulary at six of the nine age groups. For the entire age range, only six of the eighty-nine coefficients for the eleven subtests fell below .70. Average coefficients for the six verbal subtests were generally higher than those for the five performance subtests.

A body of evidence, both rational and empirical, attests to the validity of the WAIS-R as a measure of global intelligence. The initial evidence of the validity of this test stems from the procedures used to determine

the content of the original Wechsler - Bellevue Intelligence Scale (1939). Tests were selected based on their correlations with other established tests of intelligence and with empirical judgments of intelligence on ratings by experienced clinicians and on empirical studies of several groups of known intellectual level.

Studies have been conducted relating the WAIS scores and various measures of academic success. In a concise summary of some of these studies, Zimmerman and Woo-Sam (1973) noted that the strength of the relationship between WAIS IQ's and such criteria is dependent on the adequacy of the latter. Research has also shown the Wechsler Adult Scales to be related to various other correlates of global intelligence.

Raven Progressive Matrices

The Raven consists of a series of visual pattern matching and analogy problems pictured in non representational designs. Testing a person's capacity for observations and clear thinking, the Raven assesses an individual's ability to comprehend meaningless figures presented for observation, see the relationship between them and conceive of the figure completing each system of relations presented. By doing this, the individual displays a systematic method of reasoning.

Construction. The Raven consists of sixty problems presented in booklet form and divided into five sets of twelve. In each set, the problem is as much as possible self evident. The problems which follow become progressively more difficult. Each item or problem contains a pattern with one part removed and six to eight pictured inserts, one of which contains the correct pattern. The subject points to or indicates the correct pattern. The subject points to or indicates the pattern piece that belongs in the pattern design above. The Raven is intended to cover the whole range of intellectual development from early childhood to old age. The standard Raven has norms from age eleven through seventy-five.

Administration. The Raven is administered by giving a standardized set of instructions. The first two problems are used as examples to show which correct piece completes the pattern. As the order of the problem provides the standard training and the method of working, the Raven can be given as an individual, self administered, or as a group test. For this study, the test was given as an individual test with the examiner presenting the material and recording the answers.

Everyone is given exactly the same series of problems in the same order and is allowed to work at their own speed, without interruptions from the beginning to the end of the scale. The five sets provide five opportunities for grasping the method and five progressive assessments of a

person's capacity for intellectual activity. To ensure sustained interest and freedom of fatigue, the figures in each problem are boldly presented, accurately drawn, and as much as possible, pleasing to look at.

Scoring. Scoring involves using a stencil key on the record form to obtain the raw score total of correct responses. The standard record form is arranged so that it can be quickly and accurately marked and scored. The score a person obtains on each set is totaled and the total score converted to percentile scores by specially prepared tables according to age. Tables are available for both children, ages eleven through sixteen, and adults, ages twenty through seventy-five. The percentile scores can be used to categorize intellectual capacity as follows:

95% and above - Intellectually Superior

75% - 94% - Above Average

25% - 74% - Average

9% - 24% - Below Average

Standardization. The Raven Progressive Matrices have been standardized for samples of individuals from ages eleven to seventy-five. The scale has a test-retest reliability, varying with age from .83 to .93. Physical or mental illness do not seriously affect the test-retest reliability of the Raven. The Raven has been standardized with the Mill Hill Vocabulary Scales. As the

intercorrelation between the Raven and the Mill Hill shows a good relationship, it would be a strong indication that the person's level of mental development and rate of progress is accurately portrayed.

Hooper Visual Organizational Test

The Hooper Visual Organizational Test was devised as an objectively scored test for diagnosis of organic brain pathology. The Hooper presents the subject with drawings of simple objects cut into several parts and rearranged. The task is to name the object. The test is helpful in being able to separate the perceptual component from a patient's performance on the object assembly subtest of the WAIS-R and other visual-constructional tests.

Construction. The Hooper Visual Organizational Test consists of thirty pictures of more or less readily recognizable cut up objects. The test was selected as one particularly sensitive to the decrement in abilities which appears with physiological changes in the cortical structures. The later pictures seem to get more difficult, but there is no established definite hierarchy.

Administration. The Hooper is administered as an individual test where the examiner records answers given by the subject. The subject is provided a bound booklet while the examiner records responses in a specially prepared answer sheet. Each subject is given standardized directions

which explain the procedure. There is no time limit for this test and subjects are given the opportunity to answer each of the thirty items. Most subjects complete the test within fifteen minutes.

Scoring. Scoring criteria for the test were formulated from a study of responses of "normal" patients. For each item, there is one correct answer which receives a full credit. Other answers resemble the indicated correct answer and should receive full credit. Other answers are but partially correct and only get half credit.

A score of twenty-five to thirty correct responses indicates no impairment. A score of twenty to twenty-four correct responses indicates mild impairment. A score of ten to nineteen correct responses shows a moderate degree of impairment of visual organizational ability.

Standardization. The reliability of the Hooper scores has been studied in two normal groups. In the first study, records of one hundred sixty-six college students were used and the correlation between split-halves of the test determined as .83. In a second study, using a group of seventy-four psychoneurotic patients of a state hospital, the correlation resulting from use of the same technique was .78.

Validity studies show that the Hooper has useful validity in differentiating organic patients from those with psychiatric diagnoses indicating functional disorders. Similar findings were obtained in studies of children, college students and the aged.

Unilateral Skills Activities of Daily Living Evaluation

A fourth instrument used in the study was the Unilateral Skills Activities of Daily Living (ADL) Evaluation. This measure is a revision of one already being used by the Occupational Therapy Department at Mary Free Bed Hospital and Rehabilitation Center. Most stroke patients cannot use their affected upper extremity for much more than to assist their good arm in performing various daily activities. The right sided CVA patient usually experiences significant functional loss of his or her left upper extremity and requires training by the occupational therapist to learn one handed techniques that will enable them to perform adequately many routine activities, such as feeding, dressing and homemaking tasks.

Research has demonstrated (Cronzo, 1962; Kaplin, 1982) that visual perceptual skills play a very important role in allowing or enabling an individual to perform many tasks properly, including activities of daily living functions. The Unilateral Skills ADL Evaluation Form, as it has been developed, has helped measure the functional carryover of several ADL skills resulting from block design training to improve visual perceptual skills. Thus, the revised form was used in this study to measure practical improvements resulting from the specially devised cognitive retraining procedure.

Administration. The Unilateral Skills ADL Evaluation Form (Appendix D) was administered and scored by a certified

occupational therapist, specially hired and trained to give the test measure. She was selected for her availability to administer pretest and post test measures on a timely basis and because of her experience in research procedures. The occupational therapist had all items necessary to assess the tasks given. The evaluation was done in a quiet, spacious kitchen/apartment area in the Occupational Therapy Department. The tasks were given in order as they appeared on the form. The same basic instructions were applicable for each task in that the patient is told that they are being evaluated on how well they can accomplish certain ADL tasks. Each task was explained to the patient and the items needed to do the tasks were presented to the patient. The patient was then observed doing the task and a number was assigned to each task from a scoring key (Appendix E) depicting the degree of proficiency or capability the person displayed in completing the task.

Scoring. A specially devised scoring key was developed for the Unilateral Skills ADL Evaluation Form. Specific definitions for the purpose of this study were provided for the six levels of performance that could be observed on each task a patient was given.

The following definitions are provided for the terms used in the scoring key:

Independent: given standard verbal directions and task materials, the patient can complete the task without further direction or assistance.

Verbal Cueing: given standard directions and task materials, the patient requires additional verbal guidance to comprehend and complete the task.

Demonstration: given the standard directions and task materials, the patient requires examiner to demonstrate the procedures needed to complete the task.

Physical Assistance: given the standard directions and task materials, the patient requires the examiner to physically assist him or her with task related movement in order to complete the given task.

Dependent: given the standard directions and task materials, the patient attempted but is unable to perform the task with either verbal or physical assistance or demonstration.

Refusal: given the standard directions and task materials, the patient refuses to attempt a task.

A performance level was thus developed along a hierarchical sequence from Independent Performance to Dependent Performance, including a category for refusing to do the task. This was to distinguish between a person's physical incapability to accomplish a task and a person's unwillingness to cooperate which would reflect a possible attitude problem.

For purposes of statistical analysis, a numerical point value was given each of the terms used in the key on the Unilateral Skills ADL Evaluation Form:

Independent - 5

Verbal Cueing - 4

Demonstration - 3

Physical Assistance - 2

Dependent - 1

Refusal - 0

The occupational therapist scoring this test marked the appropriate box beside each task performed by the patient for both the pretest and post test. Then by assigning numbers to the scores of the corresponding performance level marked, a comparative analysis was done between tasks and for each task a comparison was then made between pre and post testing.

Construction. The Mary Free Bed Unilateral Skills ADL Evaluation Form is a clinical tool developed to assess a patient's progress in several ADL functional areas during the course of his or her rehabilitation program. Significant revisions were made to an existing form used by occupational therapists to evaluate unilateral skills in stroke patients and other physically disabled patients having the use of only one upper extremity. This author, along with three occupational therapist supervisors, reviewed the various activities of daily living areas and

selected five general categories to assess for the purpose of this study:

1. Feeding skills
2. Hygiene
3. Dressing skills
4. Homemaking skills
5. Community ADL/vocational skills

Specific behavioral tasks were developed under each general category. These tasks were made relevant to activities commonly done by most people in the course of their daily routine. The specific tasks selected were also those that were clearly identifiable and easy to observe behaviorally as to the degree of successful completion. The number of tasks under each ADL general category varied from four to seven, according to what was decided by the group as an adequate number of tasks to demonstrate competence or to cover satisfactorily the skills involved in a particular ADL area. For instance, the homemaking skill area has four tasks to be assessed relating to common activities performed around the home or kitchen. The hygiene area has seven tasks to complete depicting various personal hygiene and cleaning activities.

The specific tasks under the five general ADL categories in the Unilateral Skills Evaluation Form were rated for each patient according to his or her degree of ability to accomplish the ADL tasks. There are boxes beside each task whereby the scorer can mark the appropriate

level of performance for both the pretest and post test.

Procedure

All patients who met the selection criteria were randomly assigned to either a control group or to an experimental group. By a simple flip of the coin, it was determined that the first man and woman selected would be in the control group. Subsequently, each eligible subject, man and woman, was alternately placed in either the experimental group or the control group.

In addition to the Wechsler Adult Intelligence Scale - Revised, all of the subjects in both groups were given the Hooper Visual Organizational Test and the Raven Progressive Matrices as pretest measures prior to the start of the experimental treatment. The Unilateral Skills Activities of Daily Living Evaluation Form was used to determine the functional level of each subject in the study. The specific ADL functional areas considered were feeding, hygiene, dressing, homemaking and community ADL/vocational skills.

After all pretest measures were completed, the subjects in the experimental group entered a specially designed cognitive retraining program. The program involved block design training using the Goldstein - Scheerer Cube Test blocks. These blocks have six sides, with each side a different color: blue, gold, red, half blue/half gold,

half red/half white, and all white.

