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THE EFFECTS OF INTERPERSONAL COMPETITION ON THE
PERFORMANCE OF SCHIZOPHRENICS

by

Brent L. Andersen

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1976

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Brent L. Andersen

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ABSTRACT

The Effects of Interpersonal Competition on the Performance of Schizophrenics

by

Brent L. Andersen, Doctor of Philosophy

Utah State University, 1976

Major Professor: Dr. William R. Dobson
Department: Psychology

The effects of interpersonal competition on schizophrenics were studied to determine if competition facilitates or impairs task performance of schizophrenics and to further determine if schizophrenics respond to interpersonal competition differently than nonschizophrenics. Forty-one hospitalized patients diagnosed as schizophrenics, 36 hospitalized patients diagnosed as personality disorders, and 36 employees of the Wyoming State Hospital were used as subjects. Each group of subjects was randomly divided into competitive and noncompetitive research groups, thus forming three competitive groups and three noncompetitive groups.

Each of the six groups of subjects was administered two equivalent forms of four standardized tests. Each group was tested under noncompetitive conditions. The subjects comprising

the competitive groups took the second form of each test under paired competition conditions, whereas the noncompetitive groups took the second form of each test under the same, noncompetitive conditions which were used during the administration of the first forms of each test. The results for each test were treated by analysis of covariance using a two (competition vs. noncompetition) by three (schizophrenics vs. personality disorders vs. normals) model. The tests used for the study were the Associative Memory Test from the Wechsler Memory Scale, the Number Completion Test from the Babcock-Levy Revised Examination, the Digit Substitution Test from the Babcock-Levy Revised Examination, and the Form Perception Test from the General Aptitude Test Battery.

Statistical treatment of the test scores indicated that competition does not significantly affect the performance of any of the three groups of subjects. The three competitive groups performed better on the Digit Substitution Test under competitive conditions, but the improvement failed to reach a desirable level of significance ($p < .10$). The three competitive groups obtained lower scores on the Associative Memory Test than did their controls, but this difference also failed to reach an acceptable level of significance. With ability held constant by means of

analysis of covariance, the two nonschizophrenic groups performed significantly better on the Digit Substitution and Associative Memory Tests. The improvement by the competitive groups on the Digit Substitution Test is consistent with previous competition studies which have shown competition to be effective primarily with visual-motor tasks requiring speed.

The results of the study are interpreted as supporting previous research using normal subjects which have shown the effects of competition to be highly task specific. The results further indicate that competition affects schizophrenics no differently than non-schizophrenics, nor is there any indication that competition impairs schizophrenic functioning. Previous studies showing impairment of schizophrenic performance under competitive conditions may reflect qualities of the task used in the study rather than reflecting an inability of schizophrenics to deal with competitive conditions. To generalize from these past studies that competition has a general debilitating effect on schizophrenics appears unwarranted when the results of this study and past studies using normals are taken into account.

The effects of competition on schizophrenics might better be understood by assessing long-term competitive conditions on schizophrenic adjustment rather than generalizing from short-term

competitive performance on tasks since competition has been shown to have task-specific and ungeneralizable effects. This study indicates that the task-specific nature of competition effects holds true for schizophrenics as well as for normals.

(77 pages)

CHAPTER I

INTRODUCTION

Statement and Delimitation of Problem

Much has been written about the effects of competition on human functioning, most of which is in terms of conjecture or theory. The dearth of competition research data is puzzling when one considers the competitive nature of our society. Educational and economic systems, and interpersonal relationship experiences encountered in our culture are laden with competition. Our economic system is based on the competitive free enterprise system and our schools stress competition in the classroom as well as on the athletic field. Even the search for a mate is often a highly competitive and stressful experience.

The incentive effect of competition on industrial and educational productivity has been thoroughly demonstrated since the first part of this century (Vaughan & Diserans, 1938). Nonetheless, there are many who feel that competition is a stressful condition which has a deleterious effect on human performance and psychological adjustment.

Psychiatric and psychological theories are especially strong in their inferences that competition and other stressful life experiences are a causative factor of schizophrenia (Arieti, 1959;

Arieti, 1955; Ax, 1970; Fish, 1962; Kohn, 1972; Mednick, 1968; Selye, 1956; Venables, 1968). Similarly, psychologists and psychiatrists have suggested that inability to handle everyday life stresses is a characteristic symptom of diagnosed schizophrenics (Epstein & Coleman, 1970; Fischer, 1954). Grimberg (1970), went so far as to develop a unique and apparently successful hospital program to help prepare schizophrenic patients for the "demands of competitive society."

Since schizophrenia generally has an onset during adolescence or early adulthood, stresses related to education, employment and interpersonal relationships have been listed as logical etiological factors in most theories of schizophrenia. Basic textbooks of psychiatry consistently point to the conflicts arising during adolescence and early adult years as being a causative factor in the development of schizophrenia. Eaton and Peterson (1969) write:

Faced with the stresses of late adolescence and early adult life, with relationships threatening, communication difficult and opportunities limited, the patient gives up. He stops trying to cope with his environment. He substitutes fantasy for reality. He withdraws. He regresses. (p. 217)

Freedman, Kaplan and Sadock (1972), writing in a psychiatric text, list what they believe to be the seven basic etiological theories of schizophrenia. Four of the theories are based on the tenet that life stresses are a factor, at least to some degree, in the development of schizophrenia.

Despite the popular and traditional concept that schizophrenia is related to or expressed as an inability to cope with stress, there is little research data to support this view. The ambiguity of the term stress may account for the lack of research in this area since researchers are reluctant to tackle problems which are not easily defined and measured. Nevertheless, it seems appropriate and imperative to investigate the effects of specific types of human interaction such as interpersonal competition in order to determine the possible debilitating or enhancing effects of these interactions on schizophrenic functioning.

The Lack of Research Pertaining to the Effects of Competition on Schizophrenics

One type of human interaction that has received little research attention is the effect of interpersonal competition on the performance of schizophrenics. Despite the seemingly obvious link between competition and the various etiological theories of schizophrenia, this author could find no more than five studies pursuant to the

effects of competition on schizophrenics. Unfortunately, these studies are very diverse and use different experimental designs. The results of these few studies are contradictory and do not give an adequate determination of the effects of competition on schizophrenics since they focus on competitive performance on one type of task and do not utilize nonschizophrenic controls.

Significance of the Problem

When working in a mental hospital one rapidly becomes aware of the disagreements concerning appropriate treatments and activities for schizophrenics. For example, should schizophrenics be required to participate in competitive recreational programs? Should competition be used in hospital school programs in an attempt to facilitate performance if the competition might compound the psychotic behavior? Should schizophrenics be placed in competitive work situations or be trained for jobs that might be highly competitive? At present there appear to be few, if any, substantive answers to these questions, unless one bases treatment decisions on theories and the very limited research available.

The popular tenet of schizophrenic decompensation under stress is not strongly supported by research. In fact, there are studies which show no relationship between schizophrenia and incidence of stressful life factors (Eisler & Polak, 1971).

