EFFECTS OF COGNITIVE-BEHAVIORAL SELF-CONTROL TRAINING ON IMPULSIVITY, EFFICIENCY, AND SELF-CONTROL OF LEARNING-DISABLED CHILDREN

By

DEAN LOUIS KERASOTES

Bachelor of Science
University of Illinois
Urbana, Illinois
1972

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1978

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
DOCTOR OF PHILOSOPHY
July, 1980

EFFECTS OF COGNITIVE-BEHAVIORAL SELF-CONTROL TRAINING ON IMPULSIVITY, EFFICIENCY, AND SELF-CONTROL OF LEARNING-DISABLED CHILDREN

Thesis Approved:

Thesis Adviser

Dean of the Graduate College

ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to the members of his doctoral committee. Special appreciation is extended to Dr. John D. Hampton, the author's major adviser, whose valuable influence reaches far beyond the preparation of this study. Appreciation is also extended to Dr. Barbara Peel whose insights and understanding of learning-disabled children sparked the author's interest in the area, and to Dr. David Perrin, Dr. Russ Dobson, and Dr. Larry Brown for their assistance and suggestions.

A special note of thanks is extended to the children and teachers whose cooperation made this study possible. Also, the author expresses his appreciation to Janet Wesctott, Mary Lynn Michelich, Patty Samuels, Kim Oliver, and Anita Weeks who served as therapists in the present study. The author wishes to thank Dr. Stephen Grissom, for his valuable comments, assistance with the analysis, and most importantly, his friendship.

Above all, very special thanks and gratitude go to my parents, Mr. and Mrs. Louis G. Kerasotes, for their love, support, and encouragement.

TABLE OF CONTENTS

LIST OF TABLES

FIGURE

CHAPTER I

THE RESEARCH PROBLEM

Introduction

In recent years, there has been a rapid growth of interest concerning learning disabilities. Professionals in medicine, the behavioral sciences, and education have focused considerable attention on gaining a better understanding of learning disabilities and developing effective intervention programs. Public awareness about learning disabilities has been heightened through the efforts of associations of concerned parents and professionals. Court decisions and federal legislation aimed at ensuring free and appropriate education in the least restrictive environment for learning disabled (LD) children, have placed the responsibility for identifying and implementing special educational programs with local and state educational systems. Despite this upsurge in professional, public, and legal concern, controversy and debate have surrounded central issues related to learning disabilities. Among the most engaging issues are characteristics of LD children, etiologies of learning disabilities, inconsistencies in terms of definitions, and procedures for assessing and intervening with LD children (Epstein, Cullinan, Lessen, and Lloyd, 1979). Reviews of research on these issues have seriously questioned the empirical validity of many current theories, practices, and conclusions regarding LD children (Torgesen, 1975; Coles, 1978).

Learning disabilities have been defined as a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written language, a problem which may be manifested in listening, thinking, talking, reading, writing, spelling, or arithmetic (Federal Register, 1976). Also included in the federal guidelines defining learning disabilities is that the child must exhibit a significant discrepancy between academic achievement and intellectual potential. Excluded from this classification are children with sensory deficits, mental retardation, emotional problems, or whose academic deficiencies result from environmental deprivation. Although this definition is one of many for learning disabilities, it is fairly representative in that it assumes a deficit in one of more psychological processes underlying learning. Following this definition, much of the research on learning disabilities has attempted to identify the specific deficits responsible for the inability to learn in the classroom. Indeed, the literature supports the notion that learning disabled children perform poorly on measures of perceptual, memory, attentional, and language processes (Torgesen, 1975). Myers and Hammill (1976) have traced the evolution of current methods used to identify and treat learning disabled children. Their treatment of this subject illustrates the traditional approach to learning disabilities found in many current educational programs.

In their analysis, Myers and Hammill (1976) enumerate three phases in the history of learning disabilities. A foundation phase (1800-1940) in which conceptualizations were based on clinical observation of adults with known organic brain damage. The culmination of this phase was delineation of the "Strauss Syndrome" for children

manifesting perceptual problems, distractibility, disinhibition, and perseveration. The similarity between these children and adults with brain damage fostered the notion that their brains were structurally damaged. Next, during the transitional phase (1940-1964), the brain-damaged concept was articulated by psychologists and educators. Tests were designed to measure psychological deficits and pioneers in the field developed educational programs. Programs based on language development, psycholinguistic information-processing, perceptual-motor processes, and brain function were instituted. Although they emphasized different causes, all assumed that an ability or psychological process deficit, based on dysfunction at a neurological level, accounted for the syndrome. Finally, the integration phase began in 1963 with emergence of the term "learning disabilities". This phase is marked by empirical scrutiny of the validity of the theoretical models and practices associated with the field. Various authors have asserted that the notion of neurological deficits is unsubstantiated (Coles, 1978), that the definition of learning disabilities ignores important motivational aspects of learning (Sabatino, 1979) and task related classroom behavior (Bryan, 1979). Furthermore, the diagnostic-prescriptive teaching techniques based on differential diagnosis of students' ability strengths and weaknesses have been severely criticized for lacking empirical support (Arter and Jenkins, 1979).

Emerging from the last phase, various authors have suggested alternatives to the traditional approach. Sabatino (1979) advances the position that diagnostic practices

> . . . should include descriptors of the learner characteristics which seem to define learning disabilities on the

> basis of past and present academic (classroom and academic performance), social (degree of self reliance), cognitive style (learning style and preference factors), and prevocational and vocational interests and aptitudes (p. 222).

The major implication of this approach would be moving assessment from a testing room to the actual environment where social and academic learning takes place. He concludes that learning disabilities should not be described as a deficit in underlying psychological processes which are poorly defined and measured by current instruments. Rather it should be approached as

> . . . variance in academic learning which results in: (a) achievement motivational inadequacy; (b) increased prevalence of off-task responses lowering student-teacher interaction ratios; (c) lowered self expectancy and self-fulfilling prophesies for failure; and (d) the all important differences in academic and social learning styles (p. 230).

Torgesen (1977) has suggested another alternative to the traditional approach to learning disabilities. He argues that performance deficits associated with learning disabilities may be related to more general factors rather than specific underlying psychological processes. His conceptualization focuses on inefficient performance rather than an ability deficit, suggesting that "poor performance in many different task settings may be due to the child's failure to actively engage the task through the efficient use of strategies and other techniques of intelligence" (p. 230). His position is consistent with theory and research from modern cognitive psychology in which mental activity of the learner plays a major role in learning and memory (Flavell, 1970; Reynolds and Flagg, 1977). It is also consistent with current theory in instructional psychology which has become much more cognitive in nature (Gagne and Briggs, 1974; Rickards, 1978). The implication of Torgesen's model

is that remediation "would take the form of careful instruction in the use of efficient task strategies or more general efforts to help the child gain a greater understanding of himself as an active and important agent in his own learning" (p. 33).

Similarly, Meichenbaum (1976) has outlined what he calls a cognitive-functional approach to learning disabilities. He states that tasks should be analyzed in terms of the behavioral requirements placed on the child. Then the child's cognitive strategies in approaching the task would be examined to determine what is interfering with adequate performance. He notes that after the presence or absence of the required cognitive strategies has been determined, performance may be improved in three ways: (1) manipulate the task to change the psychological demands, (2) alter non-task variables which interfere with performance, or (3) provide the child with support in the form of task aids and instructional aids to help him appraise the task, focus attention, and evaluate performance.

While the current state of knowledge leaves the questions about etiology unresolved, the alternatives presented by Sabatino, Torgesen, and Meichenbaum suggest that educational interventions for LD children should undergo a change of emphasis. All three recommend examining the child's learning in light of cognitive styles or strategies required by the task. The learner's active role in the learning process is also highlighted. Cognitive factors such as expectations for failure, low achievement motivation, and cognitions interferring with task performance are included in their explanation of poor academic achievement. They imply that the LD child could be taught more appropriate cognitive strategies.

Numerous authors from different theoretical perspectives have addressed the areas of cognitive styles and strategies. Cognitive styles are defined as "individual variation in modes of perceiving, remembering, and thinking, or as distinctive ways of storing, transforming, and utilizing information" (Kogan, 1971, p. 244). Gagne and Briggs (1974) provide the following definition of cognitive strategy:

> A cognitive strategy is an internally organized skill that selects and guides the internal processes involved in defining and solving novel problems. In other words it is a skill by means of which the learner manages his own thinking behavior (p. 48).

The literature suggests that conceptual tempo is an important cognitive style to consider in relation to school learning and that it may be modified through teaching cognitive strategies (Messer, 1976; Kogan, 1971).

Conceptual tempo, with its dimension of impulsivity and reflectivity, has been cited as an important variable to consider when examining problem-solving processes of children with learning-disabilities (Keogh and Donlon, 1972; Epstein, Cullinan, and Steinberg, 1977). Originally identified by Kagan (Kagan et al., 1964) conceptual tempo is assessed by means of the Matching Familiar Figures test (MFF), a visual discrimination task, in which the child selects a figure matching a standard from six highly similar alternatives. Children who respond very rapidly, as measured by response latency, and make many errors are referred to as impulsive. On the other hand, children who respond slowly and make few errors are referred to as reflective. Research has demonstrated important differences between impulsive and reflective children on tasks requiring the processing of visual information. Reflective children look longer at visual

stimuli (Siegelman, 1969) and gather more information about the stimuli prior to responding (Drake, 1970). In contrast to reflective children, impulsives tend to perform more poorly on academic-related tasks. Impulsivity is associated with poor performance in perceptual skills (Odom, McIntyre, and Neal, 1971), inductive reasoning (Kagan, Pearson, and Welch, 1966), reading readiness (Shapiro, 1976), reading (Kagan, 1965), and arithmetic (Cathcart and Liedtke, 1969). In addition, Messer (1970) found impulsivity to be associated with higher rates of retention with elementary school children. Other investigations have extended the study of conceptual tempo to children with learning disabilities. Comparisons between LD and normally-achieving school children on the MFF indicate that LD children are more impulsive (Keogh and Donlon, 1972; Cook, 1976; Epstein, Cullinan, and Steinberg, 1977).

A wealth of research is available to document that an impulsive cognitive style can be modified (Messer, 1976). Various treatments have been employed with school-age children and varying degrees of success modifying impulsivity have been reported. Attempts to slow impulsive children's responses through forced delay (Kagan, Pearson, and Welch, 1966), reinforcement of increased latency (Briggs and Weinberg, 1973), and modeling reflective behavior (Yando and Kagan, 1968; Denny, 1972) have generally been effective in increasing response latencies but failed to reduce errors on the MFF.

Researchers have also attempted to teach cognitive strategies to impulsive children. Differentiation training, requiring identification of pictures which differ from a standard, has been shown to be effective in reducing errors on the MFF with impulsive third

graders (Zelniker, Jeffrey, Ault, and Parsons, 1972). Comparing two groups of second grade impulsives, one trained in visual scanning strategies and one trained in delay responses, Egeland (1974) found reduction in errors and increased latencies for both groups on an immediate MFF post-test. However, only the strategy trained group maintained a reduction in errors on a two-month followup test. The children trained to scan more efficiently also received significantly higher scores on the Gates-McGinity reading comprehension subtest administered approximately five months after training. Reviewing the research on modifying impulsivity, Messer (1976) concluded that the

> . . . most potent way to make impulsives more reflective seems to be to teach them improved scanning strategies while having them verbalize what they are doing and to use appropriate training materials that require such scanning (p. 1047).

A promising development in methods used to modify impulsivity incorporates verbal self-instruction (VSI) training in addition to strategy training. The purpose of VSI is to ensure that children both attend to and apply cognitive strategies. Children employing VSI are required to perform tasks while saying instructions aloud. The technique is theoretically based on the self-regulatory function of speech (Luria, 1961; Vygotsky, 1962), and the procedure has been outlined by Meichenbaum (1974). Research suggests that modeling scanning strategies plus verbal self-instruction is superior to teaching strategies directly or through modeling (Meichenbaum and Goodman, 1971; Bender, 1976).

Most recently, impulsivity has studied in the context of behavioral analyses of self-control (Kanfer and Karoly, 1973) and social

learning theory (Bandura, 1977), which emphasize the reciprocal nature of internal (cognitive) and external (contingent consequences) determinants of behavior. From this perspective, Kendall and Finch (1979a) proposed a cognitive-behavioral definition of impulsivity:

> A child displays nonimpulsive (self-controlled) behavior when prior to behaving, he/she engages in cognitive evaluation of response alternatives and, having performed such reflection, is then capable of either engaging in the decided act or inhibiting the discarded possibilities (p. 42).

Based on an extensive review of the characteristics of impulsive children, Kendall and Finch (1979a) have developed a multifaceted cognitive-behavioral intervention program for modifying impulsivity. Their program relies heavily upon the principles of verbal self-instructional training (VSI) (Meichenbaum), modeling (Bandura), and upon a response-cost contingency on errors during training tasks. This approach has been effective in modifying impulsivity (as measured by MFF and behavioral rating scales) in emotionally disturbed children (Kendall and Finch, 1978) and school children with conduct problems (Kendall and Wilcox, 1979).

In light of the evidence that an impulsive conceptual tempo is associated with poor performance on a broad range of tasks, is characteristic of learning disabled children, and can be modified, several authors have stated implications for the diagnosis and instruction of learning disabled students. Keogh and Donlon (1972) suggested that a measure of cognitive impulsivity be included in assessment of learning disabilities. Several authors (Epstein, Hallahan, and Kaufman, 1975) have proposed that impulsive cognitive tempo may partially explain learning deficiencies and that modification of impulsive

tempo, especially the development of verbal self-instruction skills, become a prime concern to educators. Other authors indicate need for further study of the diagnostic usefulness of the MFF and additional research on the effects of treatments to modify impulsivity with LD children (Ross, 1976), the stability of such effects, and the extent to which such treatments generalize to other behaviors other than MFF performance (Epstein, Cullman, and Sternberg, 1977; Abikoff, 1979).