The block design training procedure was a combination of Ben-Yishay's technique of saturational cueing and the directions used on the Goldstein - Scheerer Cube Test (1941). Saturational cueing, as defined in Chapter One, is the procedure of providing a series of graded cues ranging from minimal to maximal explicitness until a subject is able to pass all items presented, or shows complete failure to benefit from cues given. Both approaches were modified for use with the experimental group in this study. For example, the first five steps presented in the standard Goldstein - Scheerer Cube Test were done in reverse order in this study (Appendix F). Step six was not carried out at all, as it included a multiple choice procedure of selecting the correct block model from a choice of three which matched the original design. This was not relevant to the training. Also, instructions similar to Ben-Yishay's saturational cueing techniques were included (Appendix G), but the kind of diagram cards used (stimulus cards) were not included. Only the standard design cards were used from the Goldstein - Scheerer Cube Test (Appendix H). This includes a large design the same size as the four actual blocks put together with distinctive lines showing the outline of each block; a smaller design one quarter as large, with the same separating lines; a large design similar to the first design mentioned but without the lines outlining each block; and again a design one quarter as large

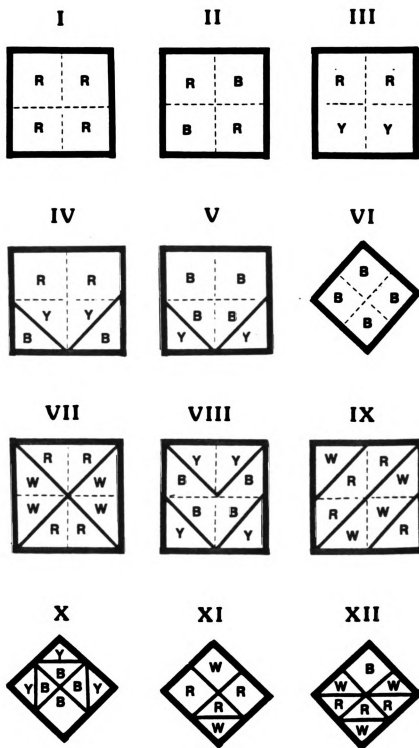
without separating lines distinguishing each block.

In addition, a specially designed sheet (Appendix I) was used for placement of the blocks in constructing the designs in steps one through three for each design.

For step four, this sheet was removed.

Prior to beginning the experimental treatment proper, each subject was given the Goldstein - Scheerer Form Color Sorting Test. An individual is given objects with varied shapes and colors and asked to sort them according to a category. The objects are shaped as circles, squares and triangles, and each shape is colored blue, green, red and gold. The sorting tasks were given as a simple screening to check the basic color and shape discrimination capability of each subject. These basic skills are needed to identify and construct the various designs offered during the block design training. No subject in the study had a problem with this task.

The experimental treatment involved each patient individually receiving block design training four times per week with each training session lasting approximately three quarters of an hour. The duration of the training period was three weeks. Halfway through each training session, the patient was given a five minute break to relax. This was consistent with the low endurance level most stroke patients experience. It was felt that such rest periods would enhance the patient's overall performance. Figure 3.1 shows the twelve designs used for block design training.



R-RED B-BLUE Y-YELLOW W-WHITE

Figure 3.1- The Twelve Block Designs of the
Goldstein - Scheerer Cube Test

Each training session consisted of the same structured procedure with the examiner providing verbal and visual cueing to the subjects for each design until they were able to complete each design without assistance from the examiner. Each training session began with the subject "warming up" by repeating the last design passed during the previous session.

Verbal and visual cueing included using a specially devised sheet (Appendix J) showing four specific directions and how each block with half one color and half another color could be correctly positioned in the total design by turning the block in a specific manner. The four directions given to the subjects during the block design training were upper left, upper right, lower left and lower right. These directions were both verbalized by the examiner and pointed out on the visual cueing sheet to help the patient complete the task. Verbal and visual cues were given only as needed. The patient was also encouraged to verbalize the directions and position for each block's placing in the total design. Cueing was decreased systematically as the patient demonstrated competence in completing each step of the design. When the twelfth or final design was passed successfully, or when the maximum of twelve training sessions were completed, the experimental treatment procedure was over for that patient.

After the experimental treatment, post test measures were carried out on the performance portion of the Wechsler

Adult Intelligence Scale - Revised, the Hooper and the Raven. Both the pre and post psychometric measures were administered by the same psychologist, a staff member within the Mary Free Bed Hospital Psychology Department. The Unilateral Skills ADL Post Test Evaluation was carried out by the same qualified occupational therapist who administered the pretest measure to each subject.

Design

The research design used in this study was the pretest-post test control group design as described by Borg and Gall (1977) and Campbell and Stanley (1963). The rehabilitation program for the experimental group and control group was kept as identical as possible, with the difference being that the experimental group was exposed to the experimental treatment. The design was structured to have the same psychologist administer all of the pre and post psychological measures and the same occupational therapist administer the pre and post Unilateral Skills ADL Evaluation Form to all patients. This procedure would ensure higher scorer reliability.

It was thought that the experimental treatment was not affected by pretesting and thus the post test only control group design was not considered. Borg and Gall (1977) discussed three possible disadvantages of not administering a pretest of the dependent variable:

1. Pretest scores are not available to control for any initial differences between the experimental and control group.
2. The researcher cannot use these scores to form subgroups to determine whether the experimental treatment has a different effect on subjects at different levels.
3. There may be a differential attrition during the course of the experiment and the researcher cannot be sure whether the differences on post test were due to the differential drop out characteristics of the two groups or due to the experimental treatment effect.

The design is a 2 x 2 factorial design. The independent variables were sex and type of training (traditional rehabilitation and traditional rehabilitation plus cognitive retraining). The dependent variables were the WAIS-R Performance Raw Score, the Hooper and the Raven. Another dependent variable was the level of performance score on the Unilateral Skills ADL Evaluation Form, specific to the areas of feeding, hygiene, dressing, homemaking and community ADL/vocational skills.

This particular design can be illustrated as follows:

Type of Training

<u>Sex</u>	<u>Type of Training</u>	
	T ₁	T ₂
M	10	10
F	10	10

Legend:

- T₁ Traditional Rehabilitation
 T₂ Traditional Rehabilitation
 Plus Cognitive Retraining
 M Men
 F Women

Figure 3.2 - Design of the Study

Hypotheses

The hypotheses tested in this study were as follows:

Hypothesis One

Subjects who receive block design training will show greater improvement in visual perception skills than those not receiving this training.

Hypothesis Two

Subjects in the experimental group will show a generalization in practical functional skills by demonstrating an increase in ability to perform certain activities of daily living when compared to the control group.

Hypothesis Three

There will be no difference between men and women and their visual perceptual skills scores.

Hypothesis Four

There will be no difference between men and women on their level of performance scores on the Unilateral Skills Activities of Daily Living Evaluation Form.

Before formal hypothesis testing, descriptive statistics were used to summarize the demographic characteristics including information about age, sex, education, and length of time since the stroke and the beginning of block design training.

Analysis of covariance was used to test the hypothesis regarding type of training and changes in visual perceptual skills. The WAIS-R performance post test raw scores, as well as the Hooper and Raven raw scores, were compared using the pretest means as covariates.

The second hypothesis regarding the demonstrated increase in ability to perform certain activities of daily living tasks used a t test for independent means on each of the five specific areas of ADL functioning found on the Unilateral Skills ADL Evaluation Form. The pre and post test level of performance scores were used to calculate the gains made by the subjects in each area. The gains of the treatment group and those in the control group as a

whole were also compared.

The third hypothesis regarding the type of training as it relates to sex was analyzed using an analysis of covariance. The Raven, Hooper and WAIS-R performance scaled score means, separated by sex, were compared using pretest measures as covariates.

The fourth hypothesis regarding the type of training as it relates to sex was analyzed using a t test for independent means. Each of the five activities of daily living categories, separated by sex, were compared.

Summary

Right sided CVA patients in a physical rehabilitation center were used as experimental subjects in a factorial design to determine the effectiveness of cognitive retraining in improving visual perceptual skills and thus resulting in better performance in various activities of daily living tasks. The patients ranged in age from thirty-six to eighty-three and the strokes experienced by those patients were recent, and the patients had no history of having suffered a previous stroke.

The subjects were randomly assigned to a control group and experimental group after meeting some basic criteria such as having a minimum verbal intelligence level and a certain visual perceptual impairment level as measured by the Wechsler Adult Intelligence Scale - Revised. Each group contained ten men and ten women in a balanced design

to help determine if men and women respond differently to cognitive retraining techniques.

Each subject in the experimental group underwent a three week training program of systematic visual perceptual training. The procedure involved using a modified form of the Goldstein - Scheerer Cube Test and the saturational cueing technique used by Ben-Yishay in his classic series of studies on block design training. This included giving the necessary verbal and visual cues to complete a particular design and gradually withdrawing the cues as it was perceived that the subjects no longer needed them to complete the tasks.

The three primary hypotheses concerned differential performances of men and women in the experimental group and the carryover of demonstrated improved visual perception in being able to better perform certain activities of daily living tasks. It was thought that there would not be a significant difference between men and women in benefitting from the cognitive retraining. However, it was felt that all those experiencing the block design training would show some improvement in their ability to perform various activities of daily living tasks and perform better than those in the control group.

The remaining hypothesis concerned the relationship of a systematic block design training procedure that would demonstrate definite improvement in a person's visual

perceptual skills. The intent was also to show that this helpful treatment procedure could be less costly and easier to implement than any other procedure proposed to help the stroke patient with regaining loss of cognitive skills.

Dependent measures consisted of the three psychological measures (WAIS-R, Raven and Hooper) and the Unilateral Skills ADL Evaluation Form especially developed for this study. Statistical analyses were used to test the above hypotheses. An analysis of covariance was used to test the hypothesis regarding type of training and changes in visual perception and type of training as it relates to sex. A t test was used to compare pre and post test data on the five general areas of the Unilateral Skills ADL Evaluation Form. Descriptive statistics were used to summarize the other data collected in the study, such as age, sex, education, and time since onset of stroke. Chapter IV contains the results of all analyses performed.

Chapter IV

ANALYSIS OF RESULTS

Analysis of the data generated by this study will be presented in this chapter. Four areas are addressed in the analysis of results. The first area concerns a summary of the demographic data collected. The next area consists of a description of the sample on experimental variables, broken down by treatment group. Formal testing of the hypotheses explored in this study is presented in the third area. The final area is a summary of all results.

Demographic Data

A total of forty right cerebral hemisphere stroke patients took part in this study. Twenty patients were men and twenty were women. A primary reason that a stroke patient was excluded from the study was having obtained too high a score on the block design subtest of the Wechsler Adult Intelligence Scale - Revised (WAIS-R). This indicated that there was no need for visual perceptual retraining, since the patient was already functional in this cognitive area. Also, too severe a visual field cut or motor apraxia would not allow the patient to appropriately participate in the block design retraining.