There are research studies linking schizophrenic decompensation to the emotional stress the patient encounters with relatives (Birley & Brown, 1970; Brown & Birley, 1968; and Brown & Birley, 1972). However, there is research which shows that schizophrenics perform at higher levels when forced to work under aversive conditions from which they can escape by improving their performance (Buss & Lang, 1965; Pascal & Swenson, 1952). The studies of schizophrenics functioning under aversive conditions cast some doubt on the generally accepted theory that schizophrenics will be adversely affected by all conditions that might be regarded as stressful. However, the studies of schizophrenic performance under aversive conditions and the studies by Birley and Brown offer information about the performance of schizophrenics under specific conditions which can help mental health workers formulate therapeutic treatment programs for schizophrenics. While there is information regarding the effects of stressful family relationships and the effects of physically aversive conditions on schizophrenics, there is currently little data concerning the effects of interpersonal competition on the functioning of schizophrenics.

Objectives

This research will attempt to determine the effects of interpersonal competition on schizophrenics performing tasks which they often show impairment on and which are often required for effective everyday functioning. Buss and Lang (1965) suggest that schizophrenia can be understood as a disorder, of unknown etiology, affecting various psychological functions such as attention span and associative thinking. There also is general agreement by most psychologists and psychiatrists that schizophrenic functioning is characterized by symptoms of associative thought disturbance, distorted perception, impaired abstract thinking, and often visual-motor dysfunction (Meehl, 1962). Thus despite theoretical differences, the specific behavioral expression of schizophrenia is generally well accepted. The bizarre behaviors displayed by schizophrenics can therefore be ascribed to psychological "deficit" and do not have to be accounted for in terms of symbolic behavior or personality conflicts.

Based on the theoretically accepted pattern of schizophrenic symptomatology this research will explore the competitive performance of schizophrenics on specific tasks which they

often display impairment in order to determine whether interpersonal competition worsens schizophrenic functioning (symptoms) or enhances functioning.

In summary, the objective of this study is to determine the effects of interpersonal competition on the functioning of schizophrenics. More specifically, this research will attempt to provide some answers regarding the effects of competition on arithmetic ability, visual perception, visual-motor speed and associative memory of schizophrenics. This research will use nonschizophrenic controls in order to determine if competition affects schizophrenics differently than nonschizophrenics.

Hypotheses

The following hypotheses have been developed for this research in order to determine if interpersonal competition facilitates or hinders the performance of schizophrenics and to determine if schizophrenics respond differently to competition than do normals and nonschizophrenic hospital patients:

1. Interpersonal competition does not affect the Digit Substitution Test performance of schizophrenics, nor do schizophrenics perform differently than nonschizophrenics on the Digit Substitution Test during competition.

2. Interpersonal competition does not affect the Form Perception Test performance of schizophrenics, nor do schizophrenics perform differently than nonschizophrenics on the Form Perception Test during competition.

3. Interpersonal competition does not affect the Number Completion Test performance of schizophrenics, nor do schizophrenics perform differently than nonschizophrenics on the Number Completion Test during competition.

4. Interpersonal competition does not affect the Associative Memory Test performance of schizophrenics, nor do schizophrenics perform differently than nonschizophrenics on the Associative Memory Test during competition.

CHAPTER II

REVIEW OF LITERATURE

Competition in Educational Settings

Whittemore (1924) used 12 college students to study the effects of competition vs. noncompetition on printing paragraphs with rubber types. His results indicated that all subjects completed more work under competitive conditions although the quality of work was lowered. In this particular study competition between small groups was more effective than one-to-one competition in increasing speed of performance.

Hurlock (1925) researched the effects of group competition on the arithmetic performance of 155 fourth and sixth grade children. The students were divided into control and competitive groups which were matched for arithmetic ability. The experiment was run daily for a week during which time the competitive group consistently performed better than the noncompetitive control group. Hurlock noted that students of inferior ability profited more from the competitive conditions than those of average or superior ability.

Sims (1928) researched the effects of group and personal rivalry on the learning of college students. Based on initial test scores, 136 college students were divided into either: (1) a control group; (2) a group which competed with members of another group; or (3) a group in which subjects worked against a personal rival. Sims found that both group and personal rivalry conditions produced better test scores than were obtained by students working in the control group. His results indicated that personal rivalry produced better results than group rivalry.

Kubula and Christensen (1968) studied the effects of group competition on performance of students in technical school. Four groups, formed on the basis of equal size and aptitude, competed against each other during successive two week periods. The exam scores obtained during the two week period indicate that group competition is an effective method for facilitating the performance of lower aptitude technical students. The use of competition had no significant effect on the performance of high aptitude students.

Clark (1969) reports a study designed to determine the effect of competition on the performance of graduate students in education. The task used was writing research papers. The results of this study suggest that competitive conditions yield higher quality papers.

Clifford (1972) used students from 66 fifth grade classrooms to study the effects of competition on performance, interest, and retention of vocabulary words. The classrooms were randomly divided into one of the following groups: (1) control; (2) competition with reward; or (3) competition in a game setting. The treatment groups were found to display more interest, but neither performance nor retention was increased. Both types of competitive treatments were found to produce similar results on all three tested variables.

Monnig (1974) compared the effects of a personal competition and token reinforcement on time on task in a remedial reading class. All subjects responded to either one or both conditions. Competition appeared to be as powerful an incentive as tokens, but also seemed to generalize into the regular classroom setting by improving performance on other school tasks.

Hurlock (1925b) studied the effects of rivalry on the Courtis Arithmetic Test. She used 155 children matched for ability and ranging in age from nine to 12 years. The competitive groups performed at a higher level than controls. Girls and younger children as well as children of lower ability showed the most improvement under competitive conditions.

Clifford, Cleary, and Walster (1972) studied the effects of competition on the School and College Ability Test (SCAT). Subtests of the SCAT were given to fifth and sixth grade students under competition with reward and competition with game conditions. Neither of the competitive conditions was found to increase SCAT performance above normal classroom testing procedures. The authors suggest that competition facilitates speed oriented tests rather than power tests.

In another study of the effects of competition on ability test performance, Maller and Zubin (1932) found no difference in the scores of elementary school students taking an IQ test under competitive conditions when compared to noncompetitive controls. The authors found that competitive conditions elicited more responses but the number of errors was increased to the point where there was no gain in score. These authors also noted an increase in scores on speeded portions of the tests during competitive conditions, while the power test (analogies) scores were decreased.

Other Variables Associated with the Effects of Competition

This section will deal with various factors which have been found to influence the effects of competition on human performance.

Type of task. Allport (1920) found that subjects perform better on the more mechanical and motor level tasks under competitive conditions than on tasks of a more mental nature such as association tasks. For example, his subjects were found to perform better under competitive conditions when the task was simply writing words from a model rather than writing every third or fourth word. Maller and Zubin (1932) reported that repetition of an IQ test under very strong rivalry conditions caused no greater gains in scores than repetition under normal conditions. They noted, however, that scores on speeded tests tended to increase whereas there was a decrease in scores on a power (analogies) test. While competition generally appears to enhance motor performance, Pettre and Galloway (1966) found that performance on a highly skilled motor task (racing slot cars with remote control) was decreased under competitive conditions. Reichenbach's (1972) research indicates work of an endurance type (pedalling a bicycle ergometer) is not affected by intergroup competition.

Yamamoto (1935) conducted an investigation of the amount and nature of competition involved in five different tasks. He used preschool and elementary school subjects engaged in activities

such as picking up beans, shooting, guessing the number of balls in a cup, mirror drawing and solving puzzles. Yamamoto concluded that the presence and nature of competitive behavior was more influenced by task type than by characteristics of the subjects.