Despite these suggestions for future research exploring the modifications of impulsivity with LD children, only two studies have approached these issues. Third and fourth grade LD children showed a significant reduction in errors and increase response latency on the MFF after three videotaped exposures to a reflective model solving a match-to-sample task similar to the MFF (Nagle and Thawaite, 1979). On the basis of this study, it appears that impulsivity can be modified with LD children; but, since the modeled task was very similar to the MFF, one may question whether such a treatment generalizes to other behaviors.

Cullinan, Epstein, and Silver (1977) compared the effectiveness of cognitive strategy modeling and modeling plus self-verbalization with LD boys. In their study, strategy modeling plus self-verbalization proved no more effective than modeling alone in altering impulsivity. Their results are inconsistent with research that indicates modeling plus self-verbalization is more effective in modifying impulsivity (Meichenbaum and Goodman, 1971; Bender, 1976; Douglas, Parry, Maston, and Garson, 1976). Cullinan et al. (1977) suggested that impulsivity may be more resistant to change with LD children. However, their treatment (one six-minute exposure to a videotaped

model) may have been inadequate. Additionally, the modeling plus self-verbalization was not comparable to verbal self-instruction reported in other studies. Therefore, the question of whether verbal self-instruction techniques are effective with LD children is unresolved.

With regard to modifying impulsivity with LD children, several questions need to be examined. First, are intervention procedures used with non-LD populations effective with LD children? As Cullinan et al. (1977) suggested, impulsivity in LD children may be more resistant to change. If LD children have an underlying attentional deficit, then one might expect more resistance. If, as Torgesen (1977) suggests, nonspecific factors account for poor task performance, then one would expect changes in impulsivity comparable with non-LD populations. Second, do such interventions affect behaviors other than performance on MFF such as classroom behavior. If they do not, then their utility as an psychoeducational intervention would appear very weak. Since the most comprehensive and articulated model for impulsivity appears to be the cognitive-behavioral perspective offered by Kendall and Finch (1979a), this would be a viable theoretical framework from which to investigate these issues.

Statement of the Problem

Various authors have suggested that the deficient academic performance of children classified as learning disabled may be related to inefficient use of task related cognitive strategies or cognitive styles which interfere with learning. The literature indicates that an impulsive cognitive style is related to poor performance on

information processing, academic, and behavioral measures. Impulsivity may be modified through a variety of techniques of which a combination of cognitive and behavioral techniques appears most promising. Although many authors have suggested that modification of impulsivity with LD children is a potentially useful intervention, empirical evidence is not available to conclude (1) that procedures used to modify impulsivity are effective with LD children and (2) that such procedures generalize to behaviors other than the Matching Familiar Figures test.

Purpose of the Study

The purpose of this study is to investigate modifying impulsivity of LD children. Specifically, this study will examine the effects of cognitive-behavioral self-control training on (1) problem-solving processes measured by the Matching Familiar Figure test and (2) behavioral rating of self-control of LD children.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The purpose of the present study is to investigate the modification of impulsivity of LD children. Relevant to this topic, three bodies of literature must be examined: the cognitive style of conceptual tempo with its dimension of impulsivity/reflection; the theoretical and empirical basis of the cognitive-behavioral approach to impulsivity; and the area of learning disabilities. Since extensive reviews on conceptual tempo are available (Messer, 1976; Kendall, and Finch, 1979a), a brief overview will be presented first. Included in the overview will be methodological concerns, recent developments in the analysis of conceptual tempo, and characteristics of impulsive children. Second, the cognitive-behavioral approach to impulsivity will be discussed from a theoretical and empirical perspective focusing particularly on its development and treatment procedures. Relevant research involving the cognitive-behavioral approach will be reviewed. Finally, research relating to the areas of learning disabilities and impulsivity will be considered and literature pertaining to modification of impulsivity with LD children will be reviewed. Behavioral characteristics of LD children will be discussed in terms of the implications of potential use of cognitive-behavior methods for developing nonimpulsive (self-controlled) behavior.

Impulsivity

Conceptual and Methodological Concerns

The present study focuses on extensions of the construct of impulsivity originated by Jerome Kagan (Kagan et al., 1964). Within his paradigm, reflection-impulsivity formed a dimension of a cognitive style, conceptual tempo, used to describe individual differences in children's approaches to problem solving. Conceptual tempo is relevant in problem-solving situations characterized by the presence of multiple response alternatives where response uncertainty, in terms of which alternative is correct, is high. In this type of task, reflection-impulsivity describes the tendency to consider the validity of the various alternatives prior to selecting one of those available. Impulsive children respond very quickly and, since they do not thoroughly evaluate the alternatives, make many errors. On the other hand, reflective children respond more slowly and make few errors. Later in this review, impulsivity will be discussed from the perspective of self-control in which reflection is considered self-controlled behavior, as opposed to impulsivity (nonself-controlled behavior; Kendall and Finch, 1979a).

The instrument traditionally used to assess impulsivity is the Matching Familiar Figures (MFF) test (Kagan et al., 1964). This is a twelve item match-to-sample task. The child is shown a picture of a familiar object and from six highly similar alternatives must select the one which is exactly the same. For each item, the time the child takes in making his first choice (response latency) and the number of errors committed before choosing the correct alternative

are recorded. Scores for the total test are reported as total number of errors and average response latency. Classification of children has traditionally been made by using a double median-split procedure. In a given sample, children above the median errors score and below the median response latency (fast-inaccurates) are classified as impulsive. Children below the median errors score and above the median response latency (slow-accurates) are classified as reflective. The reflection-impulsivity variable has been used extensively in research. Using the double median-split procedure, impulsive and reflective children have been compared on a variety of tasks, error and latency scores have been related to other variables, and effects of treatments to modify impulsive responding have been analyzed by reporting changes in error and latency scores. Several methodological problems using MFF have been studied and bear directly on future research involving the MFF.

The psychometric characteristics of the MFF lead to certain methodological problems. Ault, Mitchell, and Hartman (1976) report that Cronbach alpha coefficients (internal consistency reliability) for MFF error scores ranged from .32 to .60, while those for latency scores consistently were around .90. Ault et al. (1976) noted that the low reliability of the error score creates four problems which contribute to a general loss of statistical power: (1) misclassification of children when the double median-split procedure is used, (2) regression toward the mean in repeated measures designs, (3) reduction of statistical power in studies which attempt to change MFF error in small samples, and (4) underestimation of the correlations between error scores and other variables. Ault et al. (1976) advise

controlling the troublesome characteristics associated with low error score reliability by including repeated measures control groups, increasing sample size, and correcting correlations for attenuation.

Use of the double median-split for classification purposes creates several problems. Ault et al. (1976) note that this procedure artificially dichotomizes continuous variables resulting in a substantial loss of information, discarding of certain subjects (fast-accurates and slow-inaccurates), and inconsistent classification across different samples. Conceptually, impulsives and reflectives do not constitute discrete groups; however, the classification procedure treats them as such.

Several authors have addressed the classification issue. It has been suggested that future research use a standard, linear composite of time and error scores rather than the double median-split (Egeland and Weinberg, 1976; Bentler and McClain, 1976; Salkind and Wright, 1977). This approach would provide a more reliable measure and preserve the continuous nature of reflection-impulsivity.

Salkind and Wright (1977) present an alternative model of reflection-impulsivity which adds conceptual clarity to the construct along with an alternative to the dependence on raw error and latency scores for classification. As mentioned earlier, the traditional approach to reflection-impulsivity does not accommodate children who are fast-accurate or slow-inaccurate responders. Salkind and Wright (1977) proposed that

> . . . both latency and error scores on such tasks are complex products of fundamental interaction between children's basic information-processing efficiency and the probably more task specific choices they make between those styles emphasizing speed and those styles emphasizing accuracy (p. 381).

They outline an "integrated model" as follows:

> The proposed model defines the speed/accuracy domain in terms of two constructs, impulsivity and efficiency. The axis of the original scatter plot (errors X response latency on MFF) are rotated so that impulsivity is defined as a dimension of individual differences ranging from fast-inaccurate to slow-accurate performance. Efficiency is defined as a dimension conceptually orthogonal to impulsivity, along which individual differences range from slow-inaccurate to fast-accurate performance. Impulsivity and efficiency scores (I and E, respectively) are generated from raw latency and error scores by the following formulas:
>
> $$I_i = Z_{ei} - Z_{li}$$
>
> $$E_i = Z_{ei} + Z_{li}$$
>
> where I_i = impulsivity for the ith individual, E_i = efficiency for the ith individual, Z_{ei} = a standard score for the ith individual's total errors, and Z_{li} = a standard score for the ith individual's mean latency (p. 381-382).

Also, Salkind (1977) has developed norms for the MFF which allow the conversion from raw to standard scores. Recognizing the need for validation of their E score, the authors hypothesize that it should be related to other measures of efficient information processing and, perhaps, general intelligence. Hence, the I score provides a more sophisticated method to assess impulsivity and an additional process, E, is posited to underlie performance on the MFF.

Characteristics of Impulsive Children

The relation of conceptual tempo to performance on other psychometric tests, visual scanning strategies, problem-solving strategies, various learning tasks, and personality and social variables has been

examined. The literature on these topics has been extensively reviewed (Messer, 1976); therefore, conclusions drawn from this literature will be briefly summarized. More emphasis will be placed on discussing studies relating conceptual tempo to academic achievement and learning disabilities.

Much of the early research involving conceptual tempo compared visual scanning strategies employed by impulsive and reflective children. Utilizing direct measures of eye fixations, it has been demonstrated that reflective children look longer at visual stimuli (Siegelman, 1969) and gather more information about the stimuli before responding (Drake, 1970). Comparing perceptual learning of impulsive and reflective kindergarten children, Odom et al. (1971) found that reflectives perceived and evaluated information based on distinctive features of visual stimuli while the type of information processed by impulsives could not be identified. Additionally, research indicates that impulsive children perform poorly on visual and auditory tasks which require analysis of details (Zelniker and Jeffry, 1976). It is interesting to note that LD children perform poorly on tests of auditory and visual perception (Torgesen, 1975). One could speculate that impulsivity contributes to poor performance on such measures; however, this issue has not been investigated.

Impulsive children tend to perform poorly across a variety of problem-solving tasks. Research indicates that impulsives use less mature problem-solving strategies than reflectives on tasks requiring serial recall, analogical reasoning tasks, and probability learning (Messer, 1976). Impulsive children ask inefficient information-seeking questions in experimental variations of the 20-questions game

(Ault, 1973; Denny, 1973). These results suggest that impulsivity is a disadvantage on tasks requiring a slow systematic approach. Dweck and Bush (1975) hypothesized that performance on tasks requiring decision-making speed would be hindered by a reflectivity. Manipulating task demand for problem-solving speed with fourth grade students, they found impulsives performed more poorly regardless of the decision speed required.

The differences between impulsive and reflective children on problem solving tasks might result from differences in general intelligence. Messer (1976) reviewed all studies reporting correlations between MFF scores and measures of intelligence. He concluded that the correlation of MFF latency time and I.Q. is small (.16) while the correlation of MFF errors with I.Q. is moderate (.31). Ault et al. (1976) note that the latter relationship is probably underestimated due to poor reliability of the error score. Controls for I.Q. are absent in many studies using impulsivity-reflection as a classification variable and should be included in future research.

Impulsivity has been studied in relation to various academic measures. At the kindergarten level, construct validity for impulsivity has been recently documented (Margolis, Leonard, Brannigan, and Heverly,1980). They hypothesized that psychometric tests high in response uncertainty would be highly predictive of children's impulsivity (I) score. The following tests were classified from high to low response uncertainty: high - (1) Columbia Mental Maturity Scale (CMMS), (2) Auditory Discrimination Test (ADT), and (3) Modified Auditory-Visual Integration Test (MAVI); moderate - (4) Peabody Picture Vocabulary Test (PPVT), (5) ITPA Sound Blending (SB); and (6)

low - WISC Digit Span (DS), (7) WPPSI-Verbal I.Q. A step-wise multiple regression analysis confirmed their hypothesis. CMMS, MAVI, and ADT were good predictors of I ($R = .75$, $p < .05$). Nonsignificant correlations were found for I with Verbal I.Q., DS, SD. It has also been reported that reflective kindergarten pupils perform significantly higher than impulsives on the Metropolitan Reading Readiness Test (Margolis, 1976) and the Gates-MacGinitie Readiness Skills Test (Sharpiro, 1976). Margolis et al. (1980) suggested that the achievement measures with high response uncertainty may be in large part an index of response tempo. This suggestion is currently very relevant since many of those same tests are used to identify learning-disabled students at the kindergarten level.

With elementary school children, impulsives obtain lower scores on a variety of achievement and skill measures. Reflectives obtain significantly higher achievement test scores than impulsives (Barrett, 1977). Impulsivity is associated with reading difficulties (Kagan, 1965; Davey, 1976; Readence and Seafross, 1976).Impulsive children also tend to score lower on measures of math achievement (Cathcart and Liedtke, 1969).