Deficits would have interfered with a patient's block design performance even though visual perception had improved and was no longer a problem. All of the patients in the study were functional in the above related cognitive areas, but did demonstrate moderate to severe deficits in visual perception.

Table 4.1 presents the demographic characteristics of the experimental and control groups. Patients participating in the study had an average age of sixty-three years. Ninety percent of the patients in the sample were above fifty years of age. The control group had twenty-five percent more of subjects over the age of sixty-five than the experimental group. Table 4.1 also shows that in both groups over half of the patients had a high school degree or better (fifty-five percent in the control group; seventy percent in the experimental group). Neither group had a high percentage of low educated or very highly educated patients. Most patients in both groups fell into the mildly impaired or low average categories of intellectual functioning as measured by the Full Scale Wechsler Adult Intelligence Scale - Revised. All of the patients in the experimental group and ninety-five percent of the patients in the control group obtained WAIS-R Full Scale IQ scores ranging from eighty through ninety-nine. Usually, a patient's low scores on the performance subtest brought a full scale IQ score down.

Table 4.1 Characteristics of the Sample by Treatment Group

	<u>Traditional Rehabilitation (Control)</u>		<u>Traditional Rehabilitation Plus Cognitive Retraining (Experimental)</u>	
	<u>%</u>	<u>(N)</u>	<u>%</u>	<u>(N)</u>
SEX				
Men	50	10	50	10
Women	50	10	50	10
AGE				
35-50	5	1	5	1
51-65	25	5	50	10
66 and Over	70	14	45	9
EDUCATION (highest completed)				
Jr. High	15	3	5	1
Sr. High (1-3 years)	30	6	25	5
Sr. High (graduated)	45	9	40	8
College (1-3 years)	10	2	25	5
College (graduated)	0	0	5	1
WAIS-R Full Scale IQ				
80-89 (Mild)	55	11	55	11
90-99 (Low Average)	40	8	45	9
100-109 (Average)	5	1	0	0

Table 4.2 presents the outcomes in block design training for each of the men and women in the experimental group. Seven of the ten men and eight of the ten women undergoing the experimental treatment completed all twelve of the block designs in the Goldstein-Scheerer Cube Test. All of these subjects were in their third and final week of block design training when they reached the criterion of completing all twelve designs.

Table 4.2 also indicates that three of the men and two of the women in the experimental group completed the three weeks of block design training before successfully passing all twelve of the block designs. One of the men completed nine of the block designs, one completed ten and another man completed eleven block designs over the course of their three week training program. One of the women completed only ten block designs and a second woman completed eleven block designs successfully before the training program was over.

An individual comparison was made of each of the visual perception psychological test scores for each of the five subjects failing to complete all of the block designs during the three week training period. None of the test scores on those subjects varied to any great extent from those scores of the other men and women in the experimental group. The poorer performance of these five subjects in not being able to successfully complete the block designs during the three week training period was attributed mostly to constructional apraxia problems rather than visual perception.

Table 4.2 Block Design Training Outcomes of Experimental Group
Separated by Sex

<u>Men</u>	<u>Number of Designs Completed</u>	<u>Women</u>	<u>Number of Designs Completed</u>
1	10	1	12
2	12	2	12
3	12	3	11
4	12	4	12
5	11	5	12
6	12	6	12
7	12	7	10
8	12	8	12
9	9	9	12
10	12	10	12

Experimental Characteristics

A summary of the experimental scores for the sample (visual perception and activities of daily living functional skills) separated by treatment groups are presented in Tables 4.3 through 4.6. T test comparisons between the experimental and control groups were performed in both the pretest and post test situations for the three psychological tests of visual perception and the Unilateral Skills ADL Evaluation Form. Of the forty patients who participated in the study, only one patient did not complete all of the post testing. The patient completed pretesting but was upset about her rehabilitation program and refused to participate in post testing of the three psychological measures. She did complete post testing of the Unilateral Skills ADL Evaluation Form. Two other patients were discharged before the Unilateral Skills ADL Evaluation post testing could be completed. In these cases, the occupational therapists who had been treating these patients daily during the course of their rehabilitation program were asked to fill out the post test portion of the Unilateral Skills ADL Evaluation Form. These occupational therapists used their clinical judgment as to how these patients were functioning in certain described areas of activities of daily living.

On the psychological tests of visual perception, Table 4.3 shows the pretest experimental group on the

WAIS-R Performance portion had a mean of 50.00 and the control group had a mean of 53.55. Table 4.4 shows that the post test experimental group on the WAIS-R had a mean of 74.75, while the control group had a mean of 60.95. Likewise, the Raven Progressive Matrices produced a mean of 19.35 for the pretest experimental group and 20.10 for the control group. On this same test measure, a post test experimental group produced a mean of 26.15 and the control group had a mean of 22.75. Table 4.3 also shows that the Hooper Visual Organization Test pretest experimental group had a mean of 18.00, while the pretest control group had a mean of 19.15. Table 4.4 shows that on the Hooper the post test experimental group had a mean of 22.85 and the control group had a mean of 20.70..

Each of the psychological tests of visual perception in the pretest situation showed no significant difference between the experimental and control groups. The WAIS-R Performance, Raven and Hooper on the t test produced a level of significance of .62, .73 and .41, respectively. While the post test comparisons between the experimental and control groups did not produce a significant difference on any of these test measures, there were some noted gains made by the experimental group over the control group after undergoing the experimental treatment of block design training. A post test comparison on the WAIS-R Performance, Raven and Hooper showed a level of significance of .08, .14 and .11, respectively.

Table 4.3 Pretest Psychological Test Results by Treatment Group

Tests of Visual Perception	Mean	Standard Deviation	Standard Error	Significance
WAIS Performance (Raw Score)				
Experimental	50.00	19.79	4.43	
Control	53.55	24.68	5.52	.62
Raven				
Experimental	19.35	6.41	1.43	
Control	20.10	7.48	1.67	.73
Hooper				
Experimental	18.00	4.10	.91	
Control	19.15	4.73	1.06	.41

Table 4.4 Post Test Psychological Test Results by Treatment Group

Tests of Visual Perception	Mean	Standard Deviation	Standard Error	Significance
WAIS Performance (Raw Score)				
Experimental	74.75	24.10	5.39	
Control	60.95	24.72	5.53	.08
Raven				
Experimental	26.15	7.16	1.60	
Control	22.75	7.34	1.64	.14
Hooper				
Experimental	22.85	4.17	.93	
Control	20.70	4.33	.96	.11

Table 4.5 Pretest Unilateral Skills ADL Evaluation Scores
by Treatment Group

Category	Mean	Standard Deviation	Standard Score	Significance
Feeding Experimental Control	19.05 18.80	3.66 4.85	.81 1.08	.85
Hygiene Experimental Control	25.20 25.75	4.36 7.09	.97 1.58	.77
Dressing Experimental Control	13.60 13.10	3.51 5.04	.78 1.12	.71
Homemaking Experimental Control	12.40 13.20	2.23 3.67	.49 .82	.41
Comm ADL/Vocational Experimental Control	22.20 22.35	3.33 5.08	.74 1.13	.91

Table 4.6 Post Test Unilateral Skills ADL Evaluation Scores
by Treatment Group

Category	Mean	Standard Deviation	Standard Score	Significance
Feeding Experimental Control	23.50 21.50	2.19 4.11	.49 .91	.13
Hygiene Experimental Control	31.90 29.05	1.83 6.60	.41 1.47	.07
Dressing Experimental Control	19.95 16.85	3.33 5.10	.74 1.14	.03
Homemaking Experimental Control	17.45 15.50	2.30 3.79	.51 .84	.05
Comm ADL/Vocational Experimental Control	27.10 25.15	2.46 3.71	.55 .83	.05

Tables 4.5 and 4. show the pretest and post test t test comparison between the experimental and control groups on the activities of daily living (ADL) functional skills described in the study. Table 4.5 shows none of the five ADL categories showed a significant difference between groups on pretesting. Table 4.6 showed that upon post testing, there was a significant difference of the experimental group over the control group in the ADL categories of Dressing, Homemaking, and Community ADL/ Vocational at the .05 level of significance or better. Feeding and Hygiene categories had a significance level of .13 and .07, respectively. While this was not considered a significant difference statistically, there was certainly a positive gain of the experimental group over the control group when comparing pretest mean scores for each group.

Tests of Hypothesis

This section consists of the results of statistical tests relevant to tests of each of the four hypotheses.

Hypothesis One

Subjects who receive block design training will show greater improvement in visual perceptual skills than those not getting this training.

An analysis of covariance was used to test the null hypothesis that there was no difference between the type of training and the degree of improvement in visual perceptual skills. The dependent measures were the post test scores of the WAIS-R Performance, Hooper Visual Organization Test and the Standard Raven Progressive Matrices. Pretest scores for each of these measures were used as the covariates.

Table 4.7 presents the results of the analysis of comparing the pretest raw scores with the post test raw scores on each of the performance portions of the WAIS-R, Hooper and Raven used to explore Hypothesis One. As indicated, an overall probability of less than .001 was found permitting a rejection of the null hypothesis. This result, and an inspection of the group means in Tables 4.3 and 4.4, suggested that differences in the dependent measures were in the direction expected, i.e., patients who participated in block design training demonstrated a significant improvement in visual perceptual skills over those patients who had not received this training. Table 4.7 also contains the calculated F-ratio, sum of squares, mean squares, and the degrees of freedom used in the calculations. Based on this analysis, the null hypothesis of no difference was rejected.

Table 4.7 Analysis of Covariance on Pretests and Post Tests of Visual Perception by Treatment Group

Tests of Visual Perception	DF	Sum of Squares	Mean Squares	F Ratio	F Probability
WAIS-R Performance	1	3002.30	3002.30	40.46	.001
Raven	1	166.22	166.22	12.76	.001
Hooper	1	95.28	95.28	27.96	.001

Hypothesis Two

Those subjects in the experimental group will show a generalization in practical functional skills by demonstrating an increase in ability to perform certain activities of daily living when compared to the control group.

A t test for independent means, separated by group, was used to test the null hypothesis that there was no difference between groups in improved visual perceptual skills showing an increase in ability to perform certain activities of daily living tasks. This was thought to be the most appropriate test for this hypothesis, since there was no reason to expect that the two group means were correlated with each other. The two samples were assumed to be independent of each other.

Table 4.8 presents the results of this analysis giving the t value, degrees of freedom and the two-tail probability or significance level for each of

five areas identified under activities of daily living: Feeding, Hygiene, Dressing, Homemaking, and Community ADL/Vocational.