Sermat (1970) conducted four experiments to investigate the consistency of cooperative or competitive behavior during two different experimental situations. Subjects who had behaved either extremely competitively or extremely cooperatively in a Game of Chicken or a Prisoner's Dilemma game were observed in either a mixed-motive task where payoff was obtained in a manner which another player could block (The Paddle Game), or a picture interpretation task utilizing story writing and discussion in dyads. Subjects previously judged as highly competitive waited less often for their turn, were usually paid first, and occasionally earned more money in the Paddle Game. In the picture interpretation task few behavioral differences were noted between competitors and cooperators although competitors portrayed more cynicism about interpersonal relationships than did the cooperators. The authors concluded that competitors may share different views concerning interpersonal relationships than cooperators. However, they feel that the findings suggest one cannot generalize from competitive game behavior to other interpersonal situations.

Sex influences. Peretti (1971) randomly selected 50 male and 50 female freshman college students to perform a color-word interference task with both sex and competitive levels as variables. The author found that female subjects performed better under both competitive and noncompetitive conditions. Both sexes performed at higher levels under the competitive conditions although the female subjects showed the greatest improvement under these conditions. Wyer and Malinowsky (1972) studied four variables thought to influence a person's behavior in a competitive situation. The researchers found that females were more competitive toward low achievers whereas males were more competitive toward high achievers. High achievement subjects were found to be more competitive toward members of their own sex while low achievement subjects were more competitive toward members of the opposite sex.

Owens (1969) studied the effects of age, race, sex, and socioeconomic status on the competitive performance of 180 children. The children were assigned to 16 groups according to race, sex, age, and socioeconomic status. The task used was dropping marbles into a box for 15 second time periods. The following results were obtained: (1) competition increased the speed of marble dropping; (2) competition increased as a

function of age in children from two to eight years of age; (3) girls competed more than boys; (4) middle class children competed more than low class children; (5) no racial differences in competition were found; (6) competition was greater when the competitor was competing at a fast rate of speed rather than a low rate of speed; (7) the increment in performance elicited by a competitive machine and a competitive person was similar.

Age. Greenburg (1932) used children, ages two to seven, in a research study designed to measure the presence of competition in a child's performance and to determine which factors cause competitiveness to vary. Pairs of children were asked to build with blocks. Upon completion of their building they were asked, "Which is prettier?" and then were requested to again use the blocks to see who could build the "prettier" this time. The results of the study indicated: (1) competition is not found in children of all ages nor in all children of any one age; (2) several factors account for a child's competitive behavior, not just the child's personality makeup (e.g. cognitive and visual-motor skills appeared as important factors in this research); (3) the development of competitive behavior seems to follow a well defined and orderly course based on the understanding and desire to excel; (4) when using building blocks, no competition is seen in children age two,

whereas 90 percent of the six year old children display well developed competitive behavior.

Whittemore (1924) and Triplett (1897) have shown that competitive behavior is not universal in adults.

Hirota (1951) used a building block task with 343 children from ages two to seven to determine at what age competitive and cooperative behavior begins. He found that the idea of competition was not understood until age four, whereas only six and seven year olds grasped cooperative group work.

Cultural influences. McClintock and Nuttin (1969) used children of different grade levels (second, fourth, and sixth) from the United States and Belgium in a study of competitive and cooperative behavior. Their study utilized a maximizing difference game in which the students have an option of competing or cooperating. The researchers found that: (1) the competitive choice is the dominant response; (2) older children use competitive responses more than the younger children of both cultures; (3) young American children give more competitive responses than young Belgian children, although by the sixth grade level the number of competitive responses is equal.

Mann (1963) conducted a cross-cultural comparison of Indians and whites living in South Africa. To investigate competition whites and Indians were paired and given a written

test. Prior to taking the test the subjects were informed that they were competing against their partner and were asked to indicate whether they expected to do better or worse than their rival. The researcher interpreted the results of the study as indicating Indians are not as competitive as whites. Mann hypothesized that due to the Indians' lower class status they were reluctant to compete against the more affluent white competitors.

Sherman (1970) compared samples of British and American university students to investigate possible cultural differences in the preference to use competition in social risk taking situations. Compared with American students, British students showed a greater preference for competitive choices in social risk taking situations. However, the results of the study may be contaminated by the fact that British students tend to come from a higher social class and form a smaller percentage of their total age group than do American university students.

Madsen (1967) studied the competitive behavior of rural and urban, poor and middle class Mexican children. His study indicates urban middle class children are the most competitive, whereas rural children tend to avoid competition.

Possibility of success. Studies concerning the relationship between level of aspiration and competition (Feuerstein, 1960; Church, Millward, & Miller, 1963; and Cope & Sigall, 1967) have consistently shown that winning increases level of aspiration and losing decreases level of aspiration. While these studies incorporated competitive tasks, they did not investigate the effect of level of aspiration on competitive performance.

Vaughn (1936) studied the effects of three different conditions of competition on rifle marksmanship. Under one condition a premium was placed on high initial ability, i.e., the highest score would win. Under another condition low initial ability was stressed thus the lowest score would win. The other condition involved the use of handicaps to equate the subjects' ability. The conclusion drawn from the results of these experiments is that a person's opinion concerning his possibility of success is an important factor influencing his subsequent performance.

Clifford (1971) researched the effects of six classroom motivational techniques on 112 fifth and sixth grade students performing a digit substitution task. The author measured the performance of subjects: (1) competing against their own pretest score; (2) competing against others of the same ability (similar pretest scores); or (3) competing against subjects of widely divergent ability. The results showed the highest increase

on test scores from subjects competing against others of similar ability. The author concluded that other things being equal, the possibility of success in competition influences performance in a competitive situation.

Personality factors. Vaught and Newman (1966) investigated the effects of anxiety on motor-steadiness under competitive and noncompetitive conditions. Twenty high anxiety and 20 low anxiety subjects were selected from a group of male introductory psychology students who had been administered the Manifest Anxiety Scale. The subjects were tested on a simple motor-steadiness task under competitive and non-competitive conditions. Low anxiety subjects under competitive conditions made the fewest errors. High anxiety competing subjects produced the most errors. Noncompetitive conditions produced no significant difference in the performances of high anxiety and low anxiety subjects.

Slevin (1970) analyzed the effects of trait and state-anxiety upon the performance of a novel gross motor task under conditions involving competition and the presence of an audience. Eighty male high school students were divided into high-trait anxiety and low-trait anxiety groups based on scores from the STAI, A Trait Anxiety Scale. Each subject was required to execute

a modified fencing lunge and recovery in a 30 second time period.

The following conclusions were listed: (1) high-trait anxious subjects perform more poorly than low-trait anxious subjects on novel gross motor tasks; and (2) competition generally produces better performance than no competition.

Marlow, Gergen, and Doob (1966) have shown that when a person is bargaining with an unfamiliar person who is playing a cooperative game, there is a greater tendency to exploit this person. When personal information about the other becomes available, the style of interaction may vary between cooperation and competitive exploitation.

Deutsch (1960), in a study of authoritarian personalities, found that authoritarians are less trusting of others and make more competitive choices on the Prisoner's Dilemma game. Marlow (1963) showed that passive dependent subjects tend to respond to cooperative behavior by using cooperative behavior.