Kagan et al. (1964) discussed three possible antecedents for the impulsivity-reflection dimension: constitutional differences in ability to inhibit responses, degree of task involvement, and anxiety associated with expectations of failure. Impulsive children have been found less able to inhibit responding following reinforcement on a differential reinforcement of low rates schedule (Stein and Landis, 1975) and to inhibit responses to nonreinforced stimuli on a discrimination learning task (Stein and Prindaville, 1976). These studies

tend to support the notion that impulsive children demonstrate less ability to inhibit motor responses. While the role of task involvement and anxiety have not been clearly identified, there is limited evidence that failure produces changes on MFF indicative of increased reflectivity and that frustration changes performance in an impulsive direction (Weiner and Adams, 1974). Messer (1976) suggested that strategies which increase concern over performance might be used to encourage reflective responding.

Cognitive-Behavioral Models of Self-Control

Theoretical Perspectives

Recent theoretical analyses of human behavior have recognized the inadequacies inherent in viewing human behavior as determined either by environmental conditions or cognitively based processes (Mahoney and Thoresen, 1974). Behaviorially oriented theories have been elaborated to include the cognitively based constructs of self-control or self-regulation in addition to events external to the individual (Bandura, 1977; Kanfer and Karoly, 1973). Merging with Soviet work on children's use of speech to exercise control over their behavior (Luria, 1961), these theories serve as the basis for research examining the development of self-control in children. Three major areas are currently being studied: (1) young children's control of their motor behavior, (2) resistance-to-temptation, and (3) modification of impulsivity (Pressley, 1979). This review is concerned only with the area of impulsivity; therefore, after briefly discussing the theory, the cognitive-behavioral analysis of impulsivity will be presented.

In their conceptual analysis of behavior, Kanfer and Karoly (1973) identify two sources of control for human behavior: alpha- and beta-regulation. Alpha-regulation refers to sources of control that depend on the direct influence of external events (classical and operant conditioning). Beta-regulation

> . . . signifies the moderating psychological processes that supplement a simple input-output relationship on the basis of a person's past history, biological constitution, and his pattern of generating internal stimulational processes (p. 404).

Thus, beta-regulation (self-generated verbal, imaginal, and other covert behaviors) interacts with alpha-regulation (external controlling events). They assume that beta-regulation can be influenced to foster self-control (beta-control). Kanfer and Karoly (1973) analyze beta-control into three components: self-monitoring, self-evaluation, and self-reinforcement. A person engages in self-control when he initially monitors his own behavior, evaluates his behavior against a criterion, and finally reinforces himself. Influencing beta-control is viewed as critical to changing behavior.

Social learning theory has similarly integrated self-regulatory processes into the analysis of behavior. Bandura (1977) proposes that behavior is a function of reciprocal determinism. From his theoretical perspective, behavioral, personal, and environmental factors exert influences on each other. According to Bandura, behavior is controlled by external, vicarious, and self-generated consequences. Germane to this discussion, Bandura analyzes self-generated consequences into a model for self-regulation which includes performance, judgemental, and self-response processes. Evaluative dimensions are present in performance of an action. These dimensions are

judged according to personal standards, normative comparisons, valuation of activity, and causal attribution to external or internal loci. Finally, the judgemental process leads to a self-response which may be positive or negative self-evaluation, self-reward or punishment, or no self-response. These self-regulatory processes are assumed to be accessible through symbol systems, primarily language and imagery. Finally, it is theorized that these thought processes can be influenced through observing modeled consequences, self-generated consequences, or direct experience of environmental consequences.

Soviet investigators have long been interested in the role of speech in the regulation of behavior. Luria (1961) has described the internalization of speech processes. According to Luria, speech plays a major role in the development of mental processes. Children's ability to respond to verbal instructions has been extensively studied in relation to behavioral and physiological measures. As a child develops, speech becomes the mechanism by which voluntary control of mental processes is attained. Luria has demonstrated how verbal instructions can be used to alter attentional processes and problem solving behavior. Developmentally, speech and language are insufficiently developed in the very young child to exert a regulatory function. Around the age of two years, speech serves an initiating function on motor behavior. At this stage, speech does not inhibit motor behavior. When the child is around the age of three, verbal instructions as well as the child's own speech can be used to initiate and inhibit behavior. Later, the child uses internalized speech to organize and guide more complicated forms of behavior. This overview of Luria's theory belies the extensiveness, richness, and complexity

of his work, bridging the areas of brain function, language, and cognitive processes (Luria, 1961, 1973, 1976). Ideas originated by Luria have made a major contribution to the techniques, particularly verbal self-instruction, currently employed to develop children's self-control.

Cognitive-Behavioral Analysis of Impulsivity

Kendall and Finch (1979a) have offered a cognitive-behavioral analysis of impulsivity. From their perspective, impulsivity has cognitive and behavioral components. Behaviorally, impulsive children lack the capability of response inhibition. Cognitively, they show deficits in problem-solving capacities. In the scope of the theories discussed above, impulsivity relates to poor self-control (beta-regulation) or poor self-regulation. They place impulsive behavior on a continuum from impulsive to non-impulsive (self-controlled) behavior and propose the following definition:

> A child displays nonimpulsive (self-controlled) behavior when, prior to behaving, he/she engages in cognitive evaluation of response alternatives and having performed such reflection, is then capable of either engaging in the decided act or inhibiting the discarded possibilities (p. 42).

In terms of the components of self-regulation (Kanfer and Karoly, 1973), impulsive children may be deficient in self-monitoring, self-evaluation, and self-reward. Kendall and Finch (1979a) suggest that impulsive children are poor self-monitors and would benefit from training in monitoring skills such as remembering to self-monitor, cue recognition, and analysis of the situation. Thus, developing non-impulsive behavior with children would proceed to include self-evaluation and self-reward. There are several apparent advantages to

a cognitive-behavioral interpretation of impulsivity. First, the construct of impulsivity is integrated into a theoretical framework offering an analysis of self-control. Questions concerning generalizability have focused on the use of task specific treatments (i.e., training children on visual match-to-sample tasks) and inferring changes in impulsivity demonstrated only by improved performance on MFF (Abikoff, 1979; Pressley, 1979). The cognitive-behavioral analysis allows building a nomological network for impulsivity and the development of treatments which generalize to other behaviors indicative of self-control. Second, current research in attribution theory indicates that when changes in behavior are attributed to self-generated effort (as opposed to ability or external causes) children are more likely to engage in achievement-oriented behavior (Wiener, 1974; Dweck, 1975; Bar-Tal, 1978). In as much as the cognitive-behavioral approach attempts to encourage self-attribution for behavior change, Kendall and Finch (1979a) have suggested thattheir approach may enhance maintenance and generalization of nonimpulsive behavior.

Kendall and Finch (1979a) have outlined a cognitive-behavioral program aimed at developing self-control. Their program employs cognitive (verbal self-instruction) and behavioral (response-cost contingencies and modeling) procedures. A therapy manual (Padawer, Kendall, and Zupan, 1980) has been developed for research purposes. The manual explicitly details application of treatment procedures for impulsive children. Additionally, a behavior rating scale, the Self-Control Rating Scale (SCRS, Kendall and Wilcox, 1979), has been developed to assess self-control in children. The components of the

treatment program research related to each component, and the SCRS will be discussed below. Finally all of the research to date involving the treatment program will be reviewed.

Components of the Cognitive-Behavioral Self-Control Training

Verbal Self-Instruction (VSI) Training. VSI involves the systematic use of verbal-instruction. As discussed by several authors (Meichenbaum and Goodman, 1971; Meichenbaum and Cameron, 1974; Kendall, 1977), the content of the actual verbalizations are statements about (1) problem definition, (2) problem approach, (3) focusing of attention, (4) coping statements (to deal with performance errors), and (5) self-reinforcement. The self-verbalizations are presented to and used by the child according to the following sequence: (a) while the child observes, the model completes the task using the self-verbalizations; (b) the child completes the task using the self-verbalizations; (c) whispering the self-instructions, the model completes the task; (d) whispering the self-instructions, the child completes the task; (e) displaying behavioral signs of thinking, the model completes the task using covert self-instructions; and (f) the child completes the task using covert self-instructions. The sequence fades self-instructions from overt speech to a covert level and, thus, attempts to internalize the process.

Modeling. The process of teaching the child to use verbal self-instructions to complete the training tasks is modeled by the individual working with the child. This individual models both mastery

(task completion without mistakes) and coping (strategies for dealing with mistakes).

Contingencies. The program uses a response-cost contingency, self-reward, rewards accurate self-evaluation. Initially, the child is given a number of tokens and loses a token when he either makes a mistake on the task or forgets any of the self-statements. After a token is lost, the model labels the child's error. The children are taught to use self-reward statements for correct performance. At the end of each session, both the child and the model rate the child's overall performance on a five point scale. If the ratings are within one point of each other then the child is rewarded with a bonus token. The child may use his tokens to purchase items listed on a reward menu.

Empirical Research: Modification of Impulsivity

The research reviewed below will focus on the modification of impulsivity using VSI, behavioral, and cognitive-behavioral treatments. An overview of research using only VSI or behavioral training will be followed by a review of all available research involving the cognitive-behavioral treatment (Kendall and Finch, 1979a).

Meichenbaum and Goodman (1971) conducted one of the earliest investigations concerning the efficacy of verbal self-instruction to alter impulsive behavior. Their research was conducted in two parts (Study I and Study II). In Study I, 15 second-grade students with "behavior problems" were assigned to one of the following experimental

groups: verbal self-instruction treatment group, attention control group, or an assessment control group. The verbal self-instruction group (N = 5) received VSI training on a variety of sensorimotor and problem-solving tasks over four, one-half hour sessions. The attention control group (N = 5) were exposed to the same tasks, but they did not receive VSI training. The assessment control group (N = 5) were only assessed on the dependent measures. Each child was assessed on performance measures (Portues Maze Test, MFF, WISC-Picture Arrangement, WISC-Coding, and WISC-Block Design) and classroom measures (observer ratings of off-task behavior and teacher rating of classroom behavior). The dependent measures were administered before, directly after, and one-month following the treatment. Comparisons between the three groups indicated significant improvement for only the VSI group on WISC-Picture Arrangement and MFF latency score. Both the attention control and VSI group improved on the Porteus Maze test with the VSI group showing the greater improvement. A nonsignificant trend toward improvement was reported for the VSI group on the other performance measures while no significant treatment effect on the classroom measures were found.

Study II (Meichenbaum and Goodman, 1971) tested the relative effects of modeling cognitive strategies versus modeling plus self-instruction. From a sample of 15 kindergarten and first-grade students classified as impulsive on the MFF, five children were assigned to each of two treatment conditions or an assessment control group. In both treatment conditions, subjects observed the experimenter modeling task strategies using self-verbalization and later completed eight tasks in a 20-minute session. One treatment group, cognitive

modeling condition, was not required to self-verbalize on the training tasks. Subjects in the other treatment group, cognitive modeling plus self-verbalization, were required to self-verbalize during the training tasks. Analysis of repeated measures for MFF error and MFF latency scores, indicated that the modeling plus self-verbalization group showed a significant reduction in errors and increase in latency. The cognitive modeling group showed only a reduction in MFF latency. The authors concluded that cognitive modeling plus self-verbalization was more effective than modeling alone for reducing impulsivity.

Several articles have provided extensive reviews of other research pertaining to the use of VSI to modify impulsivity (Pressley, 1979; Abikoff, 1979; Kendall, 1977). There is evidence that the conclusion made by Meichenbaum and Goodman (1971) also applies to impulsive first-grade students (Bender, 1976) and hyperactive children (Douglas, Parry, Morton, and Garson, 1976; Bugental, Whalen, and Henker, 1977). Although Denny and Turner (1979) concluded that VSI did not facilitate task performance in normal children, they suggested that VSI might be useful for children whose task performance is deficient. However, several criticisms have been made. Pressley (1979) and Kagen (1977) note that generalized effects of VSI training on other cognitive tasks have not been demonstrated. Abikoff (1979) has questioned whether VSI training will reduce inappropriate classroom behavior. On the other hand, Kendall (1977) pointed out that most VSI treatment procedures reported in the literature lack adequate planning for treatment generalization.

Behavioral attempts to modify impulsivity have examined the effects of modeling or the effects of manipulating reinforcement contingencies. Impulsive children exposed to reflective models tend to increase their MFF response latency but do not necessarily show a corresponding decrease on MFF errors (Yando and Kagan, 1968). Examining the effects of types of reinforcement (social, mastery, or tangible) on MFF errors and latency scores, Briggs and Weinberg (1973) reported that regardless of type of reinforcement, impulsive fourth-grade boys slowed their response latency less than fourth-grade reflectives. Additionally, reinforcement had no effect on MFF errors for either reflectives or impulsives. Messer (1976) indicated that increasing concern over errors might help impulsive children respond in a more reflective manner. Kendall and Finch (1979) have suggested use of a response-cost contingency for errors could be used to increase concern over performance and several studies support their contention (Erickson, Wyne, and Routh, 1973; Nelson, Finch, and Hooke, 1975).