The dependent measures were the average of the performance level scores on all of the tasks under each of the five categories of activities of daily living. The pretest and post test scores were compared for each category. Table 4.8 showed that all of the activity of daily living categories except Feeding were significant beyond the .05 established level of significance. This permitted rejection of the null hypothesis for Hygiene, Dressing, Homemaking and Community ADL/Vocational Skills.

In these four categories, an inspection of the group means in Table 4.6 suggested that differences in the dependent measure were in the direction expected, i.e., that patients who had undergone block design training demonstrated a higher level of performance in almost all of the areas of activities of daily living skills. Even the Feeding category with a .13 level of significance suggested a strong difference between groups going in the direction of a more noted improvement in the experimental group.

In the area of Feeding, Table 4.8 showed that the level of significance was .06. This was seen to be a substantial difference in favor of the experimental group but not at the .05 or better statistical level of significance. Thus, the hypothesis cannot be supported

of there being a significant difference between groups in the ADL area of Feeding.

As presented in Table 4.8, the null hypothesis of no difference can be rejected.

Table 4.8 Results of t Test for Independent Means by Group for Five Areas of Activities of Daily Living Skills

ADL Category	Degrees of Freedom	T Value	F Probability
Feeding Experimental Control	36.94	-1.89	.066
Hygiene Experimental Control	36.40	-3.01	.005
Dressing Experimental Control	37.64	-2.47	.018
Homemaking Experimental Control	37.55	-3.90	.000
Comm ADL/Vocational Experimental Control	37.82	-2.31	.026

Hypothesis Three

There will be no difference between men and women and their visual perceptual skills scores.

An analysis of covariance was utilized to test the null hypothesis that there was a difference between men and women on the type of training received and their measured visual perceptual skills. The dependent measures were the scores on the WAIS-R Performance, Hooper and Raven. The post test raw scores on each of these measures, separated by sex, were compared using pretest measures as covariates.

Table 4.9 presents the results of this analysis, giving the degrees of freedom, F-ratio and the level of significance for each of the visual perceptual measures in the study. As indicated, a probability of .295, .865 and .131 were found on the WAIS-R Performance, Raven and Hooper, respectively, indicating that there was no significant difference between men and women on any of the test measures for visual perception. There was not sufficient data to allow one to reject the null hypothesis. This was in the expected direction.

Table 4.9 Analysis of Covariance on Pretest and Post Test of Tests of Visual Perception by Sex

Tests of Visual Perception	DF	Sum of Squares	Mean Squares	F Ratio	F Probability
WAIS-R Performance	1	83.89	83.89	1.13	.295
Raven	1	.38	.38	.03	.865
Hooper	1	8.13	8.13	2.38	.131

Hypothesis Four

There will be no difference between men and women on their level of performance scores on the Unilateral Skills Activities of Daily Living Evaluation Form.

A t test for independent means, separated by sex, was used to test the null hypothesis that there is a difference between men and women on the type of training received and their level of performance in certain ADL areas. The dependent measure was the average of the performance level scores on each of the five areas in the Unilateral Skills ADL Evaluation Form.

Table 4.10 presents the results of this analysis giving the degrees of freedom, t-value and two-tail probability level of significance of each of the five activities of daily living areas described on the Unilateral Skills ADL Evaluation Form. The table suggests that for the activity of daily living areas of Hygiene, Dressing, Homemaking, and Community ADL/Vocational there is no significance difference at the .05 level or better for both the experimental and control groups in the area of Feeding.

The null hypothesis, therefore, can be accepted. This was in the anticipated direction, as it was felt no difference would be found between men and women.

Table 4.10 Results of t Test for Independent Means
by Sex for Five Areas of Activities of
Daily Living Skills Separated by Group

ADL Category	Degrees of Freedom	T Value	F Probability
Feeding			
Experimental	13.70	2.09	.055
Control	17.87	2.79	.012
Hygiene			
Experimental	16.28	-.90	.379
Control	14.88	0	.100
Dressing			
Experimental	15.68	.91	.374
Control	17.22	.57	.529
Homemaking			
Experimental	17.82	.66	.520
Control	17.21	.63	.539
Comm ADL/Vocational			
Experimental	17.00	.32	.756
Control	17.67	1.56	.135

Summary of Results

1. It was found that the experimental and control groups were very similar in demographic characteristics as it related to age, education and intelligence level. There was a tendency for the experimental group to be slightly younger and more educated.

2. Patients receiving the block design training showed a significant improvement in visual perceptual skills over those patients who did not receive such training.

3. Patients in the experimental group showed a significant improvement over the control group in their level of performance in the ADL functional areas of Dressing, Hygiene, Homemaking, and Community ADL/ Vocational. Although not at a statistically significant level, there was a positive indication of improved feeding skills by the experimental group over the control group.

4. There were no differences found between men and women in the type of training received and their ability to perform in several of the activity of daily living areas.

Chapter V

SUMMARY AND DISCUSSION

Summary

The purpose of this study was to explore the effect of using a standard block design test on remediating the cognitive deficit of visual perception in stroke patients suffering right sided cerebral hemisphere damage. Another purpose was to relate any improvement in visual perception to improvement in various areas of activities of daily living.

The questions to be answered were: is there an improvement in visual perception from similarly matched groups of right hemisphere CVA patients after receiving specific cognitive retraining in block design? Will there be a generalization in those patients who have demonstrated improvement in block design skills to certain areas of activities of daily living? Are there differences between men and women CVA patients in their recovery pattern from their stroke specific to visual perception and activities of daily living skills?

Most researchers have found that a systematic and carefully executed treatment approach of block design training or other visual motor and visual perceptual tasks can lead to significant improvement in scores on psychological tests developed to measure visual perception.

What has not been addressed adequately is whether certain forms of cognitive retraining which improve visual perception will show carry over to activities of daily living skills.

Some researchers feel that many cognitive retraining techniques can enhance the cognitive skills of visual perception (Weinberg, 1970; Ben-Yishay, 1974). However, they fail to emphasize the importance that visual perception plays in the everyday quality performance of even minor daily routine tasks. Thus, little is known about how improved visual perception can generalize to a functional improvement in several areas of activities of daily living. Another existing problem is a lack of easy to use available cognitive retraining materials and guidelines to use in retraining these individuals. The few published articles in this area describe elaborate and somewhat difficult to construct training materials to use in cognitive retraining. Since these materials are not commercially manufactured or available, few staff practitioners in the rehabilitation setting can or will take the time to develop these materials themselves. What is needed is to explore already commercially available materials to see if they can be used in new ways.

In the present study, one of the aims was to show that an existing commercially available psychological test, the Goldstein - Scheerer Cube Test, could be modified in the way it was presented to train patients in visual perceptual skills. This would provide an additional clinical tool for

the treatment team working with stroke patients to improve functional skills and enhance overall recovery from their stroke. Another important aim of the study was to show that demonstrated improvement in visual perception by CVA patients who underwent block design training would also result in improvement in certain activities of daily living skills.

Discussion

The major hypotheses which were the focus of this study were confirmed. Each of the dependent measures used were able to detect differences between the experimental and control group in visual perceptual skills and related activities of daily living tasks. It was seen that block design training did significantly increase a patient's score on the visual perceptual measures. It was also evident that there was a corresponding improvement in the experimental group being better able to perform various activities of daily living tasks. This supports Ben-Yishay and Diller's study (1974), whose research produced similar findings.

The issue of various treatment modalities improving activity of daily living skills is quite relevant to the current treatment being carried out in physical rehabilitation hospitals today. With increased emphasis on cost effectiveness and proper utilization of existing inpatient rehabilitation beds, it is vital for rehabilitation practitioners, especially attending physicians, in those

facilities to determine the quality of care that an inpatient is getting and what will be the outcome of such rehabilitation services. The question is often asked in the rehabilitation setting whether more comprehensive allied health services could be provided to ensure that the patient is getting the maximum benefit from his or her stay. A related concern is how much of what the patient has learned in the rehabilitation facility is going to be useful and functionally generalize to the home environment after discharge. The third party payer, as well as the attending physician, wants to know if the time the patient has spent in the rehabilitation facility has been cost effective to the outcome obtained.

The results of this study suggest that the inclusion of a cognitive retraining program in a rehabilitation facility specific to the treatment of a stroke patient's visual perception deficits would be of great benefit in the patient's overall rehabilitation program. Kaplan and Hier's (1982) contentions, that as much emphasis should be placed on remediating visual perception deficits as in restoring physical functioning in those patients suffering from a stroke, are verified in this study. Ben-Yishay, Diller, Weinberg and others have also pointed out the need to complement physical rehabilitation techniques with cognitive rehabilitation procedures to treat more comprehensively the rehabilitation patient.

In addition to offering a more complete multidisciplinary treatment approach to the stroke patient, busy practitioners

in rehabilitation facilities should have available to them commercially made or ready made proven clinical tools to effectively treat the patient. There should not be the need for wide spread experimentation and the need for development of new techniques and procedures. Although continued research in rehabilitation settings and further development of new clinical tools should be part of the progressive rehabilitation program, methods already exist that are currently doing a satisfactory job.

Weinberg (1979) discovered that there are certain treatment approaches to visual perception that only may be effective for specific areas of visual perception. He found that his initial treatment procedures needed to be expanded to help remediate other specific cognitive deficits relative to visual/spatial neglect and visual scanning. This is an important concept that should be emphasized in the treatment of right cerebral stroke patients. There are ways to complement or supplement cognitive treatment procedures and provide multiple treatment modalities to meet the needs of these patients.

It is evident that the treatment program carried out in this study does remediate certain visual perceptual skills such as spatial relationships and form constancy. This is evidenced by knowing that significant improvements were seen in the WAIS-R Block Design Test, Hooper Visual Organization Test and the Raven Progressive Matrices Test. This study

provides support for Weinberg and Taylor's premise that a series of cognitive retraining procedures could be made available and used when needed to remediate identified cognitive deficits. This is consistent with a growing trend in rehabilitation facilities to determine adequately, through refined diagnostic neuropsychological testing, what cognitive areas have been effected by a brain injury. The next step after identifying what cognitive deficits exist is to provide methods to alleviate the cognitive deficit and improve the performance of the patient in those areas.

In addition to a more complete use of cognitive retraining procedures, it is important to recognize that the intensity of treatment in cognitive retraining could be a factor in improving deficits. This study demonstrated that statistically significant results were obtained with patients who underwent three weeks of cognitive retraining in block design four times a week for forty-five minutes a day. A longer period of treatment may be beneficial and worthy of investigation. Although good visual perceptual gains were evident after the three weeks of cognitive retraining, these patients still were not at their premorbid level of functioning in those areas. There is room for further gains to be made not only while the person completes the inpatient stay, but even after discharge. Thus, Cognitive retraining programs need to continue throughout the course of the patient's inpatient stay and on into their

outpatient rehabilitation. Carter (1983) showed that cognitive retraining could be beneficial when given in the acute care setting as early as one week after the stroke. A patient need not wait three or four weeks after arriving in the rehabilitation setting to begin cognitive retraining tasks. Nor should cognitive retraining stop once a patient is discharged into the home setting. Programs are being provided for the patient after discharge.