Effects of Competition on the Performance of Schizophrenics

The earliest research found concerning the effects of competition on the performance of schizophrenics was by Feuerstein (1960). He divided 108 male paranoid schizophrenic patients into three treatment groups (intergroup competition, intragroup competition, and no competition).

All subjects were administered two equivalent forms of four brief and simple tests (Letter-Cancellation, Word-Finding, Arithmetic, and Hole-Punching). The first test administration was under noncompetitive conditions and the second administration of the equivalent test form was given under one of the three test conditions. The results of the research showed that intragroup competition subjects made more errors when taking the tests under competitive conditions. To a lesser extent, the performance of subjects in the intergroup competition sample was poorer than their noncompetitive performance. There was no difference between the pretest and posttest scores of subjects who took the tests entirely under noncompetitive conditions. Interestingly, the intragroup competition subjects judged the second administration of their tests as "hardest" whereas the other two groups of subjects showed no significant agreement as to which of the two test administrations was the most difficult.

Myers (1963) studied the effects of team competition on the social behavior of schizophrenic patients. Forty-eight chronic schizophrenics were divided into three groups based on their level of incapacitation and participated in six weeks of golf competition. The results of the study indicated that competition facilitated adjustment of the more adjusted patients while it had an unfavorable effect on the more poorly adjusted patients. Grimberg (1970)

hypothesized that schizophrenics deteriorated under the highly competitive demands of modern society. Therefore, he developed a "surrogate society" training program for hospitalized schizophrenics. He viewed this program as a competitive society in microcosm to help prepare schizophrenic patients for competitive situations outside the hospital. No statistical data was provided, but Grimberg reported the results as appearing successful.

Craig (1971) tested the performance of schizophrenics on a word naming task under alone and paired competition and alone and paired noncompetitive conditions. Craig controlled for serial effects by alternating the presentation of experimental conditions from paired to alone and alone to paired sequences of testing. The results of the study indicate that performance during the competition conditions was superior to performance in non-competition conditions. Paired-to-alone testing order reduced the scores for most subjects irregardless of competitive conditions. The author summarized by stating that schizophrenics respond to competitive conditions as well as do normal subjects.

One theory of schizophrenic thought disturbance holds that schizophrenics are characterized by overresponsiveness to inappropriate stimuli. Craig (1973) researched the effects of paired competition on overinclusive thinking of schizophrenics. Four matched groups of 20 subjects were tested on three measures

of overinclusive thinking. Two of the groups consisted of chronic schizophrenics and two groups were psychiatric aides. One week later, after performing a word naming task under either competitive or noncompetitive conditions, the subjects were retested on the overinclusive thinking tests. Following competition schizophrenics became more overinclusive, but were no more bizarre nor concrete in their thinking. The position that schizophrenics lose conceptual and abstracting skills under stress was not supported.

The limited research available on schizophrenic functioning under competitive conditions has produced diverse findings. There is evidence that competition impairs schizophrenics' performance on speeded, basically visual-motor tests. There is no evidence that competition adversely affects schizophrenic thinking processes whereas research on the effects of punishment suggests that conditions usually considered aversive might even facilitate schizophrenic performance. There are indications that the effects of competition may not have a consistent effect on schizophrenics due to degree of pathology, and the possibility exists that competition may have a different effect on some types of schizophrenics.

Research of the Effects of other
Variables on the Performance of
Schizophrenics

Effects of reinforcement on schizophrenic functioning. Lindsley and Skinner (1954), Rodnick and Garmegy (1957), and Isaacs, Thomas and Goldiamond (1960) have used operant procedures to enhance the performance of schizophrenics. However, Lindsley (1960) found that some schizophrenics would cease operant responding before extinction procedures were instituted. Peters (1953) applied operant procedures to motor learning in schizophrenics and concluded that reward increases operant rate, but does little to eliminate errors. Burday (1962) used monetary reward in an effort to improve the performance of schizophrenics and brain damaged patients on a conceptual sorting task. The use of the money incentive failed to enhance the performance of either group. Topping and O'Connor (1960) were able to improve the performance of normals on a serial anticipation task when using monetary reward. However, they found that nonparanoid schizophrenics failed to improve and the performance of paranoid schizophrenics worsened under the same conditions. Reviewing the many studies involving the use of operant procedures with schizophrenics suggests that positive reward has an inconsistent effect on schizophrenic performance.

Effects of physical punishment on schizophrenic functioning.

Pascal and Swenson (1952) were able to improve the performance of schizophrenics by utilizing high intensity noise fed through earphones which could be turned off by correctly responding to a complex discrimination task. In this study both normals and schizophrenic subjects showed the greatest improvement and actually reached a performance level equal to that of normals. Cohen (1956) administered shock to half of a group of schizophrenics who, like the unshocked group, had to motorically respond to a visual pattern. He found that the performance of the unshocked group deteriorated over trials whereas the shocked group maintained their original functioning level. Cavanaugh (1958) was able to increase the performance of schizophrenics to the level of non-psychotic patients by using high intensity noise that was shut off following a correct response to a conceptual task.

Buss and Lang (1965) have noted that physical punishment has proved to be the most effective method of enhancing schizophrenic performance. They also note that the word WRONG, following incorrect responses, is more effective than the word RIGHT following correct responses for improving the performance of schizophrenics. Buss and Lang feel that punishment is effective since it assists the schizophrenic by breaking up perseverative tendencies, whereas reward maintains a previously correct

response which is incorrect on subsequent trials. They also note that punishment may serve to focus attention or increase arousal rather than simply serve as a reinforcer.

Summary of Competition Studies and Related Studies

Competition has been shown to be a condition that can improve performance, but there are many qualifications pertaining to its effects. Age, sex, personality factors, culture, ability, and type of task have been found to influence the effects of competition. Some studies that show facilitative effects of competition note that not all subjects improved their performance; some subjects were adversely affected, and some subjects failed to show any effects.

Two factors appear strongly related to the effectiveness of competition: (1) type of task, and (2) visibility of the competitor. Competition has been shown to enhance speed of performance rather than quality of performance. Therefore the type of task used when researching the effects of competition is a highly important factor. Competition appears to have little effect on tasks involving high levels of abstract thinking, complex motor coordination, memory, and endurance. Most competition studies show that the visibility, or presence of the competitor is an

important condition. Therefore, interpersonal competition usually results in greater competitive effects than intergroup competition.

Operant conditioning studies of schizophrenics have yielded inconsistent results. Some studies using reward have shown initial improvement in schizophrenic performance, but the operant responding would often fall back to baseline levels before extinction procedures were instituted. Still other operant studies failed to show any improvement with schizophrenic subjects, while some studies have reported an increase in the operant rate of schizophrenics although the number of errors was not affected.

Whereas reward has been shown to have an inconsistent effect on schizophrenics, studies which have used punishment in an operant paradigm have shown consistent improvement in schizophrenic performance. However, it appears unlikely that punishment will ever gain acceptance as a treatment method for schizophrenics unless it can be shown that its use does not have long-term negative consequences. In addition, there is no evidence that the effects of punishment have a generalizing effect outside of the research room.