Cognitive-behavioral treatment procedures for developing nonimpulsive behavior with children have appeared in three experimental studies. The first study (Kendall and Finch, 1978) involved the application of the cognitive-behavioral procedures with emotionally disturbed children. Using the double-median split procedure, 20 children from a clinic population were identified as impulsive and randomly assigned to a treatment (n = 10, mean age = 10.2 years) or a control condition (n = 10, mean age = 11.1 years). All subjects received six 20-minute individual sessions working on the same training materials. The treatment group received training in verbal self-instructions and a response-cost contingency on errors. The dependent measures were

the MFF, two self-report measures, and teacher ratings of impulsive classroom behavior. All subjects were assessed prior to and directly after the three-week treatment period as well as after a follow-up (three months) period. A separate two-way (treatment by trials) analysis of variance with repeated measures on trials was conducted for each dependent measure. Results indicated that the treatment group received significantly lower MFF error scores and longer MFF latency scores at posttreatment and follow-up. Scores on the two self-report scales did not change significantly for either group. However, the subjects in the treatment group were rated by teachers as significantly less impulsive at both posttreatment and follow-up assessments. The authors interpreted their results as substantiating evidence for the cognitive-behavior treatment procedure's efficacy in developing nonimpulsive responding on the MFF, and for generalization to classroom behavior.

A certain amount of controversy has surrounded the analysis and interpretation of the results in the Kendall and Finch (1978) study. Abikoff and Ramsey (1979) found a significant pretreatment difference between control and treatment groups on the classroom behavior data reported by Kendall and Finch (1978). A reanalysis of the data using analysis of covariance failed to indicate a significant difference between the groups posttreatment or at follow-up. Therefore, Abikoff and Ramsey (1979) questioned the conclusion that treatment effects generalized to classroom behavior. In a reply to the criticism, Kendall and Finch (1979b) argued that because of a negative relationship between measures for pretreatment and at follow-up, the covariance analysis actually reduced group differences.

A second study (Kendall and Wilcox, 1979) investigated the effects of cognitive-behavioral treatment procedures on self-control with children 8-12 years of age. The children were referred for having a variety of classroom behavior problems. Using a randomized-blocks procedure, 30 subjects were assigned to one of two treatment conditions or a control group. The treatment group varied with respect to type of VSI instructions, concrete (task specific) or conceptual (general). In six 30-minute individual sessions, all subjects were exposed to the same psychoeducational tasks. Children in both treatment groups received VSI (concrete or conceptual) with a response-cost contingency for errors. Dependent measures, collected on all children at pretreatment, at posttreatment, and at a one-month follow-up, consisted of two performance measures (MFF and Porteus Mazes), a subject self-report, and two classroom behavior rating scales. The classroom behavior rating scales, the Self-Control Rating Scale (SCRS) and Conner's Teacher Rating Scale, were completed blind of treatment conditions by the children's teachers. A separate two-way analysis of variance (treatment by trials) with repeated measures on the second factor was completed for each dependent measure. Nonsignificant changes were reported for the Porteus Mazes test and self-report measure. Treatment groups were not differentially superior to controls on MFF error scores. However, on both measures of classroom behavior, the conceptual treatment group maintained significant improvement from pretreatment to follow-up while the concrete treatment group evidenced improvement from pretreatment to posttreatment but not follow-up, and the changes in the control group were not significantly different from pretreatment to follow-up.

In the third study, Kendall and Zupan (1980) examined the role of treatment context in the application of cognitive-behavioral self-control training. Treatment context was studied by comparing individual treatment, group treatment (five children per group) and a nonspecific (control) treatment group. Children in the individual (n = 10) and group (n = 10) treatments received VSI with a response cost for error and self-reward for accurate self-evaluation (Padawar, et al., 1980). Children in the nonspecific treatment condition (n = 10) were exposed to the same materials. Ten children were assigned to each treatment condition. Each treatment condition received 12, 30-40 minute sessions. Dependent measures collected on all children at pretreatment, at posttreatment and at a two-month follow-up included the MFF, SCRS, and Conner's Teacher Rating Scale. Analysis of the SCRS data indicated that both individual and group treatment groups showed significant improvement from pre to posttreatment and maintained improvement at follow-up. Individual and group treatment conditions did not differ on the SCRS. Subjects in all three conditions showed significant improvement on the Conner's Scale regardless of treatment condition. Likewise, MFF scores showed improvement regardless of treatment condition. The authors noted that the individual treatment was not superior to the group treatment with regard to generalizing to the classroom measure of self-control.

In conclusion, it appears that the cognitive-behavioral treatment procedures for impulsivity have a positive effect on impulsive children's self-control as measured by blind teacher ratings. However, the effect of the treatment on MFF performance is less clear. Distinct improvement for the treatment group in terms of both

increased MFF latency and decreased MFF error scores, was clear in one of the studies (Kendall and Finch, 1978). Methodological problems associated with the double median split for classifying impulsives, low reliability of the MFF error score, and conceptual difficulties arising from separate analyses on error and latency scores contribute to making the MFF results difficult to interpret. The use of Salkind and Wright's (1977) composite standard measure for impulsivity would increase internal as well as external validity in future research; thus, the effects of cognitive-behavioral treatments on MFF performance could be more accurately assessed.

Learning Disabilities and Impulsivity

Teachers and psychologists often refer to LD children with rather global descriptors of behavior. Teachers commonly describe these children as "distractible", having short "attention span", unable to follow directions, and "immature". Diagnostic psychological testing reports often label LD children as "impulsive", having a low tolerance for frustration, or approach tasks in unsystematic, hurried manner. These descriptions suggest that many LD children are lacking in self-control. Research indicates that LD children attribute successful academic performance to external sources of control (Chapman and Boersma, 1979), show verbal-mediation deficiencies (Swanson, 1979), and engage in high rates of off-task behavior in class (Bryan, 1979). A number of writers have concluded that LD children have problems in controlling attention (Tarver and Hallahan, 1974; Keogh and Margolis, 1976). On experimental measures of selective attention LD children perform similar to much younger children (Pelham and Ross, 1977;

Tarver, Hallahan, Kauffman, and Ball, 1976). They tend not to use cognitive strategies on a variety of memory tests but can perform adequately after receiving strategy training (Bowen, Galbert, and Torgesen, 1978; Wong, 1978). One might hypothesize that impulsive, nonself-controlled behavior interferes with academic, social-emotional, and cognitive development of LD children.

One of the most frequently noted characteristics of learning disabled children is "impulsivity" (Haring, 1974). Three studies have examined impulsive conceptual tempo as measured by the MFF test with learning disabled children. Koegh and Donlon (1972) concluded that severe learning disabled children were more impulsive than children with moderate learning problems. Cook (1976) compared LD children with non-LD children in grades three and four on the MFF. The LD group had significantly more errors and shorter reponse latencies. Also, the third grade LD group performed similarly to a non-LD first-grade group included in the study. Epstein, Cullinan, and Sternberg (1977) compared severe and mild learning disabled children to "normal" children on the MFF test. The results indicated that the LD children were more impulsive than the normal children and severe LD children were more impulsive than mild LD children. On the basis of these studies, it appears that, as measured by the MFF, LD children are more impulsive than their normally-achieving peers.

In light of the evidence that an impulsive conceptual tempo is associated with poor performance on academic tasks, is characteristic of learning disabled children, and can be modified, several authors have stated implications for the diagnosis and instruction of learning disabled students. Keogh and Donlon (1972) suggested that a measure

of cognitive impulsivity be included in assessment of learning disabilities. Several authors (Epstein, Hallahan, and Kaufman, 1975; Gardner, 1977) proposed that impulsive cognitive tempo may partially explain learning deficiencies and that modification of impulsive tempo, especially the development of verbal self-instruction skills, become a prime concern to educators. Other authors have indicated need for further study of the diagnostic usefulness of the MFF, additional research on the effects of treatments to modify impulsivity of LD children (Ross, 1976), and the stability of such effects, and the extent to which such treatments generalize to behaviors other than MFF performance (Epstein, Cullinan, Sternberg, 1977; Abikoff, 1979).

A question may be raised concerning generalizing the effectiveness of impulsivity modification techniques from presumably normal children to learning disabled children. Ross (1976) has warned, "extrapolations to general academic performance of hyperactive, learning disabled children may or may not be valid" (p. 119). Only two studies addressing this issue could be found in the literature.

Nagle and Thwaite (1979) examined the effect of modeling on the impulsivity of learning disabled children. Learning disabled third-and-fourth grade students classified as impulsive on MFF were exposed to a videotaped model demonstrating either reflective or impulsive cognitive tempo on a matching-to-sample task or a control condition in which the model played an unrelated game. After three exposures to the modeling conditions only the children who had viewed the reflective model showed significant decrease in errors and increases in response latency on the MFF. The authors suggested that future research will need to examine how improved performance on the

matching-familiar figure task will generalize to other academic and behavioral measures.

The second experiment compared the effectiveness of modeling and modeling plus self-verbalization in modifying impulsive conceptual tempo with LD boys, 9 to 12 years old (Cullinan, Epstein, and Silver, 1977). The modeling condition was one exposure to a six-minute videotape of a boy demonstrating reflective problem-solving on six MFF items while verbally self-instructing. Children in the modeling plus self-verbalization condition observed the same videotape but were also required to verbalize the modeled behavior. The experimenters constructed alternate forms of the MFF and administered an immediate and delayed (three weeks later) posttest. On the immediate posttest, both experimental groups significantly decreased errors but not response latencies. There were no significant differences between the treatment conditions on the posttests. Contrasting their findings with previous research, the authors suggested that the response latency of LD children may be more resistant to change than non-LD children. They also noted, in contrast to Meichenbaum and Goodman (1971), that modeling plus self-verbalization condition did not prove to be superior than to modeling alone. While the Nagle and Thwaite (1979) study is generally consistent with past research, the Cullinan et al. (1977) study reports results inconsistent with the literature.

Importantly, the results on the Cullinan et al. (1977) are subject to alternative interpretation. First, the authors report constructing alternate forms of the MFF test for the immediate and delayed posttests without demonstrating equivalent difficulty. Therefore, it is impossible to assess whether the differences or lack of

differences between groups was a result of the instrumentation or treatment. Secondly, and perhaps most important, the brief duration of the treatment, one six-minute videotape, may have been inadequate. Third, the modeling plus self-verbalization condition is not comparable to the verbal-self instruction (VSI) reported in previous studies (Meichenbaum and Goodman, 1971; Bender, 1976; Kendall, 1977). The previous studies trained VSI skills on a variety of tasks, fading children's overt verbalizations to a covert level. Therefore, the results of the Cullinan et al. (1977) study do not resolve the issue of whether verbal self-instruction techniques are effective with LD children.

Summary

Several key points emerge from the review of the literature which bear directly on investigating the modification of impulsivity with learning-disabled children. First, the literature on impulsivity suggests several methodological and conceptual issues be addressed. When using the MFF to demonstrate changes impulsivity, separate analysis of MFF latency and MFF error scores is methodologically and conceptually problematic. The use of Salkind and Wright's (1977) integrated model for conceptual tempo appears to provide for more sound measurement as well as enabling the researcher to examine two constructs involved in MFF performance, I (Impulsivity) and E (Efficiency). Second cognitive-behavioral theory appears to be a viable theoretical framework from which to investigate modification of impulsivity. A cognitive-behavioral approach integrates impulsivity with the area of self-control, and cognitive-behavioral treatment

procedures appear to generalize to classroom behavior with impulsive non-LD children. Third, the literature indicates that many LD children display behavior related to poor self-control and that an impulsive conceptual tempo may contribute to their academic deficiencies. The available research regarding the modification of impulsivity with LD children is extremely sparse, leaving questions of treatment generalization and effectiveness unresolved.

Definition of Terms

For the purpose of this investigation, the following terms and definitions will be employed:

1) Cognitive-behavioral self-control training: As outlined by Kendall and Finch (1979a), cognitive-behavioral self-control training consists of procedures for training nonimpulsive behavior by attempting to establish self-control. It includes verbal self-instruction training via modeling with a response-cost contingency for errors and reward for accurate self-evaluation.
2) Impulsivity: As measured by the Matching Familiar Figures test, impulsivity is defined as a dimension of individual difference ranging from fast-inaccurate to slow-accurate performance (Salkind and Wright, 1977).
3) Efficiency: As measured by the Matching Familiar Figures test, efficiency is defined as a dimension of individual differences ranging from fast-accurate to slow-inaccurate performance (Salkind and Wright, 1977).

Research Questions

In relation to the purpose of the present study, two major research questions and one minor research question are formulated. The major research questions focus on the effects of cognitive-behavioral self-control training on impulsivity and self-control. Although the literature is extremely limited concerning efficiency, it appears that the efficiency dimension of individual differences should be considered in conjunction with impulsivity. Therefore, the research question focusing on the effect of cognitive-behavioral self-control training on efficiency will be formulated, but considered secondary in importance for the purpose of this study.

Research Question One: Does cognitive-behavioral self-control training reduce impulsivity (I) of LD children?

Research Question Two: Does the cognitive-behavioral self-control training increase efficiency (E) of LD children?

Research Question Three: Does the cognitive-behavioral self-control training enhance LD children's self control?

Hypotheses

The following hypotheses are formulated in conjunction with the preceding research questions:

Hypothesis One: Impulsivity (I) will be reduced by the cognitive-behavioral self-control training.

Hypothesis Two: Efficiency (E) will be increased by the cognitive-behavioral self-control training.

Hypothesis Three: The cognitive-behavioral self-control training will increase LD children's self-control.

CHAPTER III

METHOD AND PROCEDURE

Subjects

Thirty children, 25 males and 5 females, served as subjects in the present study. The subjects, ranging in age from 8 years 3 months to 12 years 11 months, were selected from a population of 71 learning disabled students attending learning disability classes in the Tulsa Public Schools, Tulsa, Oklahoma. These 71 students were rated by their respective teachers on the Self-Control Rating Scale (SCRS, Kendall and Wilcox, 1979). The 30 children selected to participate in this experiment received scores on the SCRS indicative of low self-control. Therefore, in addition to being classified as learning disabled by their school system, the LD children participating in this study were rated by their teachers as manifesting classroom behavior indicative of poor cognitive and behavioral self-control.