When a patient gets into a rehabilitation facility such as Mary Free Bed Hospital and Rehabilitation Center, they are medically stable. Thus, a more intensive program of rehabilitation treatment including cognitive retraining could be carried out with the patient receiving treatment perhaps as much as two times a day for one-half hour sessions. This is what is traditionally done in physical therapy, occupational therapy, and speech therapy. Such an addition to the rehabilitation regimen could easily be incorporated in an inpatient program.

Another issue in the present study that needs to be discussed is the lack of differences found in the recovery pattern between men and women. The present study supported Kaplan (1982) and Dee (1970) in that there was no difference between men and women in the area of visual perception. In the studies cited above, and in the present study, both men and women showed a substantial decline in visual spatial ability after right hemisphere stroke. Kaplan (1982) found

a slight decline in visual spatial ability in men as compared to women, but the difference was not statistically significant on any of the visual spatial tests given in this study. In the current study, there were no statistically significant differences found between men and women on any of the psychological visual perception tests and in only one out of the five areas on the Unilateral Skills ADL Evaluation Form was there a significant difference found between men and women, i.e., in the area of feeding.

Failure to support part of the hypothesis concerning no differences between men and women in activities of daily living skills as it pertains to feeding could be due to several reasons. The scores used (ranging from one to five for level of competence) may not have been refined and sensitive enough for the category of feeding. It is also possible that there was an unusual combination of patients in this study which was not representative of the general population of right cerebral stroke patients. A discussion with several of the occupational therapists as to an explanation why all the other categories in activities of daily living showed no significant differences between men and women except for feeding did not produce any clear answers. One explanation given by several of the occupational therapists contended that men may not appreciate the need for the lunch program (where the activity of feeding is assessed and treated) and may seem more self conscious and have a

"pride" factor enter into their training in this area. Such a contention would be that there would be a culturally based bias which leads to poor motivation for men participating in the feeding program. However, these explanations are only speculative and no firm reason was found for this difference. Perhaps more efficient training procedures than those used in this study need to be developed focusing on this area.

Implications for Future Research

The importance of this study is directly related to its ability to show that improvements in visual perceptual skills do have a positive effect on improving activities of daily living skills. To this end, some suggestions for future studies are presented.

It would be fruitful to try the block design training procedure with other populations. The present study used only right sided CVA patients. Ben-Yishay (1974) in his series of studies used both left and right CVA patients and showed improvements with both groups in visual perceptual skills. Since there is evidence that both left and right sided CVA patients do experience visual perceptual problems (Ayers, 1962), it would be beneficial to carry out a similar research design using both groups of CVA patients.

It is also suggested that the current block design training as carried out in this study be used in a group of closed head injured patients. Due to the diffuse nature

of most head injured patients, a well thought out research design may be needed to control for as many "nuisance" variables as possible. But as Weinberg (1979) has shown in his research, an individual can have a number of cognitive deficits present but still benefit from cognitive retraining specifically geared to certain deficits. Thus, even though a closed head injured patient may have several cognitive deficits identified through neuropsychological testing, research could be carried out to show if such patients may benefit from cognitive retraining procedures developed specifically to remediate the visual perceptual problems often found in this population of patients.

The current study demonstrated good carryover skills in the area of activities of daily living after undergoing block design training. The training procedures used in this study can be carried out by a properly trained B.A. level college graduate and need not require a M.A. or Ph.D. level person. It would be helpful to have longitudinal follow up studies to see how long the block design training effects last. It would be worthwhile to repeat the testing on the Unilateral Skills ADL Evaluation Form three months, six months and twelve months on both the control group and experimental group to see what significant changes, if any, occur over time. Even repeat visual perceptual testing could be done as Weinberg (1977) did in his study to substantiate if gains were maintained several months after cognitive retraining.

A related suggested study is that the Unilateral Skills ADL Evaluation Form be used by the Occupational Therapy Department with all stroke patients, both left and right CVA's, to document performance clinically in the various areas of activities of daily living both at the time of admission and at the time of discharge. In a relatively short period of time, enough data could be collected to do a comparative study on which groups (men and women; right CVA and left CVA) seem to benefit functionally the most from their rehabilitation experience.

Another suggestion for future research would be to expand on Weinberg and Diller's (1979) concept of complementing one cognitive retraining procedure with another in order to remediate perhaps several cognitive deficits at the same time. A study could be carried out, for instance, using the block design retraining procedure used in this study for increasing visual perceptual skills and other cognitive retraining procedures as suggested by Diller (1971) and Kaplan (1982) for visual constructive deficits, and/or Gianutsos (1980) for improving memory functioning.

It is also suggested that future efforts be taken in researching other instruments and methods such as those identified by Anderson and Choy (1970) and Freishtat and Siev (1976) to empirically validate their use in the clinical setting for improving cognitive functioning with the brain injured patient. It would be worthwhile to conduct a study using two experimental treatment groups compared to each

other as well as a control group. One treatment group could receive the same treatment as the experimental group in this study, and the other group could receive the treatment used by Ben-Yishay in his studies (1974).

Conclusions

The hypothesis studied in the project concerned the effects of cognitive retraining on increasing stroke patients' visual perceptual skills with a corresponding improvement in better being able to perform various activities of daily living skills. With one exception, all of the hypotheses were supported; that exception concerned finding a significant difference between men and women in the activity of daily living area of feeding. It was thought that there would be no difference between men and women in either regaining visual perceptual skills or in their demonstrated competence level in any areas of activities of daily living.

It was found that, consistent with past research, patients who had gone through a systematic cognitive retraining program in visual perception showed a significant improvement over similarly matched patients who did not receive such training. An even more important finding was that the experimental group showed significant gains in functional skills and were better able to perform various activities of daily living tasks compared to the control group.

The implications from the study for rehabilitation practitioners is evident when applying these findings to rehabilitation settings. Using a clinically proven treatment approach in cognitive retraining would seem logical and beneficial to the patient suffering visual perceptual deficits. Not only would it help complement the other traditional rehabilitation services such as physical therapy, occupational therapy and speech therapy in increasing a patient's functional skill and level of independence, but it would also positively impact the cost effectiveness of hospitalization. If the patient is able to significantly improve in activities of daily living skills and show beneficial gains especially attributed to cognitive retraining, perhaps length of stay in the rehabilitation hospital would be shortened resulting in a definite cost savings. The benefit of such a proven treatment approach in increasing the patients' independence and activities of daily living skills is hard to measure in dollars, but could certainly have a positive psycho-social effect.

Because it was demonstrated that cognitive retraining was associated with an increase in functional performance, other lines of research were suggested. These included studying other population groups such as traumatically brain injured patients, left sided CVA patients, and comparing a group undergoing the treatment approach used in this study with one that is given the treatment used by Ben-Yishay and Diller. It was also suggested that other

cognitive retraining instruments and techniques be clinically tested and empirically validated to allow additional treatment programs to be used in rehabilitation facilities.

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Appendix A
Purpose of Study

STATEMENT OF PURPOSE

Study on Cognitive Retraining

We would like you to take part in a study being run by researchers from Michigan State University and Mary Free Bed Hospital and Rehabilitation Center. The study will help us better understand how people like yourself benefit from visual perceptual retraining. If you decide to take part in the study, you will be given a number of tasks to do during the next three to four weeks. Your performance on these tasks will be kept private and will not be shared with anyone unless you ask us to give them to someone else.

We hope that this study will help us know more about how people relearn visual perceptual skills. We believe that if we know how people can benefit from this kind of training, we can use this treatment to help others regain certain skills lost because of their stroke. Your participation in the study is important because of some of your experiences here at Mary Free Bed Hospital and Rehabilitation Center. Other people here will be participating in this study. We hope that by combining all the information from everybody, including you, we will be able to demonstrate how to better provide service and treatment for many of our patients.

Appendix B
Informed Consent Form

INFORMED CONSENT AGREEMENT**Study on Cognitive Retraining on Visual Perception**

I, _____ have had the purposes of this project explained to me. I understand that the general purpose of the procedures to be used in this project is the better understanding of how people relearn visual perception skills. I understand that the personal information to be collected during the course of this project is essential to the project and this information is confidential and will not be released to anyone without my express written permission. I give Mary Free Bed Hospital and Rehabilitation Center permission to obtain any necessary information from my file and records. In any research report prepared subsequent to this project, I will not be identified by name, and other identifying information will be changed so as to protect my identity. I understand that I can stop participating in the study at any time during the study. This consent agreement terminates April 1, 1983 but the terms of confidentiality are extended indefinitely.

SIGNED: _____

DATE: _____

WITNESS: _____

I certify that I have read this document or had it read to me prior to my signing it.

SIGNED: _____

Appendix C
Administrative Agreement

ADMINISTRATIVE AGREEMENT

This document indicates the agreement of the Executive Director of:

Mary Free Bed Hospital and Rehabilitation Center
235 Wealthy Street Southeast
Grand Rapids, Michigan 49503

to allow research (to be supervised by Bill Leer, Researcher, Michigan State University) to be conducted in the aforementioned facility.

The following list of responsibilities constitutes an agreement between the above facility and the researcher from Michigan State University, who is also on the staff at Mary Free Bed Hospital and Rehabilitation Center. This will ensure the continuity of this study and the protection of the confidentiality of subjects of the study on cognitive retraining.

The Executive Director of Mary Free Bed Hospital agrees to:

1. Allow a researcher to meet with selected patients attending the facility during the time period September 1982 through May 1983.
2. Provide access to information contained in the files of said patients.
3. Allow the use of said information for the use of performing quantitative analyses for any and all subsequent research reports.
4. Provide other additional information pertinent to the study as requested.

The Researcher from Michigan State University agrees to:

1. Take full responsibility for protecting the confidentiality of the individuals who are used in any of the selection, observation and subsequent data analyses.
2. Secure from each patient a consent form for participation in the study.
3. Take full responsibility for protecting the confidentiality of test and survey results obtained on each individual participating in the study.
4. Inform the facility of the availability of the results of this study and provide any necessary assistance in interpretation of the study's findings.

These agreements shall be in force until the final report is written.

SIGNED: W. H. Bessing Date 9/3/82
Executive Director

SIGNED: Wilbur B Leer Date 9/3/82
Researcher
Michigan State University

Appendix D

Unilateral Skills Activities of Daily Living
Evaluation Form

UNILATERAL SKILLS ACTIVITIES OF DAILY LIVING EVALUATION FORM

NAME: _____ DATE: _____ PHYSICIAN: _____

DIAGNOSIS: _____ PRIMARY THERAPIST: _____

DOMINANT U.E. _____

Function of Affected U.E. (positioning, stabilizer, gross assist, etc.)

Reason for Referral (Pt's primary needs; change of hand dominance; expected performance; independence; assist; etc.)