Operant conditioning studies of schizophrenics have attempted to find contingencies that can be used to extinguish schizophrenic symptoms without primary regard to theoretical issues of schizophrenic etiology or dynamics. Conversely, competition studies of

schizophrenics usually are motivated by the hypothetical construct that various types of stress contribute to schizophrenia. Therefore, this type of research is oriented toward determining if competition causes, or is contributory to schizophrenic symptomatology.

CHAPTER III

METHODOLOGY

Subjects

The subjects used in this research were 41 hospitalized schizophrenics, 36 hospitalized patients with personality disorder diagnoses, and 36 employees at the Wyoming State Hospital in Evanston, Wyoming. Subjects with defective intelligence, organicity, or sensory impairment were not used. Subjects older than age 65, subjects with severe health impairment, and subjects displaying extremely bizarre, psychotic behavior were also excluded.

The subjects from each diagnostic category were randomly assigned into experimental and control groups thereby forming three experimental groups (schizophrenic, personality disorder, & normals) and three control groups (schizophrenic, personality disorder, & normals). Normal and personality disorder comparison groups were used in this study since few of the earlier studies used nonschizophrenic controls and therefore could not determine if their results were unique to schizophrenics.

Instruments Used

Since competition has been found to be highly task specific with normals, it was decided that simply measuring the competitive performance of schizophrenics on one type of task would not provide an adequate determination as to whether competition impairs overall functioning of schizophrenics. Therefore, four easily administered, timed tests which are available in alternate forms were used in this study. The tests selected measure a variety of intellectual functions whereas previous research regarding the effects of competition on schizophrenics has focused primarily on either visual-motor speed or very simple verbal tasks.

Each test used is relatively short and all four tests can be administered in 30 or 40 minutes so that fatigue can be minimized. Tests which have equivalent forms were chosen in order to reduce practice effect which is a problem in pretest-posttest designs.

The eight tests used (Form A & Form B for each of the four tests) were printed in special form by the Wyoming State Hospital printing shop so that the instructions and choice of answers (where needed) were available on the same sheet of paper. This was necessary since some of the tests, e.g., the Form Perception portion of the General Aptitude Test Battery, required special scoring sheets that are difficult to use, and some tests were part

of larger test protocols measuring other abilities not being studied in this research. Test instructions and choices of answers were enlarged for easier reading. The tests used in the study are:

1. Associative Memory Test from the Wechsler Memory Scale.
2. Number Completion Test from the Babcock-Levy Revised Examination. (Basic arithmetic problems requiring addition, subtraction, multiplication & division)
3. Digit Substitution Test from the Babcock-Levy Revised Examination.
4. Form Perception Test from the General Aptitude Test Battery.

The above tests were selected on the basis of one additional factor. They measure types of intellectual processes which are often impaired in schizophrenics. Therefore, any effects of competition might be interpreted as improving or worsening basic schizophrenic symptomatology.

Design and Statistical Procedures

A Pretest-Posttest Control Group design was used for this study. As mentioned previously, the subjects of each diagnostic group (schizophrenics, personality disorders, normals) were randomly divided into experimental (competitive) and control (noncompetitive) groups. All groups took Form A of the four tests under small group, noncompetitive conditions. On the second administration of the test forms (Form B) the experimental groups took the tests under paired, competitive conditions whereas the control groups took the alternate forms of each test under the same noncompetitive conditions that existed for the initial testing.

The posttest scores for all subjects were treated by analysis of covariance using the pretest as a covariate, so that initial differences between subjects could be controlled for. Four separate analysis of covariance statistical procedures were run to test for differences on the four measures used in this study.

General Procedure

The subjects were brought to one of two testing rooms in groups of approximately 10-20 subjects each during a two week period. All subjects were tested within their own research group, therefore there were no members of one research group being tested with members of another research group.

For the administration of the Form A tests, the patients were assembled in the testing room and informally greeted by one of the participating psychologists while pencils and consent forms were passed out. After the subjects were seated in individual desks and had received the consent forms and pencils the following statement was read to them:

"The Hospital is currently doing research which you will be part of. About 120 patients and employees have been randomly selected from all parts of the Hospital to take several short tests. We should be finished with all of the tests in about one and one-half hours.

I should point out that all test results will be strictly confidential and will have no bearing on your hospital treatment program.

Since your test results are for research please do your own work and do not copy wrong answers from your neighbor.

Will you please read the required consent form and sign it and then we can begin."

After the consent forms had been signed and returned the subjects were given the four tests in the following order:

(1) Digit Substitution, (2) Form Perception, (3) Number Completion, and (4) Associative Memory.

Each test was preceded by brief instructions and some trial examples. Testing did not commence until all subjects indicated an understanding of the test requirements.

Following the completion of Form A of the four tests the subjects were separated into the predetermined control and experimental groups. The experimental subjects were taken into another room and the control subjects were administered the alternate forms (Form B) of the tests under the same conditions as were used for the initial testing.

The instructions preceding all tests for both experimental and control groups were always prefaced by asking the subjects to place their name on the test form so that the correct pretest and posttest scores could be recorded. The test forms were marked as either Form A or Form B with Form A of each test used as the pretest for all groups and Form B used as the posttest for all groups.

Procedures for Competitive Subjects

Prior to testing on the alternate forms of the tests (Form B) the experimental subjects were arranged in pairs by placing two desks facing each other. The following message was read to the pairs of subjects:

"You will note that you are now arranged in pairs and are facing a partner. We now will score each test as it is completed. You and your partner will know each other's score in order to determine who does the best on each test. The best partner's test will be marked with a W for winner and the other partner's test will be given an L for loser. If there are any questions I will be glad to answer them after this phase of the testing."

The alternate forms of the tests were then given in the same sequence used for the pretests. Following the administration of each test four or five assistants scored the test forms and announced to each pair of subjects which subject had the highest score, while marking the test papers according to the earlier instructions.

All tests (Form A & Form B) were given during one sitting with a 15 minute break between pretesting and posttesting. All groups finished the testing within a two hour period. Following the testing the groups were informally thanked and asked to come forward if they had any questions.

		<u>B</u>	
		Control	Competition
<u>A</u>	Normals	*	*
	Personality Disorders	*	*
	Schizophrenics	*	*

Figure 1. Statistical design (analysis of covariance)

*Adjusted posttest means

CHAPTER IV

RESULTS

Hypothesis 1

The effects of competition on Digit Substitution performance.

The analysis of covariance for the Digit Substitution scores is presented in Table 1. As can be noted, competition did not affect the Digit Substitution performance of the experimental groups to an acceptably significant level. However, all competitive groups performed better than the controls at a significance level of $p < .10$. The higher adjusted mean scores obtained by the competitive groups as shown in Figure 2 suggest that competition was having some effect on this task despite the failure to obtain a more acceptable level of significance from the statistical treatment.

There was a significant difference between the mean Digit Substitution performance of the three diagnostic groups when treated by analysis of covariance. As seen in Figure 2, the normals performed better than the schizophrenics and personality disorders on the posttest under competitive and noncompetitive conditions. Since initial differences on the Digit Substitution Test were controlled for by analysis of covariance it is apparent, as can be seen from Figure 6, that the normals performed better on the posttest than did the schizophrenics and personality disorders.

As seen in Figures 2 and 6, the competition group of normals accounted for this gain on the posttest which resulted in significant difference among group performance. Hypothesis 1 cannot be rejected since interpersonal competition did not affect the Digit Substitution performance of schizophrenics at an acceptably significant level, nor did the schizophrenics perform differently than nonschizophrenics under competitive conditions.