Therapists

The treatment was administered by five female graduate students enrolled in a master's level clinical psychology program at Tulsa University. All therapists received approximately five hours of practice involving observation of therapy procedures, supervised rehearsal, and individual practice. Additionally, all therapists followed a therapist training manual (Padawer et al., 1980).

Dependent Measures

Matching Familiar Figures

The Matching Familiar Figures (MFF) test (Kagan et al., 1964) was used as the measure of impulsivity. The MFF is a 12-item match-to-sample task. The child is shown a picture of a familiar object and must select a matching object from an array of six highly similar alternatives. For each item, the time the child takes to make his first choice (response latency) is recorded. If the child's first choice is incorrect, he continues to select another alternative until the correct one is chosen. The number of errors committed on the entire test and average latency to first response are recorded. Using norms developed by Salkind (1977), the raw MFF latency and error scores are transformed to z-scores. Salkind and Wright's (1977) formulas were used to compute an impulsivity index (I) and an efficiency index (E). I is computed by subtracting the z-score for response latency from the z-score for errors. E is computed by adding the z-score for errors with the z-score for response latency. Large positive I scores are indicative of impulsivity while large negative I scores are indicative of reflectivity. High positive E scores are indicative of inefficiency while high negative E scores are indicative of efficiency.

Test-retest reliability of the MFF raw scores with LD children were reported by Epstein, Cullinan, and Lloyd (1977). For a sample of 20 LD children, they report a significant correlation for response time ($r = .72$, $p < .001$) and error scores ($r = .55$, $p < .02$). For internal consistency, Ault et al. (1976) reported Cronbach coefficient

alphas of .89 for response latency and .52 for errors. Cairns (1977) reported MFF reponse time Spearman-Brown reliability coefficients of .96 for 9 year-olds and .97 for 11 year olds and error score reliability coefficients of .63 and .68, respectively.

Self Control Rating Scale

The Self Control Rating Scale (SCRS, Kendall and Wilcox, 1979) was the measure of children's self-control. The SCRS contains 33 items rated by the teacher on a seven-point continuum. Ten items describe behaviors associated with self control, 13 items describe impulsive behaviors, and 10 items denote both possibilities. Kendall and Wilcox (1979) report the following information concerning the validity and reliability of the SCRS. SCRS scores correlate significantly with behavioral observations of classroom behavior, latency and errors from the MFF, and Porteus Maze test scores. These correlations remained significant when I.Q. and chronological age were partialled out. An orthogonal factor analysis of SCRS scores revealed one major factor accounting for 72% of the variance. The authors identified the factor as cognitive-behavioral self control. The authors report a test-retest reliabliity over a three-to-four week period of .84. Cronbach's internal consistency coefficient alpha for the SCRS was reported to be .98. Comparisons of randomly selected students and students referred by teachers to participate in self-control training revealed significant differences for MFF test scores, SCRS scores, and behavioral observation. In all cases, the referred children obtained scores reflecting less self-control. The authors concluded that teacher referral using the SCRS appears to be a sound

procedure for subject selection in future research. (The SCRS can be found in Appendix A.)

Procedure

Subject Selection

All subjects were selected from children attending learning disability classes in their respective schools. Teachers of these classes rated their students on the SCRS. From this population, a sample of 30 children who scored at least .5 standard deviation above the normative means collected by Kendall and Wilcox (1979) participated in the study. Participation in this research was dependent on parental and school consent.

Period 1: Pretreatment Assessment

Seven to ten days prior to the treatment, all subjects were administered the MFF. The subjects were randomly assigned to a treatment, nonspecific treatment, or pretest/posttest only control group. Two children from each of the treatment conditions were randomly assigned to each of the five therapists.

Intervention

The subjects in both treatment and nonspecific treatment groups received a total of six, 40-50 minute sessions, conducted twice a week for three weeks. The length of treatment and timing of the assessment periods was determined empirically on the basis of previous research employing similar treatments and instrumentation (Kendall and Finch, 1978; Kendall and Wilcox, 1979; Kendall and Zupan, 1980). Each

therapist worked with two children during each session and was assigned one pair of subjects from the treatment and one pair from the nonspecific treatment groups. All materials and tasks were the same for both treatment conditions; however, the treatment group engaged in verbal-self instruction via modeling with a response-cost contingency on errors. They also received reinforcement for accurate self-evaluation. Therapy materials and application of cognitive-behavior treatment procedures for each session are based directly on those developed by Padawer, Kendall, and Zupan (1980). The therapy materials and tasks used in each session are described below and a specific list can be found in Appendix B. Additionally, a flow chart outlining materials and treatment procedures by session can be found in Appendix C.

Therapy Materials. The materials used in the six sessions were simple psycho-educational tasks commonly used in special education classes (see Appendix B). The tasks consist of completing sequences of drawings, following directions, skill exercises, solving problems using the "Little Professor" calculator, and assembling perceptual puzzles (Tangrams) to form assorted figures.

Cognitive-Behavioral Treatment Condition. Subjects in the treatment group received the components of the cognitive-behavioral treatment: (1) training in VSI, (2) modeling, and (3) contingencies (response-cost and reward for self-evaluation). Training in VSI was introduced in session one. The therapist modeled VSI using overt speech demonstrating the types of self verbalizations: defining the problem, stating a problem approach, focusing attention, choosing an

answer, and self-reinforcement. Coping statements for errors were also demonstrated. During the first session, the subject imitated the therapist and used a cue card to aid in remembering the sequence and types of self-verbalizations. Over the next five sessions, VSI faded from overt speech to a whisper and finally to a covert level (see Appendix C).

The modeling component of the cognitive-behavioral treatment was embedded in the VSI training. The children were taught VSI by altering task performance with the therapist. Minimal use of direct instructions was employed. The therapist modeled two major types of behavior, mastery (successful performance) and coping (reorienting to the problem when an error is committed).

Several contingencies were incorporated in the cognitive-behavioral treatment. First, there was a response-cost contingency. At the beginning of each session, the child was given 20 tokens. If he committed an error (e.g., answered incorrectly or omitted any of the self-statements), a token was lost. Additionally, the therapist verbally identified the error. Second, the child could receive a bonus token for accurate self-evaluation at the end of each session. Both therapist and child rate the child's performance for the session on a five-point scale ranging from "not so good" to "super". If their ratings were within one point of each other, then the child received a bonus token. Tokens were exchanged for educational items (pencils, Flair pens, supply pouches) at the end of each session. The reward menu is located in Appendix D.

Nonspecific Treatment Condition. Subjects in the nonspecific treatment condition met in pairs with assigned therapists for the same

number of sessions and practiced the same psychoeducational tasks. However, they did not receive the components of the cognitive-behavioral treatment. Since this group did not receive tokens, each therapist gave the children the same items selected by the pair of children in their respective cognitive-behavioral treatment condition.

Pretest/Posttest Only Control Condition. Subjects in this condition received no treatment. They were administered the MFF and rated by their teachers on the SCRS before and after the intervention with the other subjects.

Period 2: Posttreatment Assessment

All subjects were administered the MFF 3-4 days following completion of the sixth treatment session. The subjects' teachers rated subjects on the SCRS within 7-10 days after the sixth session was completed. Teachers had no information as to which treatment group subjects were assigned.

Analysis of the Data

Hypotheses one through three were investigated by using separate three-way analyses of variance (Groups by Therapists by Assessment Periods), with repeated measures of the last factor, for each dependent variable. There were three levels of the Groups factor: treatment, nonspecific treatment, and pretest/posttest only control. There were five levels of the Therapists factor and two levels of the Assessment Periods factor, pretreatment and posttreatment assessment. Computationally, this design is equivalent to the Split-Plot Factorial Design (SPF pq.r) outlined by Kirk (1968). Subjects in the

pretest/posttest only control group were randomly assigned to therapists. Computations were done using SAS (Barr, Goodnight, Sall, and Helwig, 1976). The minimum requirement for significance was set as an experimentwise error rate of $p < .05$.

Limitations of the Study

Several factors limit the generalizability of the finding of this study. First, subject selection was made from a population of LD children in public elementary schools on the basis of teacher ratings indicative of low self-control. It must be emphasized that LD children are not a homogeneous group and not all LD children display low self-control. Therefore, the findings of the present study are generalizable to LD children who display nonself-controlled, impulsive behavior. Second, generalization of treatment effects to classroom behavior was investigated by one dependent measure, the SCRS, and, thus, was limited in scope. Finally, there was insufficient time remaining in the school year to conduct follow-up assessments which would have allowed examination of maintenance for treatment effects. Therefore, generalizing the findings of this study to a longer period of time would be inappropriate.

CHAPTER IV

RESULTS

Introduction

The purpose of this chapter is to present the results of the statistical analysis of the three research questions formulated in the present study. The emphasis of the study is to examine the effects of cognitive-behavioral self-control training on three dependent measures: impulsivity (I), efficiency (E), and self-control of LD children. Separate three-way analyses of variances (Groups by Therapists by Assessment Periods) with repeated measures on the last factor (Assessment Periods) were conducted for each of the three dependent measures. Additionally, the comparability of the three groups (Treatment, Nonspecific Treatment, and Pre-test/Post-test Only Control) was examined by conducting separate one-way analysis of variance on four subject variables: chronological age (CA) and three measures of intelligence from the Weschler Intelligence Scale for Children-Revised (WISC-R)--Verbal IQ (VIQ), Performance IQ (PIQ), and Full Scale IQ (FSIQ). Prior to presenting the results for the three research questions, the comparability of the treatment groups will be examined.

Group Comparability

Means and standard deviations on age, VIQ, PIQ, and FSIQ for each treatment group are presented in Table I. One-way analyses of variance indicated that the groups did not differ significantly with respect to age ($F_{2,27} = 1.28$, $p = .29$), VIQ ($F_{2,27} = 2.05$, $p = .15$), or PIQ ($F_{2,27} = 2.32$, $p = .15$). The groups were found to differ significantly on FSIQ ($F_{2,27} = 3.72$, $p = .04$). Tukey's HSD (Kirk, 1968) was used to determine the means between which significant differences existed. It was found that mean FSIQ for the nonspecific treatment group was significantly greater ($p < .05$) than for the control group. Mean FSIQ for the treatment group did not differ significantly with either that of the nonspecific treatment group or the control group; therefore, no positive bias in favor of the treatment group was introduced into the experiment.

Tests of the Research Questions

The research questions will be discussed in terms of the statistical results of the data. Means and standard deviations for the dependent variables at the assessment periods for the three groups are presented in Table II.

Research Question One: Does cognitive-behavioral self-control training reduce impulsivity (I) of LD children?

Referencing Table III, the I scores evidenced a significant group effect ($F_{2,15} = 4.10$, $p = .038$), a significant Periods effect ($F_{1,15} = 31.63$, $p = .0001$), and a significant Groups by Periods interaction ($F_{2,15} = 12.13$, $p = .0007$). The analysis of variance for

TABLE I

MEAN AGE, VIQ, PIQ, FSIQ BY GROUPS*

Measure	Groups					
	Treatment		Nonspecific Treatment		Control	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Age (mo.)	134.3	17.6	122.1	16.0	128.3	16.8
VIQ	86.3	7.8	91.7	6.8	85.6	7.3
PIQ	90.6	4.8	93.2	10.2	85.0	10.2
FSIQ	87.8	5.8	90.4	5.8	83.8	4.8

*n=10 for each group

TABLE II

MEANS AND STANDARD DEVIATIONS OF THE DEPENDENT VARIABLES AT THE ASSESSMENT PERIODS FOR THE THREE GROUPS*

Dependent Variable		Group: Treatment, Period 1	Treatment, Period 2	Nonspecific Treatment, Period 1	Nonspecific Treatment, Period 2	Control, Period 1	Control, Period 2
Impulsivity	$\bar{X}$	1.96	-1.66	2.05	1.77	1.56	1.13
	SD	1.14	1.14	1.56	1.66	1.23	1.21
Efficiency	$\bar{X}$	0.38	-0.50	0.92	0.68	0.49	-0.23
	SD	0.88	0.54	0.46	1.23	1.12	0.83
Self-Control Rating Scale	$\bar{X}$	169.00	142.90	170.30	153.10	166.80	149.70
	SD	12.39	13.25	15.92	25.00	18.06	17.22

*n=10 for each group

TABLE III

SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE: IMPULSIVITY

Source	SS	df	MS	F	P
Between Subjects					
A (Groups)	10.288	2	5.144	4.10	.0379
C (Therapists)	15.125	4	3.781	3.02	.0519
A x C	47.760	8	5.970	4.76	.0046
Subj w. groups	18.797	15	1.253		
Within Subjects					
B (Periods)	13.680	1	13.680	31.63	.0001
A x B	10.488	2	5.244	12.13	.0007
B x C	1.817	4	0.454	1.05	.4142
A x B x C	6.957	8	0.869	2.01	.1159
B x Subj w. groups	6.487	15	0.432		
Total	131.404	59			

the simple effects breakdown of the Groups by Periods interaction are presented in Table IV. The analysis reveals that there were no significant differences between the groups prior to the intervention at Assessment Period 1 ($F_{2,15} < 1$). However, at Assessment Period 2, the groups differed significantly on I ($F_{2,15} = 11.51$, $p < .01$). At Assessment Period 2, post hoc comparisons using Tukey's HSD revealed that the mean I score for the treatment group was significantly less than the nonspecific treatment group ($p < .01$) and the control group ($p < .01$). No significant differences between the nonspecific treatment group and control group was indicated at Period 2. Furthermore, Table IV reveals a significant decrease on I for the treatment group from Period 1 to Period 2 ($F_{1,15} = 52.73$, $p < .01$), while no differences were found for either the nonspecific treatment or the control group from Period 1 to Period 2. Figure 1 illustrates the significant Groups by Periods interaction. Thus, the presence of the significant Groups by Periods interaction and follow-up analysis which isolated a significant decrease on I across Assessment Periods for only the treatment group provides evidence to answer Research Question One affirmatively. More specifically, Hypothesis One cannot be rejected.