Pretest					SKILLS	Post Test					
I	V	S	P	D		I	V	S	P	D	R
					FEEDING SKILLS:						
					1. Folds a napkin.						
					2. Uses a rocker knife.						
					3. Opens sugar packet and straw casing.						
					4. Opens a milk carton.						
					5. Butters bread.						
					HYGIENE:						
					1. Applies soap to wet washcloth.						
					2. Washes uninvolved forearm with washcloth.						
					3. Removes, cleans and replaces glasses on face.						
					4. Applies cleaner and cleans teeth or dentures with a brush.						
					5. Uses a hand brush to clean fingernails.						
					6. Opens an aspirin bottle.						
					7. Uncaps container and applies deodorant or powder to underarms.						
					DRESSING SKILLS:						
					1. Dons and removes short sleeved shirt/blouse.						
					2. Buttons and applies shirt or blouse.						
					3. Puts a belt around a waist and buckles it.						
					4. Puts on and secures shoes with kno-bows.						
					5. Zips a separating zipper.						
					HOMEMAKING SKILLS:						
					1. Use commercial adaptive cutting board to peel an apple or carrot.						
					2. Can open and close three kinds of kitchen containers with lids.						
					3. Can open soup can with electric can opener.						
					4. Given a one pint can, can locate pan in kitchen cupboard and pour soup from the can.						
					COMMUNITY ADL/VOCATIONAL SKILLS:						
					1. Can open, seal and address envelopes by hand.						
					2. Can locate telephone number in telephone book and dial the number.						
					3. Can cut out an abstract shape, fold it, staple it and tape it.						
					4. Can select appropriate coins for a 68¢ purchase from a wallet and close the wallet.						
					5. With an embroidery needle supported in an upright position, can thread the needle manually.						
					6. Can sort objects (washers or bolts) according to size.						

 KEY: Independent (I)
 Verbal Cueing (V)
 Demonstration (S)

 Physical Assistance (P)
 Dependent (D)
 Refusal (R)

Appendix E

Scoring Key for Unilateral Skills
ADL Evaluation Form

DEFINITION OF TERMS AND SCORING KEY

The following definitions are provided for the terms used in the key on the Unilateral Skills Group sheet:

Independent – Given standard verbal directions and task materials, the patient can complete the task without further direction or assistance.

Verbal Cueing – Given standard directions and task materials, the patient requires additional verbal guidance to comprehend and complete the task.

Demonstration – Given the standard directions and task materials, the patient requires examiner to demonstrate the procedures needed to complete the task.

Physical Assistance – Given the standard directions and task materials, the patient requires the examiner to physically assist him or her with task related movements in order to complete the given task.

Dependent – Given the standard directions and task materials, the patient attempted but is unable to perform the task with either verbal or physical assistance or demonstration.

Refusal – Given the standard directions and task materials, the patient refuses to attempt a task.

For purposes of statistical analysis, the following numerical point value is given each of the above defined terms:

Independent – 5

Verbal Cueing – 4

Demonstration – 3

Physical Assistance – 2

Dependent – 1

Refusal – 0

Appendix F

Order of Presentation of Goldstein - Scheerer Cube Test

ORDER OF PRESENTATION
GOLDSTEIN-SCHEERER CUBE TEST

ORDER OF PRESENTATION
BLOCK DESIGN TRAINING PROGRAM

1. The original design.

2. An enlargement of the same design which is the same size as four blocks.

3. The same design in original size, divided by lines which break up the figure into four squares corresponding to the four block-sides required for copying.

4. An enlargement of the same design (as Step 2) again divided by lines.

5. A model of the same design built of four blocks. If patient can't copy it, the correct block model is presented again but each block separately and an inch apart.

6. (Multiple Choice): Three models each built of four blocks; two models are faulty and one is an exact reproduction of original.

1. A model of the block design built of four blocks is presented. The blocks are then placed at the corners outside of the four block design outline.

2. A copy of the same design which is divided by lines that break up the figure into four squares corresponding to the four block-sides required for copying.

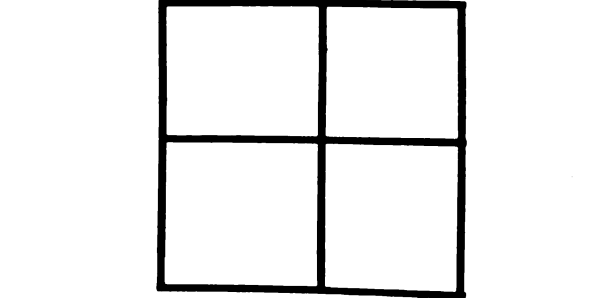
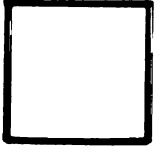
3. The same design but only $\frac{1}{4}$ actual model size divided by lines.

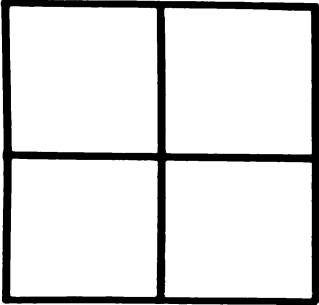
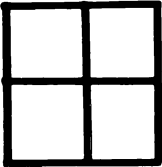
4. An enlargement of the same design which is the same as four blocks without separating lines.

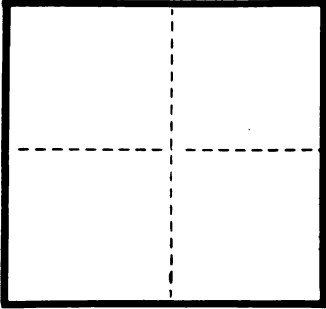
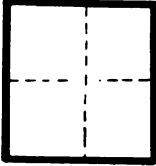
5. The original design ($\frac{1}{4}$ actual model size without lines).

Appendix G

Steps in Saturational Cueing Used in Study

Step	Description	Diagram	Instructions
1	Demonstration of initial design plus explanation of block design procedure	 	Watch what I do. I am going to turn each block round until it exactly matches its proper place on the card (E orientates blocks correctly $\frac{1}{2}$ in margin of the card). Now put each block into its proper place on the card so that they end up looking like the standard design. Remember, I have already turned the blocks round for you: you must not turn them round any more, just pick each block up and put it directly in place. If <u>E</u> persists in turning blocks after verbal inhibition, <u>E</u> grasps his hand and says: "Don't turn. Just pick and place," and guides him in executing each step.
2	Blocks correctly oriented in margin		Same as above.

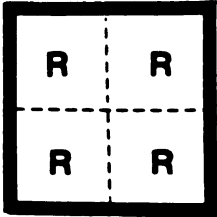
<u>Step</u>	<u>Description</u>	<u>Diagram</u>	<u>Instructions</u>
3	Full size outline, subdivision, orientation and color. Use directional sheet.		Build the design you see on the standard card. Build inside the outline, one block in each square. Some little squares have diagonal lines: this indicates that the block that goes in that place must be split – half with different colors. If there are no diagonal lines, the block must be solid or all one color. You must remember to look at the standard to see exactly how the colors go. This card may help you see exactly where each block has to go and how the colors must be place. Etc. as in l.
4	Standard size outline, subdivision, orientation and color. Directional sheet not used.		Build the design you see on the standard card. Repeat instructions in Step 3 if needed.

<u>Step</u>	<u>Description</u>	<u>Diagram</u>	<u>Instructions</u>
5	Full size without subdivision with orientation and color. Directional sheet not used.		Build the design you see on the standard card. Repeat instructions in Step 3 if needed.
6	Regular size without subdivision with orientation and color. Directional sheet not used.		Build the design you see on the standard card. Remember the final design must be a perfect square. Look at the design carefully and try to figure out when to place split-color blocks. remember to keep your place in the design: when you put down a block check with the standard to make sure it is exactly correct. Keep trying until you get it absolutely perfect. Don't go to another block until the one you are working on is exactly right.

Appendix H

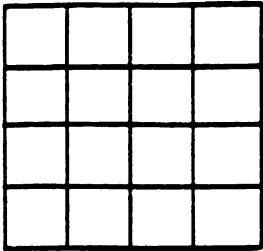
Standard Design Cards of
Goldstein - Scheerer Cube Test

DESIGN I



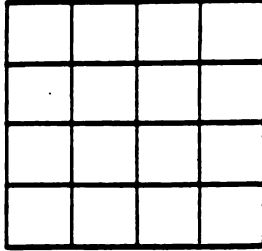
NOTES:

1 Original Unlined



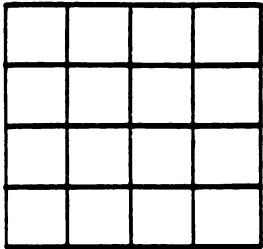
Query:

2 Large Unlined



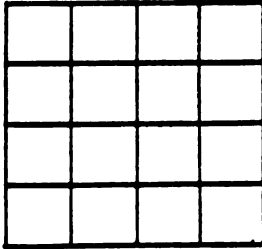
Query:

1a Original Unlined



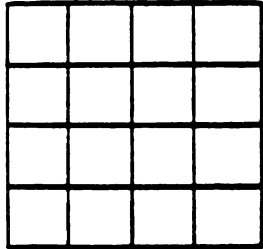
Query:

3 Original Lined



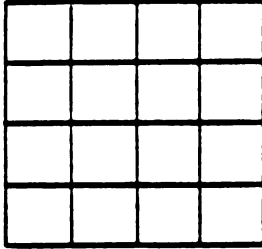
Query:

1b Original Unlined



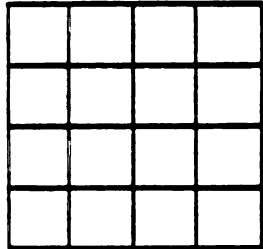
Query:

4 Large Lined



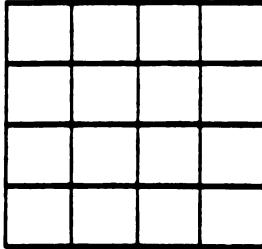
Query:

1c Original Unlined



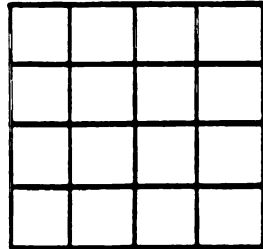
Query:

5 Copying Model



Query:

1d Original Unlined



Query:

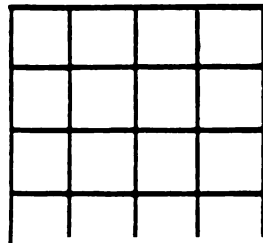
6 Multiple Choice

Correct
Choice _____

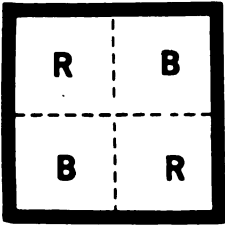
Incorrect
Choice _____

Query:

1e Original Unlined

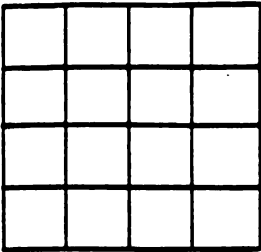


DESIGN II



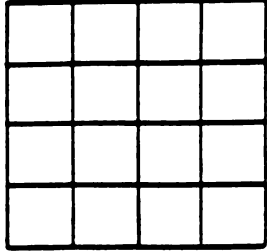
NOTES:

1 Original Unlined



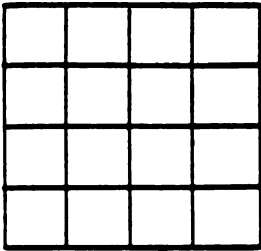
Query:

2 Large Unlined



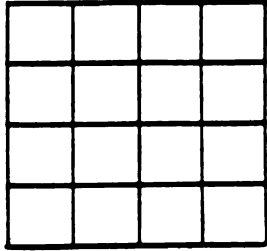
Query:

1a Original Unlined



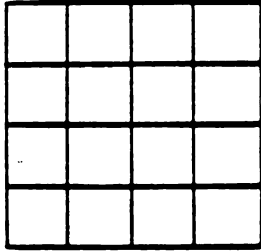
Query:

3 Original Lined



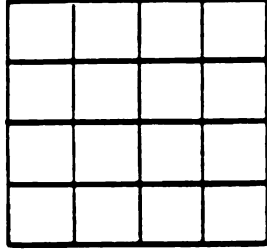
Query:

1b Original Unlined



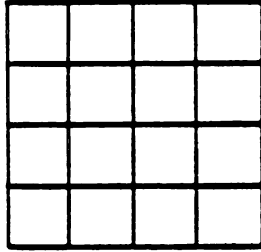
Query:

4 Large Lined



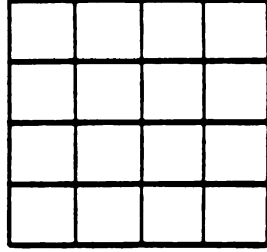
Query:

1c Original Unlined



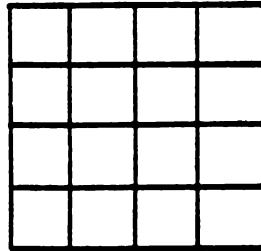
Query:

5 Copying Model



Query:

1d Original Unlined



Query:

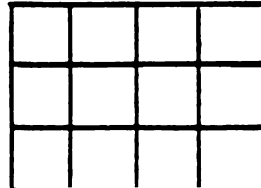
6 Multiple Choice

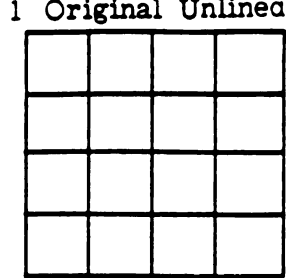
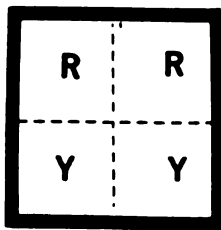
Correct
Choice _____

Incorrect
Choice _____

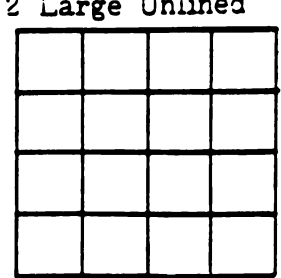
Query:

1e Original Unlined



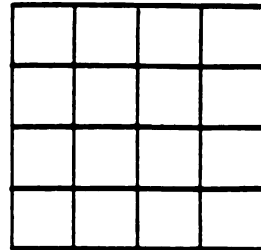


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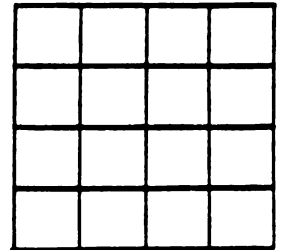
Query:

1a Original Unlined



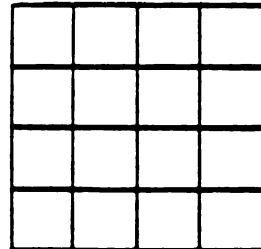
Query:

3 Original Lined



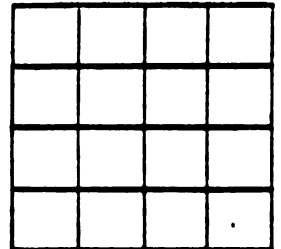
Query:

1b Original Unlined



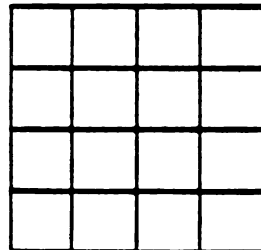
Query:

4 Large Lined



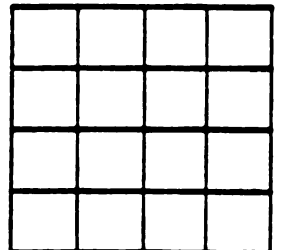
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1c Original Unlined



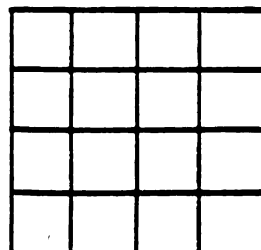
Query:

5 Copying Model



Query:

1d Original Unlined



Query:

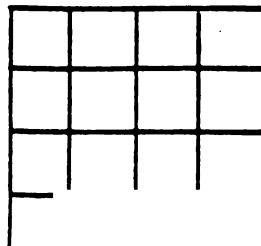
6 Multiple Choice

Correct
Choice _____

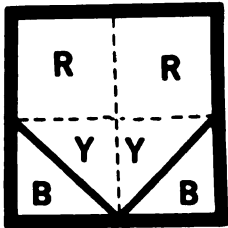
Incorrect
Choice _____

Query:

1e Original Unlined



DESIGN IV



1 Original Unlined

Query:

2 Large Unlined

Query:

1a Original Unlined

Query:

3 Original Lined

Query:

1b Original Unlined

Query:

4 Large Lined

Query:

1c Original Unlined

Query:

5 Copying Model

Query:

1d Original Unlined

Query:

6 Multiple Choice

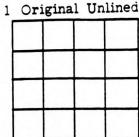
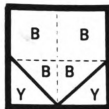
Correct
Choice _____

Incorrect
Choice _____

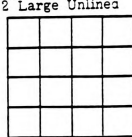
Query:

1e Original Unlined

NOTES:

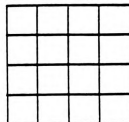


Query:



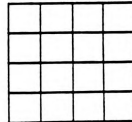
Query:

1a Original Unlined



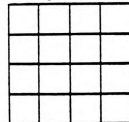
Query:

3 Original Lined



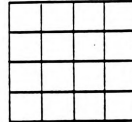
Query:

1b Original Unlined



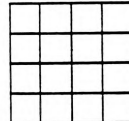
Query:

4 Large Lined



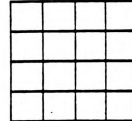
Query:

1c Original Unlined



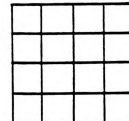
Query:

5 Copying Model



Query:

1d Original Unlined



Query:

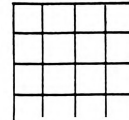
6 Multiple Choice

Correct
Choice _____

Incorrect
Choice _____

Query:

1e Original Unlined



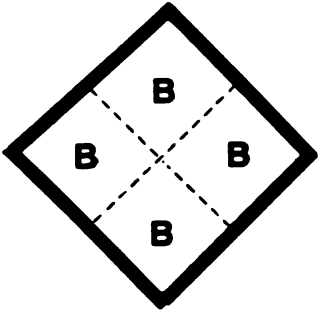
NOTES:

DES

NOT

DESIGN VI

VI



NOTES:

1 Original Unlined

Query:

2 Large Unlined

Query:

1a Original Unlined

Query:

3 Original Lined

Query:

1b Original Unlined

Query:

4 Large Lined

Query:

1c Original Unlined

Query:

5 Copying Model

Query:

1d Original Unlined

Query:

6 Multiple Choice

Correct
Choice _____

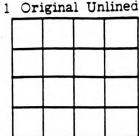
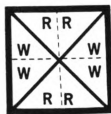
Incorrect
Choice _____

Query:

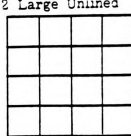
1e Original Unlined

DE

NC

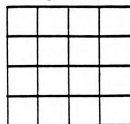


Query:



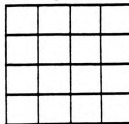
Query:

1a Original Unlined



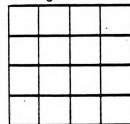
Query:

3 Original Lined



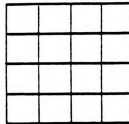
Query:

1b Original Unlined



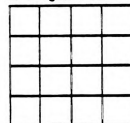
Query:

4 Large Lined



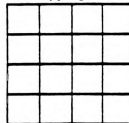
Query:

1c Original Unlined



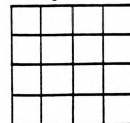
Query:

5 Copying Model



Query:

1d Original Unlined



Query:

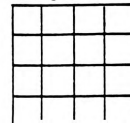
6 Multiple Choice

Correct
Choice _____

Incorrect
Choice _____

Query:

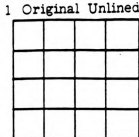
1e Original Unlined



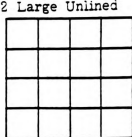
NOTES:



NOTES:

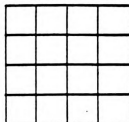


Query:



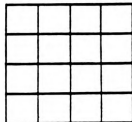
Query:

1a Original Unlined



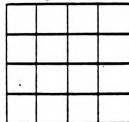
Query:

3 Original Lined



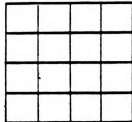
Query:

1b Original Unlined



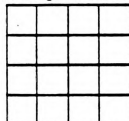
Query:

4 Large Lined



Query:

1c Original Unlined



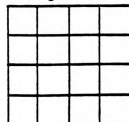
Query:

5 Copying Model



Query:

1d Original Unlined



Query:

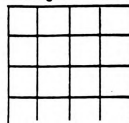
6 Multiple Choice

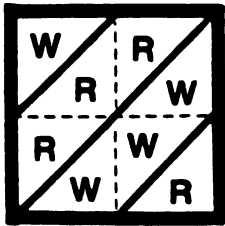
Correct
Choice _____

Incorrect
Choice _____

Query:

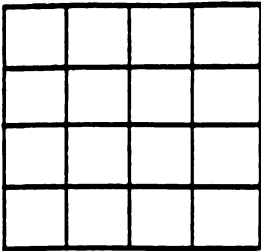
1e Original Unlined





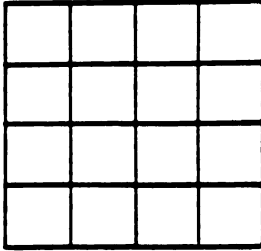
NOTES:

1 Original Unlined



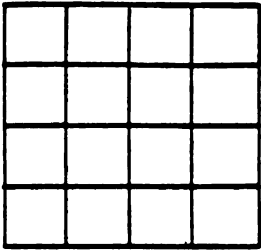
Query:

2 Large Unlined



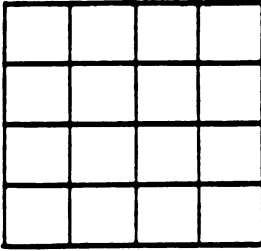
Query:

1a Original Unlined



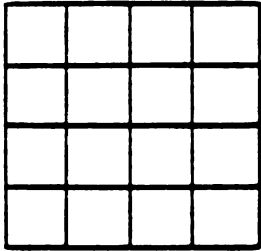
Query:

3 Original Lined



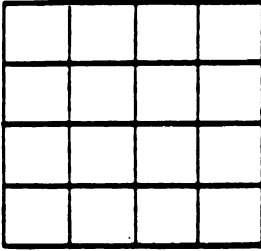
Query:

1b Original Unlined



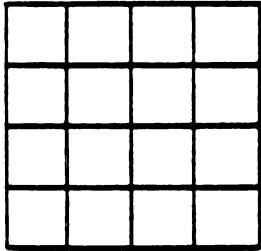
Query:

4 Large Lined



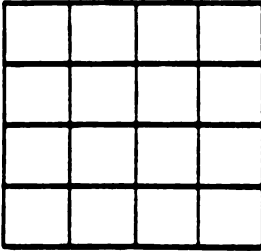
Query:

1c Original Unlined



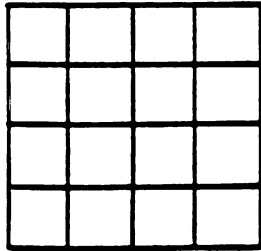
Query:

5 Copying Model



Query:

1d Original Unlined



Query:

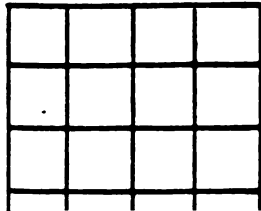
6 Multiple Choice

Correct
Choice _____

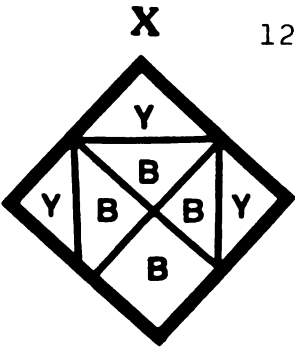
Incorrect
Choice _____

Query:

1e Original Unlined



DESIGN X



123

NOTES:

1 Original Unlined

Query:

2 Large Unlined

Query:

1a Original Unlined

Query:

3 Original Lined

Query:

1b Original Unlined

Query:

4 Large Lined

Query:

1c Original Unlined

Query:

5 Copying Model

Query:

1d Original Unlined

Query:

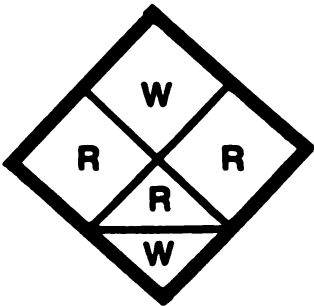
6 Multiple Choice

Correct
Choice _____

Incorrect
Choice _____

Query:

1e Original Unlined



NOTES:

1 Original Unlined

Query:

2 Large Unlined

Query:

1a Original Unlined

Query:

3 Original Lined

Query:

1b Original Unlined

Query:

4 Large Lined

Query:

1c Original Unlined

Query:

5 Copying Model

Query:

1d Original Unlined

Query:

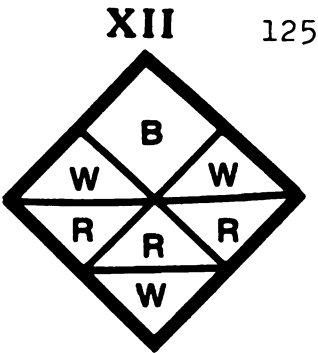
6 Multiple Choice

Correct Choice _____

Incorrect Choice _____

Query:

1e Original Unlined



NOTES:

1 Original Unlined

Query:

2 Large Unlined

Query:

1a Original Unlined

Query:

3 Original Lined

Query:

1b Original Unlined

Query:

4 Large Lined

Query:

1c Original Unlined

Query:

5 Copying Model

Query:

1d Original Unlined

Query:

6 Multiple Choice

Correct Choice _____

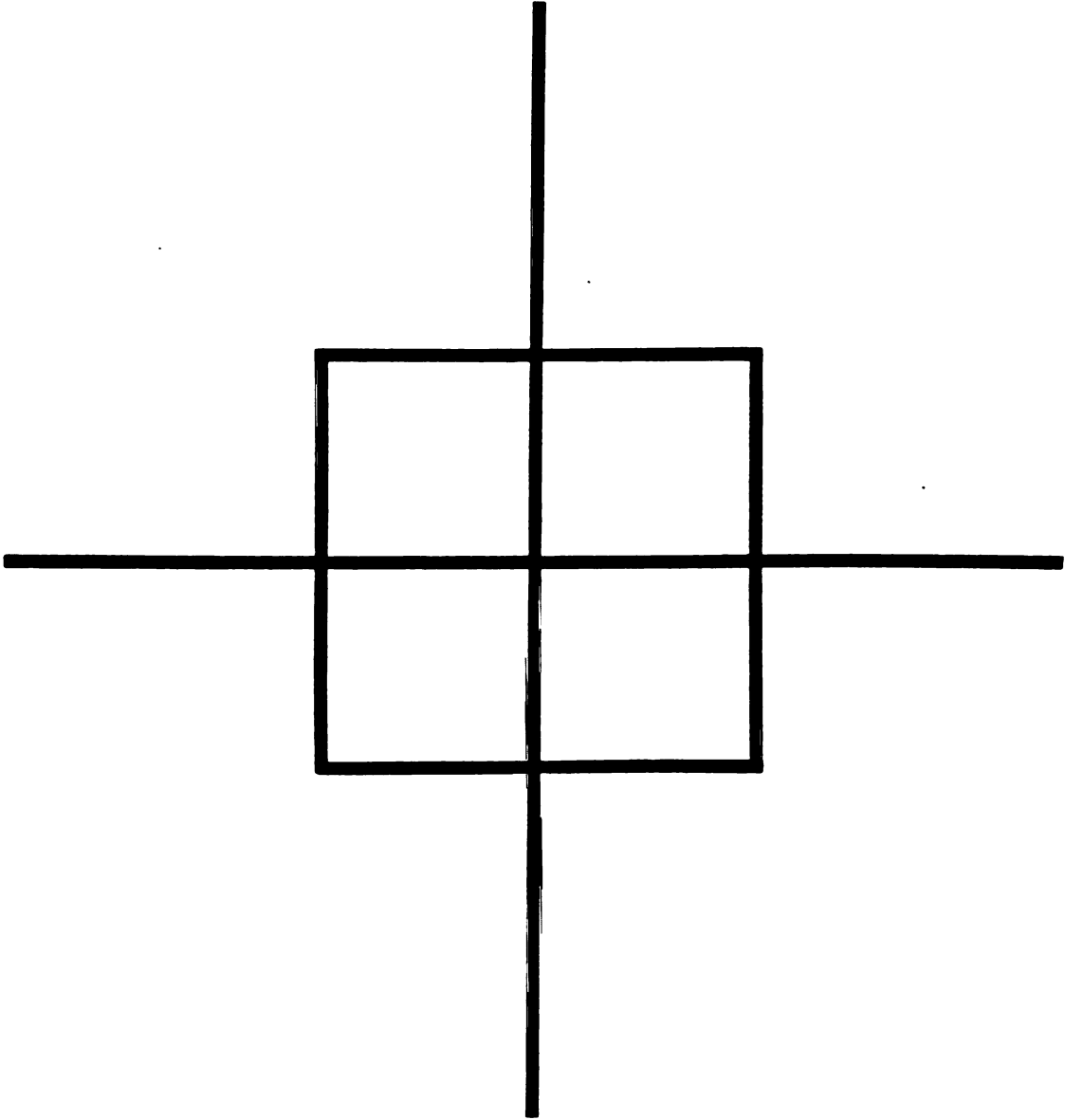
Incorrect Choice _____

Query:

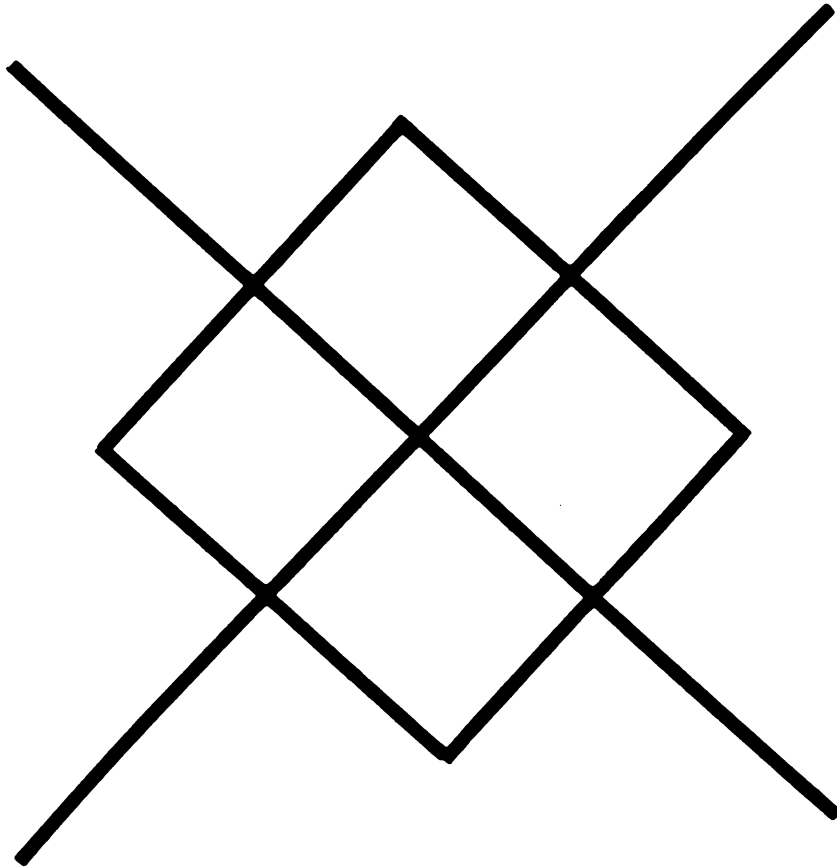
1e Original Unlined

Appendix I

Directional Sheet for Block Design



For designs I-V and VII-IX



For designs VI and X-XII

Appendix J

Directional Cueing for Block Placement

UPPER RIGHT



LOWER RIGHT



UPPER LEFT



LOWER LEFT



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