Table 1
 Analysis of Covariance of Digit
 Substitution Test Scores

Source of Variation	Degrees of Freedom	Mean Squares	F
Between Groups (A)	2	98.67	4.26*
Between Methods (B)	1	58.70	2.54
Interaction (AxB)	2	7.32	.32
Within Groups	107	23.15	

*Significant beyond the .05 level

		<u>B</u>		
		Control	Competition	
<u>A</u>	Normals	37.43	39.85	38.64
	Personality Disorders	35.41	36.04	35.73
	Schizophrenics	34.43	35.73	35.08
		35.76	37.21	

Figure 2. Adjusted posttest means for Digit Substitution Test

Hypothesis 2

The effects of competition on Form Perception performance.

Table 2 presents the analysis of covariance for the Form Perception Test performance. There was no significant difference between the Form Perception scores of the groups taking the test under competitive conditions and the control groups when their scores are analyzed by analysis of covariance. The Form Perception scores of normals and personality disorders were higher under noncompetitive conditions, whereas schizophrenics performed better under competitive conditions (Figure 3). The hypothesis stating that interpersonal competition does not affect Form Perception Test performance of schizophrenics, and that schizophrenics do not perform differently than nonschizophrenics under competitive conditions cannot be rejected.

Table 2
 Analysis of Covariance of Form
 Perception Test Scores

Source of Variation	Degrees of Freedom	Mean Squares	F
Between Groups (A)	2	6.59	.39
Between Methods (B)	1	30.10	1.77
Interaction (AxB)	2	32.25	1.89
Within Groups	107	17.04	

No F value significant at the .05 level

		<u>B</u>		
		Control	Competition	
<u>A</u>	Normals	32.24	30.80	31.52
	Personality Disorders	32.56	29.90	31.23
	Schizophrenics	30.14	31.15	30.64
		31.65	30.62	

Figure 3. Adjusted posttest means for Form Perception Test

Hypothesis 3

The effects of competition on Number Completion performance.

The analysis of covariance for Number Completion performance is presented in Table 3. As presented in the table, there were no significant test differences due to competition, or significant interaction effects on the Number Completion Test, therefore Hypothesis 3 cannot be rejected.

Table 3

Analysis of Covariance of Number Completion Test Scores

Source of Variation	Degrees of Freedom	Mean Squares	F
Between Groups (A)	2	9.42	.98
Between Methods (B)	1	1.72	.18
Interaction (AxB)	2	.63	.07
Within Groups	107	9.60	

No F value significant at the .05 level

		<u>B</u>		
		Control	Competition	
<u>A</u>	Normals	26.56	27.00	26.78
	Personality Disorder	25.78	25.73	25.75
	Schizo-phrenics	25.55	25.91	25.73
		25.96	26.21	

Figure 4. Adjusted posttest means for Number Completion Test

Hypothesis 4

The effects of competition on Associative Memory performance.

The effects of competition on Associative Memory performance are presented in Table 4. Competition failed to significantly change the Associative Memory performance of the experimental groups, although all competitive groups had slightly lower adjusted mean scores than the control groups (see Figure 5). As noted in Table 4, there was a significant difference between the adjusted group means on the Associative Memory Test. Figure 5 shows that with initial ability equated by means of analysis of covariance, normals performed better than personality disorders who similarly performed better than schizophrenics. It is possible that there was a factor of negative transfer operating on the Associative Memory posttest since all groups performed at lower levels on the posttest than they did on the pretest. As seen in Figure 6, the schizophrenics and personality disorders showed the greatest impairment on the posttest which is to be expected because of associative thought disturbances. Since there were no significant effects due to competition, nor any interaction between competition and groups, Hypothesis 4 cannot be rejected.

Table 4
 Analysis of Covariance of Associative
 Memory Test Scores

Source of Variation	Degrees of Freedom	Mean Squares	F
Between Groups (A)	2	105.35	3.95*
Between Methods (B)	1	29.39	1.10
Interaction (AxB)	2	2.27	.09
Within Groups	107	26.66	

*Significant beyond the .05 level

		<u>B</u>		
		Control	Competition	
<u>A</u>	Normals	22.55	21.79	22.16
	Personality Disorders	21.00	19.42	20.20
	Schizophrenics	18.87	19.15	18.51
		20.81	19.79	

Figure 5. Adjusted posttest means for Associative Memory Test

		Digit Substitution		Form Perception		Number Competition		Associative Memory	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Schizophrenics	Competition	30.6	31.5	24.1	26.3	24.0	24.2	19.6	16.5
	Control	31.2	30.7	28.3	29.0	19.8	19.6	18.8	16.6
Personality Disorders	Competition	36.8	36.7	30.1	30.9	24.4	24.7	21.3	19.6
	Control	35.0	34.6	23.9	27.6	23.2	23.3	22.2	21.2
Normals	Competition	40.2	43.1	35.3	35.8	30.7	32.0	26.1	24.5
	Control	44.8	44.3	37.3	39.1	33.5	34.3	25.5	25.1

Figure 6. Unadjusted pretest and posttest means

CHAPTER V

DISCUSSION

The Relationship of Present

Findings to Other Studies

Previous studies of competition using normal subjects have generally failed to find any significant effects of competition on memory and abstract tasks, but there is little research investigating the effects of competition on schizophrenic subjects performing these types of tasks. Related studies have shown that aversive conditions such as shock and intense white noise can be used to enhance the performance of schizophrenics. Since the few previous studies of competition involving schizophrenics and the related punishment studies have yielded highly divergent results, the present study was undertaken.

The results of this study support the findings of numerous other studies using normal subjects which have shown the effects of competition to be highly task specific and generally effective only with tasks emphasizing speed rather than abstract problem solving or memory. The present study failed to provide any evidence that competition may act similarly to aversive conditions to enhance abstract performance of schizophrenics.

Craig (1971) interpreted the results of his study, in which schizophrenics competed in a simple word naming task, as possibly indicating that schizophrenics respond to the "motivational arousal" quality of competition in the same manner that aversive conditions elicit. The results of this study suggest that Craig's findings may reflect the nature of the task he used rather than indicating that competition can be used to increase the motivation and general performance level of schizophrenics. Results from the present study suggest that schizophrenics respond to competition in the same manner as do nonschizophrenics, and therefore any changes obtained during competitive conditions are probably related to the task used.

The present study does not support the earlier findings of Feuerstein (1960) who investigated the effects of interpersonal and group competition on the performance of schizophrenics. Feuerstein found that male paranoid schizophrenics performed more poorly on a group of relatively simple visual-motor tasks under competitive conditions. Previous research investigating the effects of competition on similar tasks performed by normals had shown improved scores, thus Feuerstein hypothesized that competition has a deleterious effect on schizophrenic performance and suggested a review of hospital programs requiring competition

that might be deleterious. Feuerstein did not use nonschizophrenic controls, therefore it is possible that nonschizophrenics would have also shown a decrement in competitive performance under his conditions.