Research Question Two: Does cognitive-behavioral self-control training increase efficiency (E) of LD children?

The results of the analysis of variance for E presented in Table V reveal a significant main effect for Periods ($F_{1,15} = 13.80$, $p = .0021$). Also indicated are nonsignificant F values for Groups ($F_{2,15} = 3.62$, $p = .0522$) and Therapists ($F_{4,15} = 1.62$, $p = .2214$). Importantly, the absence of a significant Groups by Periods

TABLE IV

SIMPLE EFFECTS BREAKDOWN OF THE GROUPS BY ASSESSMENT PERIODS INTERACTION: IMPULSIVITY

Source	SS	df	MS	F
A x B				
A at b_1	1.08	2	0.54	0.64
A at b_2	19.38	2	9.69	11.51*
Pooled Error	12.64	15	0.84	
B at a_1	22.77	1	33.77	52.73*
B at a_2	.14	1	0.14	0.32
B at a_3	.99	1	0.99	2.29
B x Subj w. groups	6.47	15	0.43	

*$p < .01$

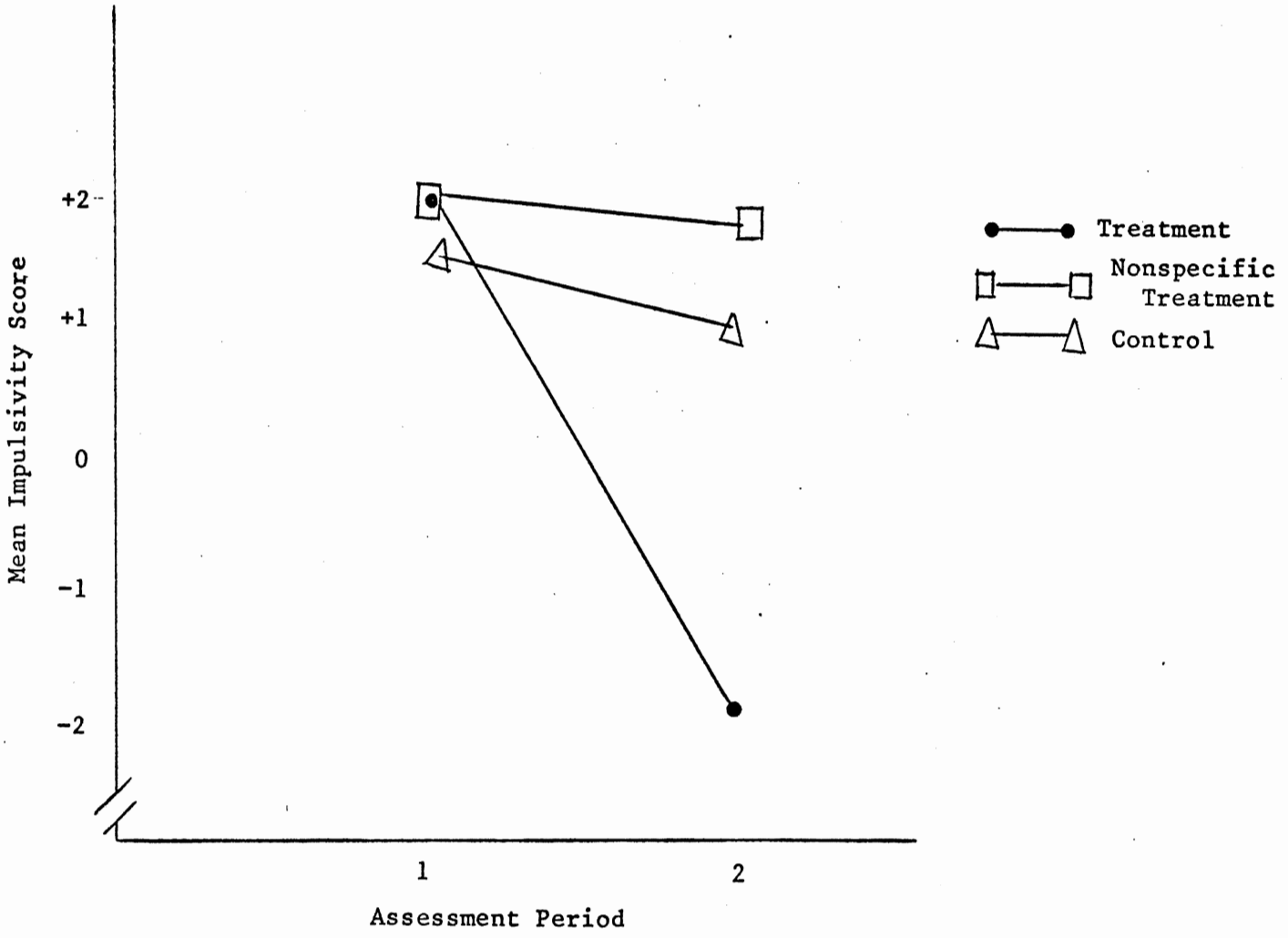

Figure 1. Groups by Assessment Periods Interaction: Impulsivity

TABLE V

SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE: EFFICIENCY

Source	SS	df	MS	F	P
Between Subjects					
A (Groups)	8.222	2	4.111	3.62	.0522
C (Therapists)	7.349	4	1.837	1.62	.2214
A x C	4.978	8	0.622	0.55	.8033
Subj w. groups	17.040	15	1.136		
Within Subjects					
B (Periods)	5.698	1	5.698	13.80	.0021
A x B	1.128	2	0.564	1.37	.2849
B x C	1.144	4	0.286	0.87	.5022
A x B x C	5.951	8	0.743	1.80	.1550
B x Subj w. groups	6.192	15	0.412		
Total	58.004	59			

interaction ($F_{2,15} = 1.37$, $p = .284$) indicates that the groups were not differentially affected by the treatment conditions. Finally, nonsignificant interactions were found for Groups by Therapists ($F_{4,15} = 0.87$, $p = .5022$), and Groups by Periods by Therapists ($F_{8,15} = 1.80$, $p = .1550$). With respect to Research Question Two, the absence of a significant Groups by Periods interaction does not provide support for an affirmative answer. More specifically, Hypothesis Two cannot be accepted. The significant Periods effect reflects decreased E scores (increased efficiency) regardless of treatment group.

Research Question Three: Does cognitive-behavioral self-control training enhance LD children's self-control?

The analysis of variance on the SCRS data presented in Table VI resulted in significant main effects for Therapists ($F_{4,15} = 3.14$, $p = .046$) and Periods ($F_{1,15} = 53.51$, $p = .001$). Importantly, the Groups by Periods interaction was not significant ($F_{2,15} = 1.17$, $p = .335$) which indicates that the treatment conditions did not differentially affect SCRS scores. Also, the F values for the Groups by Therapists ($F_{8,15} = .63$, $p = .744$), Therapists by Periods ($F_{4,15} = 2.59$, $p = .078$), and Groups by Therapists by Periods ($F_{8,15} = 1.69$, $p = .180$) interactions were not significant. Since Period 1 SCRS scores were obtained prior to the treatment condition, the significant main effect for Therapists and the absence of a significant Therapists by Periods interaction indicates that the main effect for Therapists is accounted for by subject variation. The significant main effect for Periods indicates that SCRS scores decreased across Periods irrespective of treatment group. The mean

TABLE VI

SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE:
SELF-CONTROL RATING SCALE

Source	SS	df	MS	F	P
Between Subjects					
A (Groups)	335.033	2	167.516	0.45	0.644
C (Therapists)	4650.933	4	1162.733	3.14	0.046
A x C	1855.466	8	231.933	0.63	0.744
Subj w. groups	553.500	15	370.233		
Between Subjects					
B (Periods)	6080.266	1	6080.266	53.51	0.001
A x B	267.033	2	133.516	1.17	0.335
B x C	1178.733	4	294.683	2.59	0.078
A x B x C	1540.466	8	192.588	1.69	0.180
B x Subj w. groups	1704.500	15	113.633		
Total	23165.933				

and standard deviation of the SCRS scores for each group at Period 1 and Period 2 are presented in Table II. With respect to Research Question Three, the absence of a significant Group by Periods interaction does not provide evidence for an affirmative answer. More specifically, Hypothesis Three cannot be accepted.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary of the Investigation

The present study examined the effects of cognitive-behavioral self-control training on impulsivity, efficiency, and self-control of LD children. The cognitive-behavioral self-control training consisted of four components: verbal self-instruction, modeling, a response cost for errors, and reinforcement for accurate self-evaluation. From 71 LD children rated by their learning disabilities teachers on the Self-Control Rating Scale (SCRS, Kendall and Wilcox, 1979), 30 children with scores on the SCRS indicative of low cognitive-behavioral self-control were assigned to one of three groups: a treatment group (n = 10), a nonspecific treatment group (n = 10), or a pretest/posttest only control group (n = 10). Prior to the intervention, subjects were also administered the Matching Familiar Figures test (MFF, Kagan et al., 1964). Children in the treatment and nonspecific treatment groups received six, 40-50 minute therapy sessions over a three-week period. The children worked in pairs with an individual therapist on a variety of common psychoeducational tasks. Subjects in the treatment group received verbal self-instruction training via modeling with a response-cost contingency for errors and reinforcement for accurate self-evaluation of performance. Subjects in the nonspecific treatment group received

therapist attention and exposure to therapy materials without the cognitive-behavioral strategies. Subsequent to the intervention, all subjects were readministered the MFF and rated by their teacher on the SCRS. Teacher ratings were completed blind of subject assignment to treatment or nonspecific treatment group. Impulsivity (I) and efficiency (E) scores derived from the MFF as well as SCRS scores were analyzed by separate three-way analyses of variance (Groups by Therapists by Assessment Periods) with repeated measures on periods.

Conclusions

Within the limits and scope of the present study, the following conclusions are suggested by the results presented in Chapter IV:

Hypothesis One: Impulsivity (I) was reduced by the cognitive-behavioral self-control training.

Hypothesis Two: Efficiency (E) was not increased by the cognitive-behavioral self-control training.

Hypothesis Three: The cognitive-behavioral self-control training did not increase LD children's self-control.

Discussion

The findings of the present study indicated that (a) the cognitive-behavioral treatment group evidenced reduced impulsivity while the nonspecific and control groups manifested no change on impulsivity, (b) all three groups manifested improved efficiency, and (c) the teachers' ratings of self-control decreased for all groups. The discussion to follow will focus on three major areas. First, interpretation of the findings will be addressed. Second,

the findings of the present study will be discussed in relation to research on impulsivity and self-control. Finally, implications of the present study will be considered.

The results provide statistical evidence demonstrating that impulsivity was reduced from pretreatment to posttreatment assessment periods for the cognitive-behavioral treatment group. On the other hand, no change on impulsivity was noted for either the nonspecific treatment or control group. The quantitative measure of impulsivity, I, reflects a dimension from fast-inaccurate to slow-accurate performance on the MFF. Since I equals the z-score for total errors minus the z-score for response latency, increasing positive values of I indicate faster and more inaccurate responses on the MFF. Increasing negative values of I indicated slower and more accurate responses on the MFF. The mean pretreatment I scores were 1.96, 2.05, and 1.56, respectively, for the treatment group, nonspecific treatment group, and control group. The mean posttreatment I score for the treatment changed substantially to -1.66. The treatment group's mean I score was not only lower than their pretreatment score, but, additionally, their performance changed from fast-inaccurate to slow-accurate relative to norms for the MFF. Thus, the cognitive-behavioral training condition appears to have been effective in achieving "clinically" significant as well as statistically significant reduction of impulsivity.

Efficiency scores decreased across assessment periods irrespective of treatment condition. The measure of efficiency, E, reflects quantitatively the slow-inaccurate to fast-accurate continuum of performance on the MFF. E equals the sum of z-scores for total

errors and average response latency on the MFF; therefore, increasing positive values of E indicate increasing inefficiency (slow-inaccurate) while increasing negative values indicate efficiency (fast-accurate). The mean E score for all subjects decreased from .59 at pretreatment to -.05 at posttreatment. The magnitude of these scores reflect only a small change in efficiency. Furthermore, the value of the E scores fall relatively close to average on the fast-accurate/slow-inaccurate continuum. Therefore, the subjects' performances can not be readily classified as fast-accurate or slow-inaccurate.

Consideration of the I in conjunction with the E scores is important for interpretive purposes. The treatment group evidenced a change on I from fast-inaccurate to slow-accurate while manifesting no change relative to the other groups on efficiency.

From the normative information, Salkind (1977) noted that

> . . . the development of MFF performance with age indicates that a change in strategy (I-score) from impulsive to reflective appears to precede a change in efficiency from reflective to efficient (p. 13).

He further states that on the MFF one cannot become efficient until one has adopted the more effective strategy. The findings of the present study suggest that while the treatment group changed to a reflective strategy on the MFF, they had not yet become proficient at efficient use of the strategy. The implication of considering both I and E scores is the suggestion that training should focus first on promoting a change in strategy and then focus on fostering efficient use of the strategy.

The teachers' ratings of self-control decreased across assessment periods regardless of treatment condition. Lower scores on the

SCRS reflect more self-control. Hence, it appears that the cognitive-behavioral treatment did not differentially affect the ratings of self-control. Several factors could account for such an outcome. First, it is possible that the children acted in a more self-controlled manner because they were participating in an experiment. Inasmuch as the pretest/posttest only group's mean SCRS scores did not differ from the other experimental groups, such an explanation of the results would seem unlikely. Second, the teachers could have reacted differently to the SCRS when they rated the children a second time, tending to rate children less extreme. In light of the point that the teachers were blind to subject assignment to treatment or nonspecific treatment group but aware of which children were in the control group, constant error could have entered into the ratings making their validity suspect. If this was the case, it is possible that the ratings were insensitive to the behavioral changes. Further discussion of the use of the SCRS in future research will be considered below.

While the present research demonstrated the effectiveness of cognitive-behavioral self-control training for modifying impulsivity of LD children, generalization of treatment effects to ratings of self-control by the teachers was not found. In general, the finding regarding impulsivity is consistent with research indicating that impulsivity is amenable to modification (Messer, 1976) and that strategies employing verbal self-instruction training result in decreased impulsivity (Meichebaum and Goodman, 1971; Bender, 1976). Furthermore, the effectiveness of cognitive-behavioral techniques in modifying impulsivity of LD children was documented by the present

study. The suggestion that impulsivity of LD children is resistant to modification (Cullinan et al., 1977) was not supported; however, the notion that techniques that modify impulsivity with non-LD populations are effective with LD children (Nagle and Thwaite, 1979) was supported.

A more direct comparison is possible between the present study and research employing similar techniques and instrumentation. As noted previously, cognitive-behavioral training had consistently resulted in improved ratings of children's self-control while reductions on impulsivity were less consistent (Kendall and Finch, 1978; Kendall and Wilcox, 1979; Kendall and Zupan, 1980). The present study provides rather strong results supportive of the training's effect of reducing impulsivity measured by the MFF. However, generalization to SCRS ratings was not replicated.

Recommendations for Future Research

Although the present study indicated that cognitive-behavioral self-control training was effective in reducing impulsivity of LD, ratings of the children's classroom behavior failed to indicate that the training generalized to classroom behavior. Due to the limitations and findings of this study, the following recommendations are made:

1) Future research should investigate the maintenance of reductions in impulsivity. The findings of the present study indicated clinically significant decrease of impulsivity following a brief but intensive intervention. The stability of such a change should be examined by follow-up

assessments over a longer interval.

2) The indirect measure of self-control through the use of teacher ratings could be subject to constant error and therefore threaten the validity of the findings. Therefore, future research should use a more direct measure of classroom behavior. For example, measures of time on task or frequencies of specific behaviors could be employed.

3) Cognitive-behavioral strategies could be applied to a specific content area such as mathematics to investigate aptitude treatment interactions between impulsivity and achievement.

4) The present study attempted to measure treatment generalization only to classroom behavior. Other important indices of treatment generalization such as measures of children's attributions for success and failure, achievement motivation, or self-concept should be addressed in future research.

SELECTED BIBLIOGRAPHY

Abikoff, H. Cognitive training interventions in children: Review of a new approach. Journal of Learning Disabilities, 1979, 12, 123-135.

Abikoff, H. and Ramsey, P. A critical comment on Kendall and Finch's cognitive behavioral group comparison study. Journal of Clinical and Consulting Psychology, 1979, 47, 1104-1106.

Arter, J. A. and Jenkins, J. R. Differential diagnosis - prescriptive teaching: A critical appraisal. Review of Educational Research, 1979, 49, 517-555.

Ault, R. L. Problem solving strategies of reflective, impulsive, fast-accurate and slow-inaccurate children. Child Development, 1973, 44, 259-266.

Ault, R. L., Mitchell, C., and Hartman, D. Some methodological problems in reflective-impulsivity research. Child Development, 1976, 7, 227-231.

Bandura, A. Social Learning Theory. Englewood Cliffs, N.J.: Prentice Hall, 1977.

Barrett, E. Reflection-impulsivity as a predictor of children's academic achievement. Child Development, 1977, 48, 1142-1447.

Bar-Tal, D. Attributional analysis of achievement-related behavior. Review of Educational Research, 1978, 48, 259-271.

Barr, A., Goodnight, J., Sall, J., and Helwig, J. A User's Guide to SAS 76. Raleigh, N.C.: SAS Institute Inc., 1976.

Bender, N. Self-verbalization versus tutor verbalization in modifying impulsivity. Journal of Educational Psychology, 1976, 88, 347-354.

Bentler, P. M. and McClain, J. A multi-trait and multi-method analysis of reflection-impulsivity. Child Development, 1976, 47, 218-226.

Bowen, C., Galbert, T. and Torgesen, J. Memorization processes involved in performance on the visual-sequential memory subtest of the Illinois Test of Psychologuistic Abilities. Journal of Educational Psychology, 1978, 70, 887-893.

Briggs, C. and Weinberg, R. Effects of reinforcement in training children's conceptual tempo. Journal of Educational Psychology, 1973, 65, 383-394.

Bryan, T. Learning disabled children's classroom behaviors and teacher-child interactions. Journal of Pediatric Psychology, 1979, 4, 233-246.

Bugental, D., Whalen, C., and Henker, R. Causal attributions and motivational assumptions of two behavior-change strategies: Evidence for an interactionist position. Child Development, 1977, 48, 874-884.

Cairns, E. The reliability of the MFFT. British Journal of Educational Psychology, 1977, 47, 197-198.

Cathcart, G. and Liedtke, E. Reflectiveness/impulsiveness and mathematics achievement. Arithmetic Teacher, 1969, 16, 536-567.

Chapman, J. E. and Boersma, F. J. Learning disabilities, locus of control, and mother attitudes. Journal of Educational Psychology, 1979, 71, 250-258.

Coles, G. The learning disabilities test battery: Empirical and social issues. Harvard Educational Review, 1978, 48, 1-28.

Cook, B. A comparative study of reading, impulsivity and learning disabilities. Master's thesis, Oklahoma State University, 1976.

Cullinan, D., Epstein, M. H., and Silver, L. Modification of impulsive tempo in learning disability pupils. Journal of Abnormal Psychology, 1977, 5, 437-444.

Davey, B. Cognitive style and reading achievement. Journal of Reading, 1976, 20, 113-120.

Denny, D. R. Reflection and impulsivity as determinants of conceptual strategy. Child Development, 1973, 43, 614-623.

Denny, N. W. and Turner, M. C. Facilitating cognitive performance in children: A comparison of strategy modeling and strategy modeling with overt self-verbalization. Journal of Experimental Child Psychology, 1976, 4, 259-276.

Douglas, V. I., Parry, P., Marton, P., and Garson, C. Assessment of a cognitive training program for hyperactive children. Journal of Abnormal Child Psychology, 1976, 4, 259-276.

Drake, D. Perceptual correlates of impulsive and reflective behavior. Child Development, 1970, 2, 202-214.

Dweck, C. S. The role of expectations and attributions in the alleviation of learned helplessness. Journal of Personality and Social Psychology, 1975, 31, 674-685.

Dweck, C. S. and Bush, E. S. Reflections on conceptual tempo: Relationship between cognitive style and performance as a functioning of task characteristics. Developmental Psychology, 1975, 11, 567-574.

Egeland, B. Training impulsive children in the use of more efficient scanning techniques. Child Development, 1974, 45, 165-171.

Egeland, B. and Weinberg, R. A. The Matching Familar Figures Test: A look at its psychometric credibility. Child Development, 1976, 47, 483-491.

Epstein, M. H., Hallahan, D. P., and Kauffman, J. M. Implications of the reflectivity-impulsivity dimension for special education. Journal of Special Education, 1975, 9, 11-25.

Epstein, M. E., Cullinan, D., and Lloyd, J. Reliability of the Matching Familar Figures Test scores of learning disabled children. Perceptual and Motor Skills, 1977, 45, 56-58.

Epstein, M., Cullinan, D., Lessen, E., and Lloyd, J. Understanding Children with Learning Disabilities. (Project EXCEL Working Paper 3) Dekalb, Ill.: Northern Illinois University, Department of Learning and Development, 1979.

Epstein, M. E., Cullinan, D., and Steinberg, R. Impulsive cognitive tempo in severe and mild learning disabled children. Psychology in the Schools, 1977, 14, 290-294.

Erickson, E., Wyne, M., and Routh, D. A response-cost procedure for reduction of impulsive behavior of academically handicapped children. Journal of Abnormal Child Psychology, 1973, 1, 350-357.

Federal Register. 41, No. 230, November, 1976.

Flavell, J. Developmental studies of mediated memory. In H. Reese and L. Lipsett (eds.), Advances in Child Development and Behavior, 1970, 5, 181-211.

Gagne, R. and Briggs, L. Principles of Instructional Design. New York: Holt, Rinehart, and Winston, 1974.

Gardner, W. I. Learning and Behavior Characteristics of Exceptional Children and Youth. Boston: Allyon and Bacon, 1977.

Haring, N. Behavior of Exceptional Children. Columbus, Ohio: Charles E. Merrill, 1974.

Kagan, J., Pearson, L., and Welch, L. Modifiability of an impulsive tempo. Journal of Educational Psychology, 1966, 57, 359-365.

Kagan, J., Rosman, B. L., Day, D., Albert, J., and Phillips, W. Information processing in the child: Significance of analytic and reflective attitudes. Psychological Monographs, 1964, 78, Whole No. 578.

Kagan, J. Reflection-impulsivity and reading ability in primary grade children. Child Development, 1965, 44, 657-660.

Kagen, R. M. Generalization of verbal self-instructional training in cognitively impulsive children. Doctoral dissertation, University of Texas at Austin, 1976. Dissertation Abstracts International. 1977, 37, 4148B. (University Microfilm No. 77-3926.)

Kanfer, E. and Karoly, P. Self-control: A behavioristic excursion into the lion's den. In C. Franks and G. Wilson (eds.) Annual Review of Behavior Therapy: Theory and Practice, New York: Brunner/Mazel, 1973.

Kendall, P. C. On the efficacious use of verbal self-instructional procedures with children. Cognitive Therapy and Research, 1977, 1, 331-341.

Kendall, P. C. and Finch, A. J. A cognitive-behavioral treatment for impulsivity: A group comparison study. Journal of Consulting and Clinical Psychology, 1978, 46, 110-118.

Kendall, P. C. and Finch, A. J. Developing nonimpulsive behavior in children: Cognitive behavioral strategies for self-control. In P. Kendall and S. Hollon (eds.) Cognitive-Behavioral Interventions: Theory, Research, and Procedures, New York: Academic Press, 1979(a).

Kendall, P. C. and Finch, A. J. Analysis: A reply. Journal of Consulting and Clinical Psychology, 1979(b), 47, 1107-1108.

Kendall, P. C. and Wilcox, C. E. Self-control in children: the development of a rating scale. Journal of Clinical and Consulting Psychology, 1979, 47, 1020-1029.

Kendall, P. C. and Wilcox, L. E. A cognitive-behavioral treatment for impulsivity: Concrete versus conceptual labeling with nonself-controlled problem children. Journal of Clinical and Consulting Psychology, in press.

Kendall, P. C. and Zupan, B. A. Individual versus group application of cognitive-behavior self-control procedures with children. Manuscript submitted for publication, 1980.

Keogh, B. K. and Donlon, G. M. Field dependence, impulsivity and learning disabilities. Journal of Learning Disabilities, 1972, 5, 16-21.

Keogh, B. K. and Margolis, J. Learn to labor and to wait: Attentional problems of children with learning disabilities. Journal of Learning Disabilities, 1976, 9, 18-28.

Keogh, B. K. and Margolis, J. S. A component analysis of attentional problems of educationally handicapped boys. Journal of Abnormal Child Psychology, 1976, 46, 349-359.

Kirk, R. E. Experimental Design: Procedures for the Behavioral Sciences. Belmont, California: Brooks/Cole, 1968.

Kogan, N. Educational implications of cognitive styles. In Gerald Lesser (ed.) Psychology and Educational Practice, Glenview, Ill.: Scott Foresman, 1971.

Luria, A. R. The Role of Speech in the Regulations of Normal and Abnormal Behavior. New York: Permagon Press, 1961.

Luria, A. R. The Working Brain. New York: Penguin, 1973.

Luria, A. R. The Neuropsychology of Memory. Washington, D. C.: Winston, 1976.

Mahoney, M. J. and Thoresen, C. E. Self-Control: Power to the Person. Belmont, California: Brooks/Cole, 1974.

Margolis, H. Relationship between auditory-visual integration, reading readiness, and conceptual tempo. Journal of Psychology, 1976, 93, 181-189.

Margolis, H., Leonard, H., Brannigan, G., and Heverly, M. The validity of form F of the Matching Familar Figures Test. Journal of Experimental Child Psychology, 1980, 29, 12-22.

Meichenbaum, D. Cognitive factors as determinants of learning disabilities: A cognitive-functional approach. In R. Knights and D. Bakker (eds.) The Neuropsychology of Learning Disorders: Theoretical Approaches. Baltimore: University Park Press, 1976.

Meichenbaum, D. and Cameron, R. The clinical potential of modifying what clients say to themselves. In M. Mahoney and C. Thoresen (eds.) Self-Control: Power to the Person. New York: Brooks/Cole, 1974.