Myers' (1963) interpreted his research findings as indicating competition facilitates adjustment among better adjusted schizophrenic patients while hindering the adjustment of more poorly adjusted patients. The Feuerstein and Craig studies also present evidence that competition may have a differential effect on schizophrenics on the basis of diagnostic subtype or adjustment. The population of schizophrenic patients at the Wyoming State Hospital was too small to allow for the use of different types of schizophrenics. However, an examination of each schizophrenic's test scores failed to reveal any consistent patterning of test results. Generally, the schizophrenic subjects exhibited no greater differences between their pretest and posttest scores than did the other two groups of subjects under competitive or noncompetitive conditions. Some schizophrenic patients obtained widely discrepant scores on the posttest of one particular test, but would usually show little change on the other tests. In addition, there was no consistent pattern to the direction of highly different posttest scores except on the Associative Memory Test on which many schizophrenic subjects from both groups showed a large score decrease. For example,

one female paranoid schizophrenic subject obtained an Associative Memory score during competition which was 18 points below her pretest score. However, this same patient obtained a Form Perception score during competition which was 22 points above her pretest score. The results of this study, based on observation of the research proceedings and examination of test results, indicates that schizophrenic test scatter is largely a factor of severely disorganized personality functioning independent of diagnostic subtype. Schizophrenic subjects often would be observed doing poorly because of oppositional behavior or because they would simply lose attention. Some chronic or severely disorganized schizophrenic patients performed consistently and some did not. In summary, there was no discernable indication that competition has a deleterious or enhancing effect on some types of schizophrenics.

The present study suggests that schizophrenics respond to competition in the same manner as do nonschizophrenics. There is no evidence that competition adversely affects the performance of schizophrenics on visual-motor, memory, arithmetic or perceptual tasks. Similarly, since the competitive test performance of schizophrenics does not differ from their

noncompetitive test performance, there is no evidence that short-term competition increases pathological symptoms such as associative impairment, lack of abstractness, etc.

Discussion of Pertinent Results

One of the most noticeable features of this research is the failure of competitive conditions to significantly affect the performance of any of the diagnostic groups. This is particularly perplexing since most previous research shows that competition facilitates performance on simple tasks, especially those of a visual-motor variety where speed is emphasized. Seemingly, the use of competition should have facilitated performance on the Digit Substitution Test with at least the normal group according to previous research studies. The adjusted Digit Substitution means of the competitive groups were higher than the control groups adjusted means, but the increase was not of a statistically significant level. It is possible that the Digit Substitution Test requires enough of a visual memory factor to partially nullify any increased speed resulting from competitive conditions. Previous research has shown that memory tasks are

not enhanced by competitive conditions, and the results of this research show that competing subjects from all the diagnostic groups tended to do more poorly on the associative memory task used in this research.

The lack of significant test differences between the competitive and control groups may also reflect pretesting conditions. The pretesting was done in group settings which may have motivated many of the subjects to perform near the limit of their ability and not leave room for the effects of further motivating factors such as competition. Craig (1971) has shown that paired subjects obtain higher test scores than subjects taking a test alone. Thus, it is possible that the presence of other subjects in the test room caused higher scores on the pretest. Merely taking the "test" is often a highly motivating factor, and the presence of hospital staff members and hopes that doing well on the tests may provide some benefit to the subjects may have motivated the subjects to perform at an unusually high level on the pretests. However, other studies have used the same research design and have obtained increased performance under competitive posttest conditions. The most probable reason that competition failed to significantly affect test performance in this study is due to the particular tests used. Notably, the test which predictably would show the most effects from competition

(Digit Substitution) did show a trend to improvement under competition. Conversely, the types of tests which had failed to be affected by competitive conditions in past studies also failed to be affected by competitive conditions during this study.

The results from the present study cast some doubt on the numerous theories and limited research which suggest that schizophrenic subjects perform poorly under competitive conditions. The data from this research indicates that schizophrenics respond to competitive conditions in the same manner as do nonschizophrenic subjects. In addition, competition does not appear to have the enhancing quality that aversive conditions have been shown to have on schizophrenic performance.

Previous studies showing enhanced or impaired performance by schizophrenics during competition failed to demonstrate that the specific competitive effects are generalizable to different tasks or the adjustment of the schizophrenics. The generalizations from competition research with schizophrenics which suggest either curtailing or increasing the use of competition clearly ignore previous findings in competition research. Not only is competition highly task specific, but there are studies which show that subjects judged high in competitive behavior are not competitive in all situations. Some studies imply that

competition is detrimental to the psychological adjustment of schizophrenics based on research showing that their performance on one type of task decreased during competition. Yet normals often perform poorly under certain competitive conditions, but this factor is not used as evidence that competition should be avoided for the sake of personality adjustment. Related research showing high anxiety normals doing poorly under competitive conditions should receive further examination since the tasks used may be the determining factor, and the high anxiety subjects might likely perform at higher levels than low anxiety subjects on a different task.

Recommendations for Future Studies

The research presently available pertaining to the effects of competition on schizophrenic functioning is equivocal at best. There is little evidence that competition has a deleterious effect on the adjustment or performance of schizophrenics as a group, and the present research study suggests that the performance of schizophrenics is not different than normals' under competitive conditions. However, there is little research involving the long-term effects of competition on schizophrenic performance and adjustment. One study (Myers, 1963) investigated the effects of competition on schizophrenics involved in a six week golf program.

The results of this study suggested that competition facilitated the adjustment of some schizophrenics while having an unfavorable effect on other schizophrenics. Still, Myers' research does not show that the schizophrenic subjects responded any differently to competition than would nonschizophrenics, or that the factor of competition was responsible for decreased performance in some schizophrenics since he did not use noncompetitive games as a control. There is a strong need for well designed, long-term studies of competitive effects on schizophrenic performance and personality adjustment in which nonschizophrenic controls and similar noncompetitive activities are used.

Future studies of competition should be designed so that covert causes of competition can be eliminated from pretesting. It appears possible that some pretesting conditions are highly motivating due to the presence of peers, significant others, and the test taking environment. There is already some research indicating that subjects perform better in group testing situations than when taking the same tests individually. Thus, in the case of competition, the independent variable may be present in the pretesting and control testing situations.

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APPENDICES

APPENDIX A

TEST SCORES FOR SCHIZOPHRENICS

COMPETITION GROUP

Digit Substitution		Form Perception		Number Completion		Associative Memory	
Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
35	33	18	29	20	24	23	17
34	22	19	21	31	33	23	19
28	31	21	18	25	23	20	15
26	26	14	15	28	31	14	14
34	26	29	35	25	30	21	8
15	18	20	20	11	10	26	21
19	24	15	19	18	19	15	9
31	36	33	37	24	25	28	29
45	46	37	35	37	35	25	27
27	31	20	25	19	18	23	13
23	33	24	19	24	23	9	8
32	33	7	29	20	16	29	11
30	33	24	22	31	33	17	16
47	43	34	29	31	35	24	27
32	28	40	37	27	24	20	20
26	28	22	22	29	21	23	24
4	20	15	18	10	8	7	6
40	44	32	32	34	36	0	14
37	32	23	31	8	9	22	10
48	43	29	30	30	34	26	26
29	31	28	26	27	24	21	17
31	33	26	29	19	21	16	12