Meichenbaum, D. and Goodman, J. Training impulsive children to talk to themselves: A means of developing self-control. Journal of Abnormal Psychology, 1971, 77, 115-126.

Messer, S. Reflection-impulsivity: A review. Psychological Bulletin, 1976, 83, 1026-1052.

Messer, S. Reflection-impulsivity: Stability and school failure. Journal of Educational Psychology, 1970, 61, 487-490.

Myers, P. and Hammill, D. Methods for Learning Disorders. New York: Wiley, 1976.

Nagel, R. J. and Thwaite, B. L. Modeling effects on impulsivity with learning disabled children. Journal of Learning Disabilities, 1979, 12, 51-56.

Nelson, W., Finch, A., and Hooke, J. Effects of reinforcement and response-cost on cognitive style in emotionally disturbed boys. Journal of Abnormal Psychology, 1975, 84, 426-428.

Odom, R. D., McIntyre, C. W., and Neale, G. S. The influence of cognitive style on perceptual learning. Child Development, 1971, 42, 883-891.

Padawar, W. J., Kendall, P. C., and Zupan, B. A. Developing self-control in children: A manual of cognitive-behavioral strategies. Unpublished manuscript, University of Minnesota, 1980.

Pelham, W. E. and Ross, A. O. Selective attention in children with reading problems: A developmental study of incidental learning. Journal of Abnormal Child Psychology, 1977, 5, 1-8.

Pressley, M. Increasing children's self-control through cognitive interventions. Review of Educational Research, 1979, 49, 319-370.

Readence, J. E. and Seafross, L. W. The impulsivity-reflectivity dimension of cognitive style. Reading World, 1976, 16, 88-96.

Reynolds, A. and Flagg, P. Cognitive Psychology. Cambridge, Mass.: Winthrop Publishers, Inc., 1977.

Rickards, J. P. Instructional psychology: From a behavioristic to a cognitive orientation. Improving Human Performance Quarterly, 1978, 7, 256-266.

Ross, A. O. Psychological Aspects of Learning and Reading Disabilities. New York: McGraw-Hill, 1976.

Sabatino, D. When a definition is in trouble, there may be trouble with the definition. Journal of Pediatric Psychology, 1979, 4, 221-231.

Salkind, N. The development of norms for the Matching Familiar Figures Test. Unpublished manuscript, University of Kansas, 1977.

Salkind, N. J. and Wright, J. C. The development of reflection-impulsivity and cognitive efficiency. Human Development, 1977, 20, 377-389.

Shapiro, J. E. The relationship of conceptual tempo to reading readiness test performance. Journal of Reading Behavior, 1976, VIII, 83-87.

Siegelman, E. Reflective and impulsive observing behavior. Child Development, 1969, 40, 1213-1222.

Stein, N. and Landis, R. Differential reinforcement of low rates of performance by impulsive and reflective children. Journal of Experimental Child Psychology, 1975, 19, 37-50.

Stein, N. and Prindaville, P. S. Discrimination learning by impulsive and reflective children. Journal of Experimental Child Psychology, 1976, 21, 25-39.

Swanson, H. L. Developmental recall lag in learning disabled children: Perceptual deficit or verbal mediation deficiency. Journal of Abnormal Child Psychology, 1979, 7, 199-210.

Tarver, S. G. and Hallahan, D. P. Attentional deficits in children with learning disabilities: A review. Journal of Learning Disabilities, 1974, 1, 560-569.

Tarver, S. G., Hallahan, D. P., Kauffman, J. M., and Ball, D. W. Verbal rehearsal and selective attention in children with learning disabilities. Journal of Experimental Child Psychology, 1976, 22, 375-385.

Torgesen, J. K. Problems and prospects in the study of learning disabilities. In M. Hetherington and J. Hagen (eds.) Review of Child Development Research, Vol. 5, New York: Russell Sage Foundation, 1975.

Torgesen, J. K. The role of nonspecific factors in the task performance of learning disabled children: A theoretical assessment. Journal of Learning Disabilities, 1977, 10, 33-40.

Vygotsky, L. Thought and Language. New York: Wiley and Sons, 1962.

Weiner, A. S. and Adams, W. V. The effect of failure and frustration on reflective and impulsive children. Journal of Experimental Child Psychology, 1974, 17, 353-359.

Weiner, B. Achievement Motivation and Attribution Theory. Morristown, N. J.: General Learning Press, 1974.

Wong, B. The effects of directive cues on the organization and recall in good and poor readers. Journal of Education Research, 1978, 72, 32-38.

Yando, R., and Kagan, J. The effect of teacher tempo on the child. Child Development, 1968, 27-34.

Zelnicker, T. and Jeffry, W. Reflective and impulsive children: Strategies of information processing underlying difference in problem solving. Monographs for the Society for Research in Child Development, 1976, 41, 1-59.

Zelnicker, T., Jeffry, W., Ault, R., and Parsons, J. Analysis and modification of search strategies of impulsive and reflective children on the Matching Familiar Figures Test. Child Development, 1973, 44, 445-450.

APPENDIX A

SELF-CONTROL RATING SCALE

BEHAVIOR RATING SCALE FOR CHILDREN

Name of Child_____ Grade_____

Rater_____

Please rate this child according to the descriptions below by circling the appropriate number. The underlined 4 in the center of each row represents where the average child would fall on this item. Please do not hesitate to use the entire range of possible ratings.

1. When the child promises to do something, can you count on him or her to do it?
   1 2 3 4 5 6 7
   always never
2. Does the child butt into games or activities even when he or she hasn't been invited?
   1 2 3 4 5 6 7
   never often
3. Can the child deliberately calm down when he or she is excited or all wound up?
   1 2 3 4 5 6 7
   yes no
4. Is the quality of the child's work all about the same or does it vary a lot?
   1 2 3 4 5 6 7
   same varies
5. Does the child work for long-range goals?
   1 2 3 4 5 6 7
   yes no
6. When the child asks a question, does he or she wait for an answer, or jump to something else (e.g., a new question) before waiting for an answer?
   1 2 3 4 5 6 7
   waits jumps
7. Does the child interrupt inappropriately in conversations with peers, or wait his or her turn to speak?
   1 2 3 4 5 6 7
   waits interrupts
8. Does the child stick to what he or she is doing until he or she is finished with it?
   1 2 3 4 5 6 7
   yes no
9. Does the child follow the instructions of responsible adults?
   1 2 3 4 5 6 7
   always never
10. Does the child have to have everything right away?
    1 2 3 4 5 6 7
    no yes
11. When the child has to wait in line, does he or she do so patiently?
    1 2 3 4 5 6 7
    yes no
12. Does the child sit still?
    1 2 3 4 5 6 7
    yes no

13. Can the child follow suggestions of others in group projects, or does he or she insist on imposing his or her own ideas?
1 2 3 4 5 6 7
able to follow — imposes

14. Does the child have to be reminded several times to do something before he or she does it?
1 2 3 4 5 6 7
never — always

15. When reprimanded, does the child answer back inappropriately?
1 2 3 4 5 6 7
never — always

16. Is the child accident prone?
1 2 3 4 5 6 7
no — yes

17. Does the child neglect or forget regular chores or tasks?
1 2 3 4 5 6 7
never — always

18. Are there days when the child seems incapable of settling down to work?
1 2 3 4 5 6 7
never — often

19. Would the child more likely grab a smaller toy today or wait for a larger toy tomorrow, if given the choice?
1 2 3 4 5 6 7
wait — grab

20. Does the child grab for the belongings of others?
1 2 3 4 5 6 7
never — often

21. Does the child bother others when they're trying to do things?
1 2 3 4 5 6 7
no — yes

22. Does the child break basic rules?
1 2 3 4 5 6 7
never — always

23. Does the child watch where he or she is going?
1 2 3 4 5 6 7
always — never

24. In answering questions, does the child give one thoughtful answer, or blurt out several answers all at once?
1 2 3 4 5 6 7
one answer — several

25. Is the child easily distracted from his or her work or chores?
1 2 3 4 5 6 7
no — yes

26. Would you describe this child more as careful or careless?
1 2 3 4 5 6 7
careful — careless

27. Does the child play well with peers (follows rules, waits turn, cooperates)?
1 2 3 4 5 6 7
yes — no

28. Does the child jump or switch from activity to activity rather than sticking to one thing at a time?
1 2 3 4 5 6 7
sticks to one — switches

29. If a task is at first too difficult for the child, will he or she get frustrated and quit, or first seek help with the problem?
1 2 3 4 5 6 7
seek help quit

30. Does the child disrupt games?
1 2 3 4 5 6 7
never often

31. Does the child think before he or she acts?
1 2 3 4 5 6 7
always never

32. If the child paid more attention to his or her work, do you think he or she would do much better than at present?
1 2 3 4 5 6 7
no yes

33. Does the child do too many things at once, or does he or she concentrate on one thing at a time?
1 2 3 4 5 6 7
one thing too many

APPENDIX B

THERAPY MATERIALS

List and Description of Task Materials

Session	Materials	Description
(1)	"Which one comes next?"	Task requiring completion of sequence with pictorial materials. The subject selects one of three alternatives to complete the task.
(2)	"Following Directions" booklet, Specific Skill Series, Baldwin, N. Y.: Barnell Loft, Ltd., 1976.	Booklet contains 50 units, each consisting of set of directions and 3 task relevant questions.
(3)	Selected "Specific Skills Series" booklet.	One of the following booklets are chosen to fit the student's individual needs: 1. Working with Sounds 2. Using the Context 3. Locating the Answer 4. Getting the Facts 5. Getting the Main Idea 6. Drawing Conclusions 7. Detecting the Sequence
(4)	"The Little Professor"™ calculator and accompanying Fun With Math Facts booklet. (Texas Instruments, Inc.)	Children's calculator that generates math equations at 4 levels of difficulty. Included are addition, subtraction, multiplication, and division problems. Booklet contains educational math games.
(5)	"The Little Professor"™	
(6)	Tangrams (available from Dover Publication Inc., New York.)	Puzzles made with seven geometric shapes. (Five triangles, a rhomboid, and a square.) Object of the task is to arrange shapes to match silhouettes of different objects.

APPENDIX C

THERAPY FLOW CHART OF COGNITIVE-BEHAVIORAL TREATMENT PROCEDURES

Therapy Flow Chart
(Adapted from Padawer, Kendall, and Zupan, 1980.)

Session	Task	Highlights
(1)	"Which One Comes Next?"	Introduction to self-instructions, response-cost contingency, self-evaluation and bonus-chip systems, and reward menu; Overt VSI; Concrete labeling of response-cost; Assign homework project.
(2)	"Following Directions"	Review self-instructions and homework project; Overt VSI for majority of session, begin fading process to whispered VSI with final 2-3 tasks; Concrete labeling.
(3)	"Specific Skills SEries"	Review self-instructions (especially coping statements) and homework assignment; Encourage rephrasing of VSI to curb rote memorization, continue fading process with whispered VSI, some overt; begin conceptual labeling with final 1-2 errors.
(4)	"The Little Professor Math Skills"	Encourage rephrasing of VSI and note additional step possible with a new task; Whispered VSI; Conceptual labeling; Child begins self-evaluation.
(5)	"The Little Professor Math Games"	First interpersonal task; Homework project reviewed; example of when the child actually used the 5 steps outside of therapy; whispered VSI, begin fading to covert VSI; conceptual labeling.
(6)	"Tangram Puzzles"	Continue fading from whispered to covert VSI; conceptual labeling; emphasis on coping model, coping statements during difficult tasks.

APPENDIX D

REWARD MENU

REWARD MENU

ITEM	COST (Chips)
METAL PAPER CLIP	2
LEAD PENCIL	5
NFL PENCIL	7
PENCIL CRAYON	8
MEMO PAD	10
FOLDER	12
ERASER	13
TISH CLIP	15
RULER	17
PENCIL SHARPENER	20
SPIRAL NOTEBOOK	25
FLAIR MARKER	30
DRAWS-A-LOT MARKER	37
CRAYOLA MARKER	40
ZIPPER BAG	45
MULTIPLIER PENCIL BOX	50

VITA

Dean Louis Kerasotes

Candidate for the Degree of

Doctor of Philosophy

Thesis: EFFECTS OF COGNITIVE-BEHAVIORAL SELF-CONTROL TRAINING ON IMPULSIVITY, EFFICIENCY, AND SELF-CONTROL OF LEARNING-DISABLED CHILDREN

Major Field: Educational Psychology

Biographical:

Personal Data: Born at Springfield, Illinois, on April 12, 1950, the son of Louis G. and Anastasia Kerasotes.

Education: Attended Springfield High School in Springfield, Illinois, graduating in June, 1968; attended the University of Illinois, Champaign-Urbana, and received the Bachelor of Science degree in June, 1972, with a major in Psychology; entered graduate school at Oklahoma State University, Stillwater, Oklahoma, August, 1975, and received the Master of Science degree in May, 1978; completed the requirements for the Doctor of Philosophy degree in July, 1980, at Oklahoma State University.

Professional Experience: Graduate Teaching Associate in the Department of Applied Behavioral Studies, Oklahoma State University for courses in Educational Psychology, Child Development, and the Exceptional Child, from 1975 to 1979; Special Research Project Director for the Director of Faculty Development, Oklahoma State University, 1978; Assistant to the Regional Psychological Consultant for the Northeast Oklahoma Headstart Program, 1978; Predoctoral Intern, Fleetwood Psychological Associates, Tulsa, Oklahoma, 1979-1980.

Organizations: Member of American Psychological Association, American Educational Research Association, Phi Delta Kappa, and National Council on Measurement in Education.