TEST SCORES FOR SCHIZOPHRENICS

CONTROL GROUP

Digit Substitution		Form Perception		Number Completion		Associative Memory	
Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
29	31	31	28	6	8	0	3
35	33	35	37	22	21	25	25
32	26	37	31	17	14	6	8
37	24	14	12	11	6	27	24
23	23	11	17	15	9	24	15
15	11	9	11	8	10	4	6
8	1	9	4	9	7	25	18
28	32	20	19	20	20	6	2
30	32	37	37	34	33	23	26
34	37	31	30	28	29	22	25
38	29	32	36	20	18	27	18
41	37	34	34	27	24	23	24
45	43	45	46	22	28	28	29
25	26	32	31	15	20	21	8
28	33	30	32	29	28	20	23
40	48	31	33	23	28	18	20
44	44	36	46	24	29	24	21
31	36	37	37	23	23	18	6
29	37	27	30	17	13	17	15

TEST SCORES FOR PERSONALITY DISORDERS

COMPETITION GROUP

Digit Substitution		Form Perception		Number Completion		Associative Memory	
Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
40	39	31	33	34	33	24	24
48	48	40	43	37	39	27	26
44	37	45	41	24	27	25	16
39	44	18	21	12	16	20	23
31	34	21	16	17	16	16	12
33	36	18	22	19	19	22	27
38	45	38	41	30	28	21	15
48	48	45	39	34	33	28	19
26	28	19	24	24	19	22	19
41	36	35	39	17	14	29	11
38	40	41	46	21	22	18	28
29	28	25	27	4	9	12	9
42	34	34	35	28	27	26	28
42	42	37	33	32	36	23	20
34	41	36	31	33	34	16	24
41	31	25	26	30	29	27	18
33	29	27	29	25	23	16	21
16	21	12	10	19	20	12	12

TEST SCORES FOR PERSONALITY DISORDERS

CONTROL GROUP

Digit Substitution		Form Perception		Number Completion		Associative Memory	
Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
31	28	23	25	28	22	26	27
37	40	29	28	27	24	26	26
29	39	14	23	16	14	21	22
48	43	33	38	37	38	28	28
28	31	22	19	23	21	10	6
39	44	20	25	30	29	29	30
31	35	30	32	16	18	22	25
48	46	37	43	30	32	26	27
44	40	23	28	35	34	28	24
33	29	28	23	18	16	21	21
36	28	26	28	23	32	23	24
19	20	8	7	13	11	7	3
30	38	27	27	11	12	28	26
27	28	22	27	16	14	17	6
37	40	29	33	28	27	24	24
41	32	14	24	21	21	19	14
24	19	14	24	20	22	17	22
48	43	32	42	26	32	27	26

TEST SCORES FOR NORMALS

COMPETITION GROUP

Digit Substitution		Form Perception		Number Completion		Associative Memory	
Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
43	48	45	45	33	34	25	28
40	45	36	34	40	40	28	27
28	26	25	30	24	24	27	22
42	40	24	27	32	33	27	24
46	48	35	36	26	19	28	19
41	46	40	39	25	32	28	26
38	44	44	46	21	26	26	26
44	48	42	43	36	40	30	30
48	48	39	45	29	32	25	24
39	42	32	35	33	36	22	24
45	47	43	43	37	38	23	26
38	48	32	29	27	23	23	20
25	31	26	28	32	31	24	16
38	37	34	33	33	35	23	25
42	48	40	37	31	37	27	27
38	41	28	27	30	30	27	28
38	45	35	32	33	33	30	24

TEST SCORES FOR NORMALS

CONTROL GROUP

Digit Substitution		Form Perception		Number Completion		Associative Memory	
Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
40	43	36	42	31	31	19	18
43	38	38	34	31	34	23	27
48	48	43	46	41	41	27	25
40	45	37	36	35	36	25	22
42	42	31	34	27	28	25	22
48	48	37	42	31	32	23	27
48	48	39	44	36	38	39	29
48	40	40	43	29	30	28	25
45	44	49	49	41	43	30	29
39	41	38	40	37	35	19	21
48	48	46	48	41	41	28	30
37	48	42	40	27	29	27	29
47	48	46	46	35	36	29	29
48	43	27	27	37	39	27	26
48	41	35	31	30	31	30	14
45	45	32	41	32	31	23	22
48	44	32	33	31	36	25	28
48	47	32	34	37	36	25	25
46	41	29	32	27	25	21	29

APPENDIX B

CONSENT FORM

I voluntarily consent to be a participant in a Wyoming State Hospital research project. I understand that my test scores will be held in strict confidence and will not be a matter of hospital record nor have any influence on my regular hospital program.

Participant

Witness

Date

APPENDIX C

ASSOCIATIVE MEMORY INSTRUCTIONS

Read twice:

I am going to read to you a list of words, two at a time. Listen carefully because after I am through I shall expect you to remember the words that go together. For example, look at the words written at the top of your answer sheets. They are East - West and Gold - Silver. If, after I had read these words, I said the word East you would write ---- West, and if I said Gold you would write ---- Silver. Now listen again (read again). Are there any questions?

Now listen carefully to the pairs of words as I read them.

FORM PERCEPTION INSTRUCTIONS

Look at the hammer in the box on the left numbered 1. Now look at the other four hammers. Notice that only figure B is exactly like figure 1 at the left. Therefore we circle the B. Has everyone circled B for problem 1?

Here are two more practice exercises. In each one find the figure (A, B, C, or D) which is exactly like the figure on the left. When you have found the correct figure circle the letter of the figure.

What figure is exactly like number 2? D is right. Did everybody circle D for the problem 2?

What figure is exactly like number 3? C is right. Make sure you have circled C on your answer sheet.

Are there any questions? on the following pages are more exercises exactly like the ones we've just done. When I say begin, start with number one and do as many as you can until I tell you to stop. You will be allowed five minutes.

DIGIT SUBSTITUTION INSTRUCTIONS

Look at the top row of designs. Note how the star, circle, square, cross and triangle all have numbers inside them.

Now look at the designs drawn below. Note that there are no numbers drawn inside the designs. We have to fill in the correct number for each design. For example, the first design is a circle and by looking at the circle at the top of the page we see that the number 2 goes in the circle.

Everybody place a 2 in the circle. The next design is a star and we can see that a 1 goes inside the star. Everybody place a 1 in the star. Are there any questions? When I say begin, fill in the correct numbers starting with the square. Do not skip any designs and don't stop until I tell you to.

You will have one minute to work. Begin.

NUMBER COMPLETION INSTRUCTIONS

Look at exercise 1.

In exercise 1 the correct answer is 5. Circle the number 5 next to the problem.

1. SUBTRACT (-)

$$\begin{array}{r} 9 \\ \underline{4} \end{array}$$

Answers

- 2
- 3
- 5
- 9
- none of these

Look at exercise 2.

In exercise 2 the correct answer is 6. Six does not appear in the answer column so you will circle none of these.

2. ADD (+)

$$\begin{array}{r} 2 \\ 4 \end{array}$$

- 2
- 3
- 4
- 5
- none of these

Now do practice exercises 3 and 4. Be sure to circle the correct answer located next to the problem.

3. MULTIPLY (\times)

$$\begin{array}{r} 4 \\ 2 \end{array}$$

- 6
- 7
- 8
- 9
- none of these

4. DIVIDE (\div)

$$3 \overline{)6}$$

- 2
- 4
- 9
- 12
- none of these

On the following pages are more exercises like these. For each exercise circle the correct answer. You may do your figuring on the work sheets. Work as fast as you can without making mistakes.

You will be allowed 6 minutes.

VITA

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